Carbapenem-Resistant Enterobacteriaceae (CRE)

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To increase awareness of carbapenem-resistant Enterobacteriaceae (CRE) by public health and healthcare professionals.
2. To promote appropriate infection control interventions to prevent transmission of CRE within or between healthcare facilities, and between healthcare facilities and the community.
3. To rapidly identify carbapenemase-producing CRE (CP-CRE) and prevent or eliminate sources or sites of ongoing transmission within Washington.
4. To better characterize the epidemiology of these infections in Washington.

B. Required Reporting

1. Laboratories: specimen submission requested (2 business days) for *E. coli, Klebsiella* spp., and *Enterobacter* spp. resistant to any carbapenem (minimum inhibitory concentrations of ≥ 4 mcg/ml for meropenem, imipenem, and doripenem or ≥ 2 mcg/ml for ertapenem). Isolate submission should be accompanied by a Public Health Laboratories PHL microbiology submission form and local antimicrobial susceptibility test result.
2. Healthcare facilities, providers and laboratories: CP-CRE notifiable to the LHJ within 1 business day.
3. Local health jurisdictions: CP-CRE notifiable to Washington State Department of Health (DOH) Office of Communicable Disease Epidemiology (OCDE) within 7 days of case investigation completion or summary information required within 21 days. Ensure all CRE meeting case definition are submitted to PHL.

C. Local Health Jurisdiction Investigation Responsibilities

It is expected that appropriate infection control will be implemented by healthcare providers and facilities for all CRE; public health investigation is required for CP-CRE.

1. Local health jurisdictions (LHJs) should investigate and report all CP-CRE cases (positive for carbapenemase by polymerase chain reaction (PCR)) in order to identify the source and whether transmission to additional patients has occurred. LHJs may be notified by a laboratory, healthcare provider or infection preventionist of a CRE isolate submitted to PHL; it is not necessary for LHJs to investigate all CRE reports, but may choose to be notified and to perform a preliminary investigation before PCR testing for carbapenemase production is completed. LHJs should also ensure that all CRE isolates meeting the surveillance case definition are submitted to PHL for testing.

2. Because of the potential for transmission of CRE to vulnerable patients in healthcare settings, action is required by providers, infection preventionists, and facilities to institute appropriate infection control precautions when CRE are identified. These actions should be taken at the time of identification of CRE by a clinical laboratory even if no public health report is required. See Section 5B for detailed recommendations about infection prevention in healthcare settings. Providers should also communicate infection or colonization status to healthcare facilities and providers receiving these patients for care. Patients should also be informed of their CRE carriage and instructed in infection prevention, particularly stressing hand hygiene. A CRE patient information form is available to educate patients. The LHJ may reinforce these messages but communication of CRE status is the responsibility of healthcare providers, infection preventionists and facilities. Providers and facilities should consider using an inter-facility infection prevention form to communicate important information to receiving facilities about patients' carriage of multidrug resistant organisms, *C. difficile*, and other epidemiologically important organisms.
3. For all PCR confirmed CP-CRE cases, enter name, demographics, dates of notification, birth and onset, and organism identified into the Public Health Issues Management System (PHIMS) Rare Disease case report form, (http://www.doh.wa.gov/Portals/1/Documents/5100/210-067-ReportForm-Rare.pdf) and fax the completed CRE supplemental report form (http://www.doh.wa.gov/Portals/1/Documents/5100/420-098-ReportForm-CRE-Supplemental.pdf) to OCDE.

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Enterobacteriaceae constitute a large family of Gram-negative bacilli, many of which are normal inhabitants of the human intestinal tract, other mammals, and birds. The most common genera in the family Enterobacteriaceae include *Enterobacter, Escherichia, Klebsiella, Proteus, Providencia, Salmonella, Serratia, and Shigella.* See Table 1 in Appendix A for a full list of genera. These bacteria may be harmless or can cause serious infections in humans, particularly those with healthcare exposure and who are debilitated due to serious illness, old age, invasive procedures, or indwelling catheters.

