Guidance for Preventing Transmission of Carbapenem-resistant Enterobacteriaceae (CRE) in Acute Care and Long-Term Care Hospitals

Wisconsin Division of Public Health CRE Toolkit

P-00532A (Rev. 07/16)
Guidance for Preventing Transmission of Carbapenem-Resistant Enterobacteriaceae (CRE) in Healthcare Settings

The Wisconsin Division of Public Health (DPH) and the City of Milwaukee Health Department (MHD) initiated a project during 2013 to develop a regional collaborative approach to preventing transmission of CRE among healthcare settings. As part of that project, MHD convened a panel of subject matter experts among acute care hospitals, long-term care hospitals and skilled nursing facilities within its jurisdiction to establish inter-facility communications and consistent CRE prevention practices.

This document contains the expert panel recommendations, which are based on the Centers for Disease Control and Prevention, "Facility Guidance for Control of Carbapenem-Resistant Enterobacteriaceae (CRE) – November 2015 Update CRE Toolkit." Healthcare settings covered by these recommendations include both acute care and long-term care hospitals. A separate document was developed for skilled nursing facilities.

Support for this project was provided in part by a grant to the MHD from the National Association of County and City Health Officials.
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<th>Name</th>
<th>Position</th>
<th>Organization</th>
<th>Location</th>
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<tbody>
<tr>
<td>Denise Block, RN, BSN, CIC</td>
<td>Infection Control Coordinator</td>
<td>Wheaton Franciscan–St. Joseph, Wisconsin Heart Hospital, Midwest Spine and Orthopedic Hospital</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Gayle Land, RN, BSN, CIC</td>
<td>Infection Control Coordinator</td>
<td>Wheaton Franciscan-St. Joseph Hospital</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Gwen Borlaug, MPH, CIC</td>
<td>Coordinator, HAI Prevention Program</td>
<td>Wheaton Franciscan Hospital</td>
<td>Madison</td>
</tr>
<tr>
<td>Shannon Lauf, MPH</td>
<td>Manager, Communicable Disease and Immunization</td>
<td>City of Milwaukee Health Department</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Deborah Briggs, RN</td>
<td>Infection Preventionist</td>
<td>St. Anne's Salvatorian Campus</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Kerri Lintott, RN, CIC</td>
<td>Infection Preventionist</td>
<td>Aurora Sinai Medical Center</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Sandra Coffaro, RN, BSN</td>
<td>Communicable Disease Coordinator</td>
<td>Disease Control and Prevention</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Anna Sarah Kaufman, BS</td>
<td>MPH Student–University of Wisconsin</td>
<td>City of Milwaukee Health Department</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Ashlie Dowdell, BA</td>
<td>Coordinator, HAI Surveillance</td>
<td>Wisconsin Division of Public Health</td>
<td>Madison</td>
</tr>
<tr>
<td>Cindy Meyer, RN, BSN</td>
<td>Infection Control Preventionist and QA Coordinator</td>
<td>Luther Manor Senior Living Community</td>
<td>Milwaukee</td>
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<tr>
<td>Charles E. Edmiston, Jr., PhD, CIC</td>
<td>Professor of Surgery and Hospital Epidemiologist</td>
<td>Froedtert and the Medical College of Wisconsin</td>
<td>Milwaukee</td>
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<tr>
<td>Mary Russell, MA</td>
<td>Continuing Medical Education Coordinator</td>
<td>ProHealth Care</td>
<td>Waukesha</td>
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<tr>
<td>Jessica Frosch, BS</td>
<td>MPH Student–University of Wisconsin</td>
<td>University of Wisconsin</td>
<td>Madison</td>
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<tr>
<td>Angela Tonozzi, MD, MS</td>
<td>System Director–Infection Prevention</td>
<td>Aurora Health Care</td>
<td>Elm Grove</td>
</tr>
<tr>
<td>A. Nancy Gagliano, RN, BSN</td>
<td>Public Health Nurse–Communicable Disease</td>
<td>City of Milwaukee Health Department</td>
<td>Milwaukee</td>
</tr>
<tr>
<td>Patti Wilson, RN, BSN, CIC</td>
<td>Infection Preventionist</td>
<td>Froedtert Hospital</td>
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Understanding Carbapenem-Resistant *Enterobacteriaceae* (CRE)

