GUIDANCE FOR PREVENTING TRANSMISSION OF CARBAPENEM-RESISTANT *ENTEROBACTERIACEAE* (CRE) IN ACUTE CARE AND LONG-TERM CARE HOSPITALS

Wisconsin Department of Health Services | Division of Public Health
Healthcare-Associated Infections Prevention Program

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INTRODUCTION AND PURPOSE

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 health care 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's "Facility Guidance for Control of Carbapenem-Resistant Enterobacteriaceae (CRE) – November 2015 Update CRE Toolkit." Health care settings covered by these recommendations include both acute care and long-term care hospitals. A separate document was developed for skilled nursing facilities.

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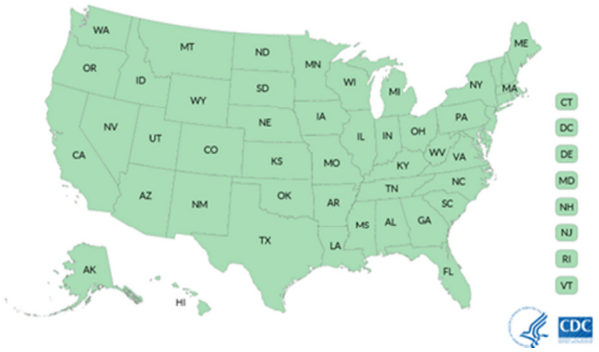
UNDERSTANDING CRE

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.



More than 9,000 healthcare-associated infections are caused by CRE each year. As of February 2018, CDC laboratories have confirmed at least one type of CRE among health care facilities in all 50 states. Approximately 4% of U.S. short-stay hospitals and 18% of long-term acute care hospitals reported at least one patient with a serious CRE infection during the first half of 2012.

RISK FACTORS

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 health care 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. CRE bacteria 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.

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 (for example, 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

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

CDC DEFINITION OF CRE

CDC defines CRE as *Enterobacteriaceae* that are:

- Resistant to any carbapenem antimicrobial (minimum inhibitory concentrations (MIC) 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 (for example, MBL tests or screens)

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

WHAT IS CURRENTLY BEING DONE TO PREVENT CRE?

Federal Government:

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

Wisconsin:

- During 2011, DPH initiated CRE surveillance to determine prevalence among health care facilities, identify incidents of health care 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, long-term acute care hospitals, and long-term care facilities are required to report all laboratory-identified CRE to NHSN per NHSN protocol (https://www.cdc.gov/nhsn/PDFs/pscManual/12pscMDRO_CDADcurrent.pdf) and to local health departments per DHS 145 (https://www.dhs.wisconsin.gov/disease/cre.htm).
- Patients with CRE should be placed in contact precautions in private rooms, and health care 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 health care 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 health care 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.

FURTHER EFFORTS TO PREVENT CRE

Health Care CEOs/Medical Officers:

- Require and strictly enforce CDC guidance for CRE detection, prevention, tracking, and reporting.
- Make sure your lab can accurately identify CRE and alert clinical and infection prevention staff when these organisms are present.
- Know CRE trends in your facility and in the facilities around you.
- When transferring a patient, require staff to notify the other facility about infections, including CRE.
- Join or start regional CRE prevention efforts and promote wise antibiotic use.

Health Care Providers:

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

Patients:

- Tell your doctor if you have received overnight health care in another facility or country.
- Take antibiotics only as prescribed.
- Ask questions. Understand the risks and benefits of your treatment.
- Wash hands often, including:
  - Before and after changing wound dressings or bandages.
  - After using the restroom.
  - After blowing your nose, coughing, or sneezing.
- Insist that everyone practice hand hygiene before touching you.
- Tell your health care providers if you have a history of CRE.

APPENDIX 1: SAMPLE HOSPITAL POLICY AND PROCEDURE

Management of Residents with Carbapenem-Resistant *Enterobacteriaceae* (CRE)

Effective date:

Department

Dates of review/revision						
Initials						

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, persons 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 facility's 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 residents with isolates of *K. oxytoca, K. pneumoniae, E. coli,* or *Enterobacter* spp. testing non-susceptible to at least one carbapenem agent.

1. Microbiology laboratory staff will submit isolates to the Wisconsin State Laboratory of Hygiene (WSLH) for fee-exempt testing to determine 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:
   - 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)

2. Unit staff should 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 should 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, regardless of infection or colonization.

4. The hospital discharge planning team (which may include infection prevention staff) will ensure notification to the receiving facilities or agencies (for example, 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 should 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.

6. The infection preventionist or NHSN administrator will report the CRE into NHSN.

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

1. 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 608-267-0915 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.

2. 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.

3. Patients admitted from facilities with high rates of CRE will be preemptively 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 resident/responsible party that a rectal swab will be collected. Scripts such as the ones in Appendix 3 may be used.

2. Perform hand hygiene with alcohol hand sanitizer or antimicrobial soap and water and then 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. Promptly submit the specimen to the laboratory for transport to the WSLH.