Please note, *Acinetobacter* and *Pseudomonas* are not in the family Enterobacteriaceae and therefore are not specifically addressed in this guideline. However, they are also Gram-negative rods, frequent causes of healthcare-associated infections, and may also produce carbapenemases. If you believe that you have a patient with carbapenemase-producing *Acinetobacter* or *Pseudomonas* infection or colonization, please contact the Office of Communicable Disease Epidemiology (OCDE) at 206-418-5500 for guidance.

B. Mechanism of Resistance

Carbapenem antibiotics (doripenem, ertapenem, imipenem, and meropenem) are broad spectrum (active against many different groups of bacteria) and usually reserved for severe life-threatening infections. Certain bacteria in the family Enterobacteriaceae have developed carbapenem resistance which results in limited options for treating these organisms. The mechanism of resistance can be varied; most concerning are

carbapenemases, enzymes produced by bacteria that inactivate carbapenems directly. Carbapenemase-producing CRE (CP-CRE) are primarily responsible for the worldwide spread of CRE. One reason for this rapid dissemination is that carbapenemase enzymes are typically located on plasmids, mobile pieces of genetic material that can be passed between bacterial species. Carbapenemases of global importance include *Klebsiella pneumoniae* carbapenemase (KPC), New Delhi metallo-β-lactamase-type 1 (NDM-1), Verona integron encoded metallo-β-lactamase (VIM), imipenemase metallo-β-lactamase (IMP), and oxacillinase-48 (OXA-48). As of 2016, KPC is the most widespread carbapenemase in the United States.

Non-carbapenemase carbapenem resistance is mediated by a combination of mechanisms, typically via production of an extended spectrum β-lactamase or extended spectrum cephalosporinase (also called ESBL or AmpC) plus decreased permeability of the bacterial cell wall (e.g., porin mutations) to influx of carbapenem antibiotics. Although also highly multi-drug resistant, these organisms are currently thought to have local rather than global importance; unlike the CP-CRE which have increased significantly over the past 10-15 years, the frequency of non-carbapenemase-producing CRE has increased only slightly over time. CP-CRE are uncommon in Washington, critically important for public health, and require the most aggressive infection control measures in order to prevent them from becoming endemic.

C. Description of Illness

Enterobacteriaceae cause a range of clinical infections and are a major cause of community as well as healthcare-associated infections, such as urinary tract, blood stream, surgical site, and intra-abdominal infections. CRE infections are associated with high rates of morbidity and mortality and occur most frequently among persons with prolonged hospitalizations, and those who are chronically or critically ill, or exposed to invasive devices such as ventilators, urinary catheters, or central venous catheters. Colonization with these bacteria can also occur and does not require treatment, though similar infection control precautions apply to colonized persons in healthcare settings. CRE colonized patients are at risk for invasive infection from their own endogenous colonization.

D. CRE in Washington State

In Washington, CRE are routinely detected by commercial laboratories but CP-CRE are relatively uncommon. Before systematic reporting began in 2012, 8 CP-CRE had been identified in Washington. Since 2012, 10-20 CP-CRE per year have been reported.

As of 2016, DOH has received reports of 5 different types of carbapenemases in CP-CRE: KPC, NDM-1, VIM, IMP and OXA-48. Almost all KPC cases were associated with healthcare in the US, while almost all non-KPC carbapenemases were believed to be imported cases associated with healthcare exposure outside of the US.

Public health agencies and healthcare facilities can play a critical role in preventing transmission of CP-CRE if addressed before the organisms become widespread in the region. The Washington Administrative Code (WAC) 246-101-630 mandates surveillance for antibiotic resistance. Since 2012, DOH requires reporting and submission of CRE as a Rare Disease of Public Health Significance.