CRE stands for Carbapenem-resistant *Enterobacteriaceae*. *Enterobacteriaceae* are a large family of gram-negative bacilli that are normal inhabitants of the gastrointestinal tract of humans and other animals. *Enterobacteriaceae* can cause infections when they invade the bloodstream, bladder, or other areas of the body. Some CRE have become resistant to all or almost all antibiotics, including last-resort drugs called carbapenems. Three species of the *Enterobacteriaceae* family—*Klebsiella*, *Enterobacter*, and *Escherichia*—are the most frequently identified CRE in the U.S.

**Epidemiologic and Clinical Importance**

Some *Enterobacteriaceae* are resistant to nearly all antibiotics, including carbapenems, which are often considered the antibiotics of last resort. More than 9,000 healthcare-associated infections are caused by CRE each year. As of February 2016, CDC laboratories have confirmed at least one type of CRE among healthcare facilities in 48 states. Approximately 4% of U.S. short-stay hospitals and 19% of long-term acute care hospitals reported at least one patient with a serious CRE infection during the first half of 2012.

**Risk Factors for Carbapenem-Resistant *Enterobacteriaceae* (CRE)**

Healthy people typically do not acquire CRE infections. CRE infections usually occur among hospitalized patients or residents of long-term care facilities who have underlying medical conditions. The major risk factors for acquiring CRE infections in the U.S. include exposure to healthcare and treatment with antibiotics such as carbapenems, cephalosporins, fluoroquinolones and vancomycin. Additional risk factors include a compromised immune system, admission to an intensive care unit and treatment with invasive devices. Outbreaks of CRE have been associated with exposure to long-term care settings.

**Transmission**

CRE are most frequently spread from person to person through contact with infected or colonized individuals. CRE can cause infections when they enter the body, often through medical devices such as intravenous catheters, urinary catheters, or through wounds caused by injury or surgery.
Difference between CRE Colonization and Infection

Isolation of CRE in a clinical culture can represent either colonization or an infection. Colonization means that the organism is found on or in the body but is not causing symptoms of disease. Colonization with CRE can lead to infection if the organisms gain access to body sites, such as the bladder, lungs, or bloodstream, that are normally sterile. Symptoms of infection vary depending on the site of infection, (e.g., cough if in the lungs, urinary symptoms if in the bladder) but can also include general symptoms such as fever or chills. Both colonized and infected persons can transmit CRE.

Treatment of CRE Infections

CRE are often resistant to many commonly prescribed antibiotics but may remain susceptible to some antibiotics. Decisions regarding the treatment of CRE infections are made on a case-by-case basis by a health care provider. Some individuals may be colonized rather than infected with CRE and may not require any treatment.

CDC Definitions of CRE

CDC defines CRE as *Enterobacteriaceae* that are:

- Resistant to any carbapenem antimicrobial (i.e., minimum inhibitory concentrations of ≥4 mcg/ml for doripenem, meropenem, or imipenem OR ≥2 mcg/ml for ertapenem)

OR

- Documented to produce carbapenemase. At present, acceptable tests for carbapenemase production include polymerase chain reaction, Modified Hodge Test, Carba NP, and metallo-β-lactamase testing (e.g., MBL tests or screens).

- For bacteria that have intrinsic imipenem nonsusceptibility (i.e., Morganella morganii, Proteus spp., Providencia spp.), resistance to carbapenems other than imipenem is required.