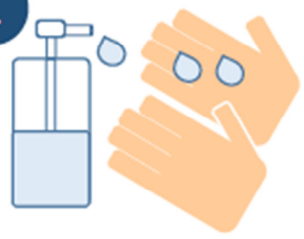
6. Clinical laboratory staff will complete a WSLH requisition form.
   a. To select the test, write in “culture for CRE” under “other.”
   b. Indicate on the requisition that testing is “authorized for fee-exempt status by the Division of Public Health.”

Store specimens at 2–8° C and ship as soon as possible (under refrigeration) to the WSLH.

Specimens may be shipped Monday–Thursday.

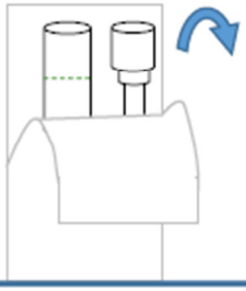
Instructions For Providers to Collect a Rectal Swab

1



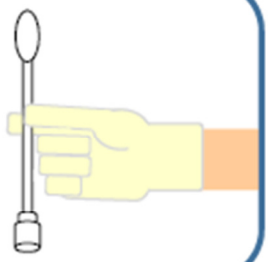
Clean your hands with soap and water or alcohol-based hand rub. Don gloves.

2



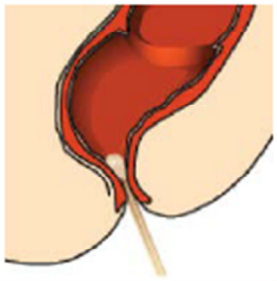
Using the swab provided in the kit, open the wrapper at the end labeled "PEEL HERE".

3



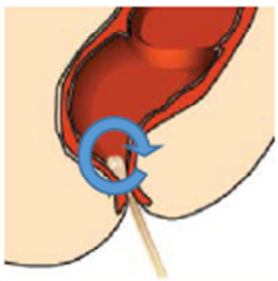
Remove swab from the wrapper holding the stick about 1 ½ to 2 inches from the tip.

4



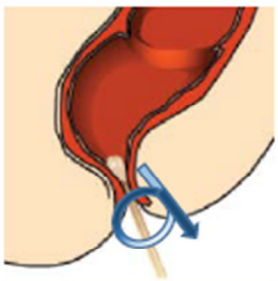
Place the patient in a comfortable position (e.g., standing or laying on their side). Holding the swab firmly, insert the swab into the rectum about 1 to 1 ½ inches.

5



With the swab inserted, gently rotate the swab once or twice in a circle to obtain a sample of stool and/or secretions.

6

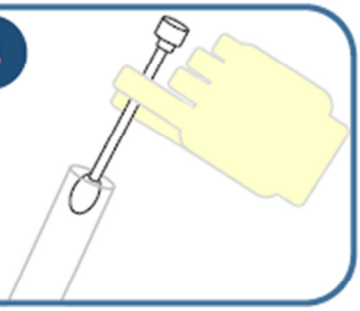


Slowly and gently remove the swab, turning the swab slowly as you remove it.

7

The swab should be lightly, but visibly soiled to ensure an adequate sample.

8



Remove the cap from the swab tube, place swab inside with the tip facing down into the tube and press down on the swab cap to close the tube.

9

Remove gloves. Clean your hands with soap and water or alcohol-based hand rub.

*Infographic borrowed with permission from the Michigan Department of Health & Human Services

APPENDIX 3: SAMPLE SCRIPTS

When informing the resident/responsible party that a rectal swab will be collected

"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. Handwashing 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."

If active surveillance testing indicates the resident is colonized with CRE, the following script may be used to inform the resident/responsible party of the positive test results.