D. Reservoirs

Enterobacteriaceae can be carried in the intestines of many mammals and birds. Humans can be colonized intestinally. CRE infections in the United States are generally associated with healthcare exposures and occur most commonly in debilitated persons with chronic illness. Enterobacteriaceae can survive on inanimate objects for many months. In CRE carriers, CRE may be present in wound drainage, on catheter exit sites, in stool, urine and sputum.

E. Modes of Transmission

Transmission occurs through direct contact with bodily tissues or fluids, particularly stool, or by skin contact. In healthcare settings, CRE are spread most commonly via the hands of healthcare workers. Enterobacteriaceae can also be transmitted via inanimate objects, such as medical equipment, bed rails and computer keyboards. Transmission has been documented in healthcare settings even when contact precautions were in place, although lapses in infection control cannot be ruled out. The attack rate for household contacts of cases has not been defined. Persons who are colonized may be a source of infection to susceptible persons.

F. Incubation Period

Because Enterobacteriaceae can colonize the intestines without causing infection, the incubation period is not well defined.

G. Period of Communicability

Persons can potentially transmit CRE to others as long as the organisms are present in stool or other bodily fluids. Patients can be intermittently positive on serial surveillance cultures and may be colonized for long periods of time. Persons at highest risk for transmitting and contracting CRE are those who require intensive care or are receiving assistance with indwelling devices, feeding, stooling, or bathing in a healthcare setting. Epidemiologically-linked persons within the healthcare environment (roommates, those who shared healthcare staff before infection precautions were implemented) are at highest risk for contracting the organism.

H. Treatment

The antibiotic agents for treating CRE infections are extremely limited and are often associated with adverse reactions. Infectious disease consultation is recommended for treatment decisions.

3. CASE AND CONTACT DEFINITIONS

A. Clinical Criteria for Diagnosis of Cases

Enterobacteriaceae may cause a variety of clinical syndromes including urinary tract, blood stream, surgical site, and intra-abdominal infections, and pneumonia. Persons who are colonized with CRE may appear healthy and have no symptoms but still require infection control precautions when in healthcare settings to prevent contamination of the environment and spread to vulnerable patients.

B. Laboratory Criteria for Diagnosis of Cases

1. CRE: A confirmed case of CRE is a patient with a clinical or surveillance culture yielding a bacterium in the family Enterobacteriaceae that tests resistant to any carbapenem (minimum inhibitory concentrations of ≥ 4 mcg/ml for meropenem, imipenem, and doripenem or ≥ 2 mcg/ml for ertapenem).
2. CP-CRE: A confirmed carbapenemase-producing CRE (CP-CRE) case is a patient with a clinical or surveillance culture yielding Enterobacteriaceae that tests positive for carbapenemase by polymerase chain reaction (PCR). Carbapenemase PCR is usually performed only at reference laboratories.

   Isolate submission to the Public Health Laboratories (PHL) is requested for human clinical or surveillance isolates of *E. coli*, *Klebsiella* spp., and *Enterobacter* spp. resistant to any carbapenem (minimum inhibitory concentrations of ≥ 4 mcg/ml for meropenem, imipenem, and doripenem or ≥ 2 mcg/ml for ertapenem). Isolate submission should be accompanied by a PHL microbiology submission form and clinical laboratory antimicrobial susceptibility test result.

   Please note that carbapenemases have been identified in other Gram-negative bacteria outside the family Enterobacteriaceae. PHL can perform carbapenemase testing on other Gram-negative organisms such as *Acinetobacter* and *Pseudomonas* and if positive for carbapenemase they would be classified as carbapenemase-producing organisms (CPO). Call the Office of Communicable Disease Epidemiology (OCDE) at 206-418-5500 for questions about whether an isolate meets criteria for submission to PHL.

C. Close Contacts (of a person with CRE)

Outbreaks in healthcare settings have been described for both CP-CRE and non-CP-CRE. CRE is spread most commonly via the hands of healthcare workers and contaminated inanimate objects such as bedrails, and computer keyboards. Patients who are epidemiologically-linked to a case of CRE are at risk for acquiring the organism and surveillance cultures (rectal, perirectal or stool culture) on these persons should be considered if lapses in infection control may have occurred. Consult with OCDE as needed on a case-by-case basis regarding questions on determining exposure risk to close-contacts. The risk of transmission outside healthcare environments has not been defined.