What Is Currently Being Done to Prevent CRE

Federal Government:

1. Monitoring the presence of and risk factors for CRE infection through the National Healthcare Safety Network (NHSN) and Emerging Infections Program (EIP).
2. Providing CRE outbreak support such as staff expertise, prevention guidelines, tools and lab testing to states and facilities.
3. Developing detection methods and prevention programs to control CRE (the CDC “Detect and Protect” effort supports regional CRE programs).
4. Helping medical facilities improve antibiotic prescribing practices.
Wisconsin:

During 2011, DPH initiated CRE surveillance to determine prevalence among healthcare facilities, identify incidents of healthcare transmission and guide CRE prevention efforts. Wisconsin was the first state to mandate reporting of CRE using the CDC National Healthcare Safety Network (NHSN).

All Wisconsin acute care, critical access and long-term acute care hospitals are required to report laboratory-identified CRE, specifically, carbapenem-resistant *Klebsiella oxytoca, Klebsiella pneumoniae, Enterobacter* spp., and *E. coli*, among hospitalized patients to DPH. During 2017, these same mandatory CRE reporting requirements will be extended to include skilled nursing facilities.

Patients with CRE are placed in contact precautions in private rooms, and healthcare personnel wear gowns and gloves upon entry to the rooms. In some cases, epidemiologically related patients are tested for CRE to determine whether transmission has occurred.

Transferring facilities should notify receiving healthcare facilities and agencies of the patient’s history of CRE to ensure continued use of appropriate prevention measures.

Strict compliance with contact precautions and hand hygiene should be observed by all healthcare providers caring for CRE patients. If more than one CRE patient is located on a unit, they should be housed in a separate location on the unit and use of dedicated staff should be considered to further reduce chances of transmission.

Patients with histories of CRE colonization or infection should be placed in contact precautions with each subsequent hospital admission. There are no recommendations for decolonization or for removing CRE patients from contact precautions.

In skilled nursing facilities, contact precautions are modified when appropriate, to allow for social interactions in these community settings.

Education regarding prevention of CRE transmission can be provided to patients and their families and to staff using the educational pamphlets provided in this toolkit.

What Can Also Be Done to Prevent CRE

Healthcare CEOs/Medical Officers Can:
1. Require and strictly enforce CDC guidance for CRE detection, prevention, tracking, and reporting.
2. Make sure your lab can accurately identify CRE and alert clinical and infection prevention staff when these organisms are present.
3. Know CRE trends in your facility and in the facilities around you.
4. When transferring a patient, require staff to notify the other facility about infections, including CRE.
5. Join or start regional CRE prevention efforts and promote wise antibiotic use.
**Healthcare Providers Can:**

1. Know if patients with CRE are located in your facility, and stay aware of CRE infection rates.
2. Ask if your patients have received medical care somewhere else, including another country.
3. Follow infection control recommendations with every patient, using contact precautions for patients with CRE. Whenever possible, dedicate rooms, equipment, and staff to CRE patients.
4. Prescribe antibiotics wisely. Use culture results to modify prescriptions if needed.
5. Request immediate alerts when the lab identifies a positive CRE patient.
6. Alert the receiving facility when a patient with CRE transfers.
7. Request information on patients transferring into your facility, specifically asking about CRE (or any hospital-acquired) infection.
8. Remove temporary medical devices as soon as possible.

**Patients Can:**

1. Tell your doctor if you have received overnight health care in another facility or country.
2. Take antibiotics only as prescribed.
4. Wash hands often.
   a. Before and after changing wound dressings or bandages.
   b. After using the restroom.
   c. After blowing your nose, coughing, or sneezing.
5. Insist that everyone practice hand hygiene before touching you.
6. Tell your healthcare providers if you have a history of CRE.
Appendices

Appendix 1: Sample Hospital CRE Policy and Procedures

Management of hospital patients with Carbapenem-Resistant Enterobacteriaceae (CRE)

Effective date

Department

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<th>Dates of review/revision</th>
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Background

CRE are a group of bacteria resistant to the last line of drugs that were developed to treat infections with certain drug-resistant organisms. CRE can be divided into two groups: those that produce carbapenemase and are therefore resistant to all beta-lactam antibiotic agents, and those that are not carbapenemase-producing organisms and are usually susceptible to agents other than the carbapenems.