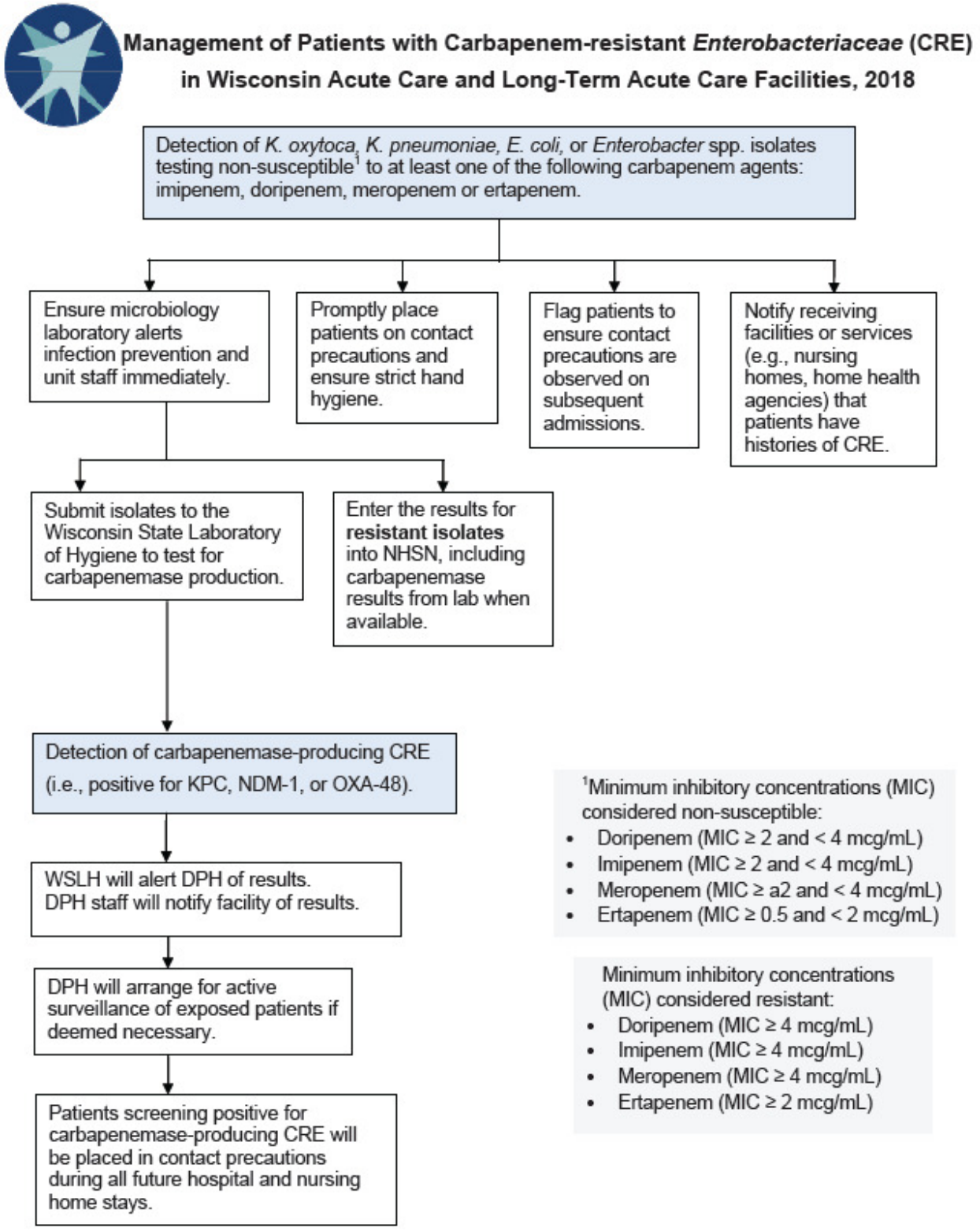
"The results of your CRE screening test indicate you are colonized with, that is you carry, CRE in your intestinal tract. Even though you may not feel any symptoms of illness at this time, you will remain in isolation to help prevent transmission to other patients during your stay here. Because it is possible to carry CRE for a long time, your health care 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 resident/responsible party 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



APPENDIX 5: SAMPLE INTER-FACILITY COMMUNICATIONS FORM

Wisconsin Inter-facility Infection Control Transfer

This template form is important for ensuring communication among facilities about patients and residents 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 Health Care Facility:

Patient orResident Last Name	First Name	Date of Birth	Medical Record Number

Name and Address of Sending Facility	Sending Unit	Sending Facility Phone

Sending Facility Contacts	Name	Phone	Email
Case Manager/Admin/SW			
Infection Prevention			

Is the patient or resident currently in isolation? □ No □ Yes

Type of Isolation (check all that apply) □ Contact □ Droplet □ Airborne □ Other: _____

Does the patient or resident currently have an infection, colonization, OR a history of positive culture of multidrug-resistant organism (MDRO) or other organism of epidemiological significance?	Currently Colonized or has history of colonization or infection *Check if YES*	Active Infection on Treatment *Check if YES*
Methicillin-Resistant *Staphylococcus aureus* (MRSA)		
Vancomycin-Resistant *Enterococcus* (VRE)		
Clostridium difficile (C. diff)		
Acinetobacter, multidrug-resistant		
E. coli, Klebsiella, Proteus, etc. w/ Extended Spectrum β-Lactamase (ESBL)		
Carbapenem-Resistant *Enterobacteriaceae* (CRE)		
Other:		

Comments:

Printed Name of Person Completing form	Signature	Date	If information communicated prior to transfer: Name and phone of individual at receiving facility

APPENDIX 6: 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 residents. The following checklist is suggested to help facilities be ready for CRE.

- ☐ CRE policies and procedures have been written and are available to hospital staff.
- ☐ The clinical laboratory has a mechanism for immediately alerting infection preventionists and unit staff when microbiology results identify a CRE isolate.
- ☐ During absence of the infection preventionist, backup 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 annually and with all new hires.
- ☐ CRE educational pamphlets are available for patients and their families when needed.

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 their 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 their 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 health care workers exposed to cases of CRE be tested?**

   There are no recommendations to test health care workers for CRE colonization. Transmission of CRE usually occurs from patient-to-patient due to contaminated hands of health care workers. Health care workers are usually healthy individuals and are therefore at lower risk of acquiring CRE.

   The best way to protect both patients and health care 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 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.

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 "For Health Professionals" tab

CDC CRE website available at
http://www.cdc.gov/HAI/organisms/cre/index.html

CDC Guidelines for Specimen Collection available at
https://www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/specimen-collection.html

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