Examples of healthcare-associated close contact with a CRE case include:

1. A roommate of a case of CRE.
2. Any patient who shared healthcare personnel or activities with a CRE case before infection precautions were implemented.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

CRE are most commonly diagnosed by bacterial isolation with antibiotic susceptibility testing. See laboratory criteria for definition of a case in Section 3B. Most clinical laboratories use automated susceptibility testing methods (Vitek 2, Trek, Microscan, Phoenix). Traditional methods for determining resistance include broth dilution, disk

diffusion or E test. Resistance should be determined using the most up to date resistance breakpoints as set by Clinical Laboratory Standards Institute (CLSI) (M100-S25). The Modified Hodge test may indicate whether the isolate is producing a carbapenemase, however this test has limitations and other screening tests may be more informative. Consult the Office of Communicable Disease Epidemiology (OCDE) for questions about determining whether a case meets the definition for CRE or for submission to PHL for confirmatory testing.

B. Services Available at the Washington State Public Health Laboratories (PHL)

At PHL, submitted Enterobacteriaceae isolates undergo polymerase chain reaction (PCR), also known as nucleic acid amplification test (NAAT), for select carbapenemase genes. In 2016, carbapenemases tested at PHL include those most commonly identified in the US: KPC, NDM-1, VIM, IMP and OXA-48.

When submitting specimens to PHL, include the correct microbiology form http://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf. Note that PHL requires all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth), on both the specimen label and the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date.

5. CASE INVESTIGATION

Review laboratory results to confirm genus and species and antimicrobial susceptibility testing to ensure they meet the CRE surveillance case definition. CRE isolates of *E. coli*, *Klebsiella* and *Enterobacter* should be submitted to PHL. As determined by the local health jurisdiction (LHJ) of the case's residence, the investigation of CP-CRE cases may be performed by LHJ staff, the facility infection preventionist, or DOH Office of Communicable Disease Epidemiology staff. Review medical records, and interview the case, parent/guardian, close family members, or others who may be able to provide pertinent information, if necessary.

A. Case Follow Up

Conduct a public health investigation for all confirmed CP-CRE cases. Review the clinical history and laboratory results. Enter case's name, demographics, dates of notification, birth and onset, and organism identified into electronic PHIMS and complete the supplemental CRE report form available at: http://www.doh.wa.gov/Portals/1/Documents/5100/420-098-ReportForm-CRE-Supplemental.pdf.

B. Ensure Infection Control

Because of the potential for transmission of CRE to vulnerable patients in healthcare settings, action is required by providers, infection preventionists and facilities to institute appropriate infection control precautions when CRE are identified. These actions should be taken at the time of identification of CRE by a clinical laboratory even if no report is made to the LHJ. Providers should also communicate infection or colonization status to patients, family members, and to receiving facilities and providers when patients transfer care by using an inter-facility infection prevention and safety form

(http://www.tpchd.org/files/library/acd8d09cb3afd04b.pdf). The LHJ may reinforce infection control messages but implementation is the responsibility of healthcare providers, infection preventionists, and facilities since for most cases of CRE, the LHJ will not be aware of the case.

For patients with CRE, the intensity of infection control measures should be determined by the type of CRE, the healthcare setting, and the patient's clinical status. More intensive infection prevention should be maintained for those with CP-CRE, active infections, indwelling devices, uncontained drainage or incontinence, and for those in acute care, or requiring assistance with activities of daily living.

In general, in acute care settings such as hospitals and long term acute care hospitals, CRE patients should be cared for in private rooms with contact precautions for all patient care. Cohorting of patients and/or staff may be used if private rooms are unavailable.