Currently individuals with extensive exposure to health care are at highest risk of CRE infections, however, because the Enterobacteriaceae family includes common gut organisms such as Klebsiella spp. and E. coli, the potential for transmission into the community exists. If this occurs, once-treatable conditions such as pneumonia and urinary tract infections could become difficult or impossible to treat.

This policy describes the hospital response to both non-carbapenemase-producing CRE and carbapenemase-producing CRE.

Purpose

To prevent transmission of CRE through rapid identification and prompt use of contact precautions and other infection control measures.

Procedures for patients with isolates of K. oxytoca, K. pneumoniae, E. coli or Enterobacter spp. testing non-susceptible to at least one carbapenem agent.

1. Microbiology staff will submit isolates to the Wisconsin State Laboratory of Hygiene (WSLH) for fee-exempt testing to detect carbapenemase production and will notify infection prevention staff and unit staff immediately following identification of isolates testing non-susceptible to at least one of the following carbapenem agents:
   a. Doripenem (MIC ≥ 2 and < 4 mcg/mL)
   b. Imipenem (MIC ≥ 2 and < 4 mcg/mL)
   c. Meropenem (MIC ≥ 2 and < 4 mcg/mL)
   d. Ertapenem (MIC ≥ 0.5 and < 2 mcg/mL)
2. Unit staff will immediately place the patient in contact precautions, which include moving the patient to a private room if currently housed in a semi-private room. Unit staff will strictly adhere to contact precautions and hand hygiene practices.

3. Infection prevention staff will place the patient on an alert list to ensure that the patient is placed in contact precautions upon every subsequent hospital admission.

4. The hospital discharge planning team (which may include infection prevention staff) will ensure notification to the receiving facilities or agencies (e.g., home health, hospice, nursing home, acute care) of the patient’s history of CRE. In turn, those facilities or agencies will be instructed to make notification if the patient is transferred to another facility or agency.

5. Unit staff will provide the patient and family members with a CRE educational pamphlet, and infection prevention staff will be available to answer questions. Education for staff members will also be provided when necessary.

Additional procedures for residents with isolates of *K. oxytoca, K. pneumoniae, E. coli, or Enterobacter* spp. testing positive for carbapenemase production.

1. If testing at the WSLH determines the CRE isolate is a carbapenemase-producer, the infection prevention staff will report to DPH within 24 hours of identification using NHSN. If entry into NHSN will be delayed, reporting to DPH should occur by telephone.

2. If DPH determines active screening of exposed patients is necessary, infection prevention staff will work with unit staff to obtain rectal swabs (following instructions in Appendix 2) from patients present on the same units where a CRE patient was identified.
   a. Infection prevention staff will obtain authorization from DPH (608-267-7711 or 608-267-9003 for assistance) to submit rectal swabs to WSLH for fee-exempt testing.
   b. DPH will report the results of the CRE screening tests to the hospital infection prevention staff.
   c. Unit staff will notify patients of their CRE screening results using one of the scripts in Appendix 3.
   d. Patients identified with CRE colonization or infection will be promptly placed in contact precautions.

3. If more than one patient with the same CRE species is located on a unit, the patients should be cohorted in a separate area of the unit when possible, and dedicated staff should be used to provide care, even if patients are housed in private rooms.

4. Patients admitted from facilities with high rates of CRE will be pre-emptively placed in contact precautions.
Appendix 2: Instructions for Collecting and Submitting Rectal Swabs to the Wisconsin State Laboratory of Hygiene (WSLH) to Detect Carbapenemase Production

Supplies
- Culturette™, ESwab™ or similar suitable collection system (do not use calcium alginate swabs)
- Disposable gloves
- Alcohol hand sanitizer

NOTE: As an alternative to collecting a rectal swab, a swab of a stool specimen can be obtained and submitted for CRE surveillance testing.

1. Inform the patient that a rectal swab will be collected. Scripts such as the ones below may be used to inform the patient why he/she is being screened for CRE:

   “Recently a patient admitted to this unit was found to have drug-resistant bacteria called CRE. These organisms can be spread from person to person by direct contact with the infected person or by contact with infected body fluids. Hands can become contaminated after contact with infected persons and that can also serve as a way to spread this organism.

   Cases of CRE in Wisconsin are uncommon, but when they do occur, the state health department asks that we screen other patients on the unit to assess whether this organism has spread. We want to make sure we are providing you and other patients on the unit with safe health care."

   The method for screening requires collection of a rectal swab. Your test results should return in a few days, and if positive for CRE, you will be placed in contact precautions. This means that anyone (including staff and visitors) who enters your room should be wearing gowns and gloves and should perform hand hygiene when entering and exiting your room.”

Sixth grade reading level sample script

“A patient on this unit was found to have a germ called CRE (Carbapenem-resistant Enterobacteriaceae). This germ can be dangerous because it is hard to kill with normal antibiotics.

CRE is not common in Wisconsin, but when it is found, the state health department asks that we check other patients on the unit to see whether this germ has spread. A quick rectal swab is used to collect the screening test. Your results should return in a few days. If you have CRE, you will be placed into contact precautions. This means that anyone who enters your room will need to wear a gown and gloves. Hand washing is very important for everyone when entering and leaving your room.

We want to make sure you and other patients get safe care. It is our job to protect patients from infection while they are in the hospital.”
2. Perform hand hygiene with alcohol hand sanitizer or antimicrobial soap and water, and don a pair of clean, disposable gloves.

3. Insert the swab into the rectum, past the anal sphincter, then rotate one full turn. Withdraw the swab and place back into the culturette tube.

4. Remove gloves, discard into regular trash, and perform hand hygiene.

5. Submit the specimen to clinical laboratory staff for transport to the WSLH.

6. Clinical laboratory staff will complete a WSLH requisition form.
   a. To select the test, under “other,” write in “culture for CRE.”
   b. Indicate on the requisition that testing is “authorized for fee-exempt status by the Division of Public Health.”

7. Store specimens at 2–8°C and ship as soon as possible (under refrigeration) to the WSLH. Specimens may be shipped Monday–Thursday.
Appendix 3: Sample Scripts to Inform Patients of CRE Screening Results

If active surveillance testing indicates the patient is colonized with CRE, the following scripts may be used to inform the patient of the positive test results.

“The results of your CRE screening test indicate you are colonized with, that is you carry, CRE in your intestinal tract. Even though you may not feel any symptoms of illness at this time, you will remain in isolation to help prevent transmission to other patients during your stay here. Because it is possible to carry CRE for a long time, your healthcare providers will practice contact precautions if you are admitted to a hospital in the future. That means you will be placed in a private room and hospital staff will wear gowns and gloves when they are caring for you.

Please read this pamphlet for more information on CRE, and let me know if you or your family members have any questions.”

If active surveillance testing indicates the patient is negative for CRE, the following script may be used to inform the patient of the negative test results.

“The results of your CRE screening test indicate you are not colonized or infected with CRE at this time. We will continue to practice good infection control measures, such as hand hygiene, when caring for you, but you do not need to be placed in isolation during your current hospital stay. Please let me know if you have any questions.”
Appendix 4: Algorithm for Hospital Response to CRE

Management of Patients with Carbapenem-resistant *Enterobacteriaceae* (CRE) in Wisconsin Acute Care and Long-Term Acute Care Facilities, 2016

Detection of *K. oxytoca*, *K. pneumoniae*, *E. coli*, or *Enterobacter* spp. isolates testing non-susceptible\(^1\) to at least one of the following carbapenem agents: imipenem, doripenem, meropenem or ertapenem.

Ensure microbiology laboratory alerts infection prevention and unit staff immediately.