In long term care settings such as skilled nursing facilities, a resident assessment should be conducted to determine the level of infection control interventions necessary to prevent transmission to others within the facility. In general, contact precautions should be applied for all residents with

- CP-CRE infection or colonization
- Active infections with non-CP-CRE (and other target MDROs such as MRSA, VRE, *C. difficile*, and other carbapenem resistant organisms)
- Higher risk of transmission who are colonized with non-CP-CRE (or other target MDROS, as listed above)

Since environmental cleaning is such a vital component of infection prevention, the identification of CRE or other target MDROs in a facility should prompt "enhanced environmental cleaning," including communications to environmental services staff reinforcing their important role in protecting patients, an audit of cleaning practices, ensuring use of EPA approved disinfectants, and assessing completeness of cleaning. Consideration should be given to providing disinfectant wipes so that bedside staff can clean and disinfect high touch surfaces such as—bedside table, remote control, call button, bedside rails, door knobs, faucet and toilet handles, and light switches—at least once a shift.

See Tables 1 and 2 in Appendix B for the different infection prevention recommendations based on healthcare setting and patients' characteristics.

For skilled nursing facility residents colonized with CP-CRE, consideration may be given to discontinuing contact precautions if the following conditions are met:

- The resident has three consecutive rectal screening cultures, each obtained at least 1 week apart, that are negative for CP-CRE, AND
- At least three months have elapsed since the last CRE positive culture, AND
- At least three months have elapsed since the last course of antibiotics

These infection control guidelines are also recommended for other carbapenem-resistant organisms (*Acinetobacter, Pseudomonas*) in acute or long term healthcare settings, using

carbapenemase test results, if known, as a guide. Additional guidance is available in the CRE Testing and Response Algorithm available at http://www.doh.wa.gov/Portals/1/Documents/5100/420-099-TestingAlgorithmCRE.pdf.

C. Identify Potential Sources of Infection and Potentially Exposed Persons

Public health should investigate all CP-CRE cases to identify the source, evaluate for lapses in infection control in healthcare settings, and ensure appropriate communication of CP-CRE status to primary care providers and healthcare facilities where the patient received care. Identify all current and past healthcare and underlying conditions, including any hospital or long term care admissions, surgeries, dialysis, indwelling catheters, or international healthcare or travel, particularly in the 12 months prior to diagnosis. To ensure that transmission has not occurred in healthcare environments, consideration should be given to performing screening rectal, perirectal, or stool cultures, as well as culturing of any site of infection (skin, wound, urine, sputum), on any patients who shared a room or shared healthcare personnel or other activities (physical or occupational therapy, dialysis, etc.) with a confirmed CP-CRE case before contact precautions were implemented. Alternatively, if elapsed time does not allow screening epi-linked patients, a point prevalence survey can be done on current inpatients on the same ward to identify ongoing transmission. Contact Office of Communicable Disease Epidemiology for more detailed recommendations. At the time of writing, culturing healthcare personnel and household contacts is not recommended unless suspected in transmission.

D. Environmental Evaluation

In healthcare settings, ensure that environmental cleaning procedures adhere to Hospital Infection Control Practices Advisory Committee (HICPAC) recommendations. (CDC. The Guidelines for Environmental Infection Control in Health-Care Facilities. MMWR 2003/52(RR10);1-42)

Core measures for preventing transmission include hand hygiene, contact precautions, education of staff about mode of transmission and prevention measures, discontinuing indwelling devices as soon as medically feasible, cohorting staff and patients, rapid notification of clinical and infection prevention staff when CRE are identified in the laboratory, antimicrobial stewardship, and screening for CRE when indicated. If a nosocomial infection is suspected, an investigation is warranted to identify environmental factors (e.g., disinfection practices, adherence to hand hygiene and contact precautions, etc.) that may favor transmission. For additional resources on preventing spread of antibiotic resistant organisms in healthcare environments, see:

Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee. Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006: Recommendation of CDC and the Healthcare Infection Control Practices Advisory Committee. http://www.cdc.gov/hicpac/mdro/mdro_toc.html