Submit isolates to the Wisconsin State Laboratory of Hygiene to test for carbapenemase production.

Promtly place patients on contact precautions and ensure strict hand hygiene.

Flag patients to ensure contact precautions are observed on subsequent admissions.

Notify receiving facilities or services (e.g., nursing homes, home health agencies) that patients have histories of CRE.

Detection of carbapenemase-producing CRE (i.e., positive for KPC, NDM-1, or OXA-48).

Report to DPH within 24 hours of detection using NHSN or by telephone if entry into NHSN is delayed.

No detection of carbapenemase-producing CRE. Not reportable to DPH. Entry into NHSN is optional.

Patients screening positive for carbapenemase-producing CRE will be placed in contact precautions during all future hospital and nursing home stays.

\(^1\) Minimum inhibitory concentrations (MIC) considered non-susceptible:
- Doripenem (MIC ≥ 2 and < 4 mcg/mL)
- Imipenem (MIC ≥ 2 and < 4 mcg/mL)
- Meropenem (MIC ≥ 2 and < 4 mcg/mL)
- Ertapenem (MIC ≥ 0.5 and < 2 mcg/mL)

Minimum inhibitory concentrations (MIC) considered resistant:
- Doripenem (MIC ≥ 4 mcg/mL)
- Imipenem (MIC ≥ 4 mcg/mL)
- Meropenem (MIC ≥ 4 mcg/mL)
- Ertapenem (MIC ≥ 2 mcg/mL)

Please visit the CDC CRE tool kit for more information regarding CRE prevention in hospitals: [http://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf](http://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf)
Appendix 5: Sample Inter-facility Communications Form

Wisconsin Inter-facility Infection Control Transfer Form

*Please note that this form is a template and can be adapted to better meet the needs of your facility.*

This form is important for ensuring communication among facilities about patients with multidrug-resistant organisms, to help prevent transmission of these organisms across the health care continuum. This form should be completed for transfer to the receiving facility with information communicated prior to or during transfer. Please attach copies of the most recent culture reports with susceptibilities, if available.

### Sending Healthcare Facility:

<table>
<thead>
<tr>
<th>Patient/Resident Last Name</th>
<th>First Name</th>
<th>Date of Birth</th>
<th>Medical Record Number</th>
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<tr>
<th>Name/Address of Sending Facility</th>
<th>Sending Unit</th>
<th>Sending Facility Phone</th>
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<tr>
<th>Sending Facility Contacts</th>
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<th>Phone</th>
<th>E-mail</th>
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<tbody>
<tr>
<td>Case Manager/Admin/SW</td>
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<tr>
<td>Infection Prevention</td>
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**Is the patient currently in isolation?**

- □ No
- □ Yes

**Type of Isolation (check all that apply)**

- □ Contact
- □ Droplet
- □ Airborne
- □ Other: __________________________

**Does patient currently have an infection, colonization OR a history of positive culture of multidrug-resistant organism (MDRO) or other organism of epidemiological significance?**

<table>
<thead>
<tr>
<th>Methicillin-Resistant <em>Staphylococcus aureus</em> (MRSA)</th>
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<tr>
<td>Vancomycin-Resistant <em>Enterococcus</em> (VRE)</td>
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<tr>
<td><em>Clostridium difficile</em></td>
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<tr>
<td><em>Acinetobacter</em>, multidrug-resistant</td>
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<tr>
<td><em>E coli</em>, <em>Klebsiella</em>, <em>Proteus</em>, etc. w/Extended Spectrum B-Lactamase (ESBL)</td>
</tr>
<tr>
<td><em>Carbapenem-Resistant Enterobacteriaceae</em> (CRE)</td>
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<tr>
<td>Other:</td>
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**Currently Colonized or has history of colonization or infection**

- Check if YES

**Active Infection on Treatment**

- Check if YES

**Comments**

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<tr>
<th>Printed Name of Person Completing form</th>
<th>Signature</th>
<th>Date</th>
<th>If information communicated prior to transfer: Name and phone of individual at receiving facility</th>
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Appendix 6: CRE Educational Materials

CRE patient and family education pamphlet available at 
http://www.dhs.wisconsin.gov/publications/P0/P00486.pdf

CRE healthcare staff education pamphlet available at 
http://www.dhs.wisconsin.gov/publications/P0/P00486B.pdf

CRE fact sheet available at 
http://www.dhs.wisconsin.gov/publications/P0/P00470.pdf

Aurora Health Care CRE staff education slides available at 
https://www.dhs.wisconsin.gov/disease/cre.htm under the “Healthcare Professionals” tab

CDC CRE website available at 
Appendix 7: Preparing to Respond to Cases of CRE

The majority of CRE cases have been reported from facilities in Southeastern Wisconsin, but hospital personnel throughout the state should be prepared to manage CRE-positive patients. The following checklist is suggested to help facilities to be ready for CRE.

- CRE policies and procedures have been written and are available to hospital staff.

- The clinical laboratory has a mechanism of immediately alerting infection prevention and unit staff when microbiology results identify a CRE isolate.

- During absence of the infection preventionist, back-up staff has been identified and trained to ensure immediate reporting of CRE cases and prompt implementation of infection control measures.

- Infection prevention staff has the authority to collect specimens from hospital inpatients as part of active CRE surveillance testing and monitoring for transmission.

- Staff education regarding CRE prevention has been conducted at least once.

- CRE educational pamphlets are available for patients and their families when needed.
Appendix 8: Frequently Asked Questions

1. Does consent need to be obtained before collecting rectal swabs for CRE surveillance testing?
   Because this is a surveillance activity for purposes of preventing disease transmission, and not a research project, no separate consent to test for CRE colonization is required.

2. What should we do if a patient refuses to be screened for CRE colonization?
   The alternative to testing a patient as part of active screening for CRE is to place the patient in contact precautions for the remainder of his/her hospital stay. Placing the patient on an alert list or notifying receiving facilities, however, does not need to occur.

3. Who should order the CRE screening tests?
   Infection prevention staff may request an order from the hospital epidemiologist, the department medical director, an infectious disease physician, or the patient’s physician.

4. Who usually collects the specimens?
   Usually the patient’s nurse or other appropriate care provider will explain the purpose of the CRE screening test to the patient, collect the specimen and report the results to the patient or his/her family.

5. What types of specimens can be collected to conduct CRE screening?
   The preferred specimen is a rectal swab, but a perirectal swab or a swab of stool material may also be submitted for testing.

6. Should family members of CRE-positive patients be tested?
   It is not usually necessary to test family members, as they are less likely to acquire CRE than hospitalized patients being treated with invasive devices or who are receiving antibiotics. The current CDC recommendations do not include testing of a patient’s family members.

7. Should healthcare workers exposed to cases of CRE be tested?
   There are no recommendations to test healthcare workers for CRE colonization. Transmission of CRE usually occurs from patient-to-patient due to contaminated hands of healthcare workers. Healthcare workers are usually healthy individuals and are therefore at lower risk of acquiring CRE.

   The best way to protect both patients and healthcare workers is to practice good hand hygiene, standard precautions, and other infection control measures proven effective in preventing transmission of healthcare-associated pathogens.
8. **Is the alcohol hand sanitizer effective against CRE?**
   Yes, alcohol-based hand sanitizers are effective against CRE in the same way they are effective against non-antibiotic resistant bacteria. They can and should be used to decontaminate hands when caring for patients with CRE colonization or infection.

9. **Do rooms housing CRE patients need to be cleaned and disinfected differently from other patient rooms?**
   No additional cleaning and disinfecting measures are required, and the currently used EPA-registered, hospital-approved disinfection products are effective against CRE. During outbreaks, increasing the frequency with which high-touch surfaces and items are cleaned and disinfected may help reduce CRE transmission.
References