CDC. Guidelines for Environmental Infection Control in Health-Care Facilities. MMWR 2003/52(RR10);1-42, http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm

Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing

Transmission of Infectious Agents in Healthcare Settings, http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf

6. CONTROLLING FURTHER SPREAD

A. Infection Control Recommendations

In general, patients with CRE should be cared for using contact precautions while in healthcare settings. It is essential that all receiving facilities are aware of the diagnosis of CRE at the time of admission so appropriate infection control can be implemented. Please see section 5B of this document for setting-specific recommendations on infection prevention precautions.

B. Case Management

Consult an Infectious Disease specialist for treatment recommendations.

C. Contact Management

Epidemiologically-linked patients who are contacts of a CRE case and are experiencing symptoms compatible with CRE disease (fever, pneumonia, sepsis, draining wound, dysuria) should be placed in contact precautions and evaluated promptly by a healthcare provider.

Strongly consider performing surveillance cultures (rectal, perirectal, stool, and any site of infection of the skin, wound, urine, or sputum) on patients who are epidemiologically-linked to a confirmed case of CP-CRE (e.g., roommates, those who shared healthcare staff before infection precautions were implemented).

Patients with CRE who return to a home setting should be instructed to adhere to good hand hygiene, especially after touching the infected area, contaminated dressings, and after using the bathroom. People providing care at home for patients with CRE should be careful about washing their hands, especially after contact with wounds, dressings and other contaminated objects or surfaces and helping the CRE patient to use the bathroom, and cleaning up stool. Caregivers should also make sure to wash their hands before and after handling the patient's medical device (e.g., intravenous catheter, urinary catheter). In addition, gloves should be used when anticipating contact with body fluids or blood. This is particularly important if the caregiver is caring for more than one ill person. Healthy people usually don't become ill from CRE but can be colonized. Communicate CRE status to healthcare providers in outpatient settings and upon return to healthcare facility.

7. ROUTINE PREVENTION

A. Routine Prevention

Prevention of CRE transmission requires collaboration and coordination between state and local public health agencies and between acute and long-term care facilities. Controlling transmission necessitates knowing local and regional prevalence of these organisms through surveillance, rapid identification of colonized and infected patients in healthcare settings, and implementing facility-specific and regional interventions to prevent transmission.

Core measures that facilities should follow include hand hygiene, contact precautions, education of healthcare personnel, minimizing device use, cohorting staff and patients, laboratory notification, antimicrobial stewardship, and screening for CRE when indicated. Please refer to Guidance for Control of Carbapenem-resistant Enterobacteriaceae (CRE) from Centers for Disease Control for detailed recommendations.

B. Prevention Recommendations

All persons can adhere to good health hygiene to stop the spread of pathogens by washing hands frequently, especially

- Before preparing or eating food
- After using the bathroom or helping another person with toileting or diapers
- After blowing the nose, coughing or sneezing
- After touching used tissues or handkerchiefs
- Before and after changing wound dressings or bandages

ACKNOWLEDGEMENTS

We would like to acknowledge the Oregon Department of Human Services for developing the format and select content of this document.

UPDATES

March 2014: Updates include submission and reporting requirements for CRE surveillance and local health responsibilities for investigation and infection control; updates are interspersed throughout but affected mainly sections 1B and C, 2A and C, 3B, 4B, and 5B and C.

April 2015: Updates include a change in CRE surveillance case definition, and submission and reporting requirements; updates are interspersed throughout but affected mainly sections 1B, 3B, and 4B.

November 2016: Updates include changes in case definitions, and added detail about infection control recommendations for different healthcare settings in section 5B and Appendix B. Other updates are interspersed throughout but affected mainly sections 1B, 3B and 5B.

Appendix A:

Table 1. Genera of Enterobacteriaceae

Common Genera of Enterobacteriaceae			
Escherichia	*Klebsiella*	*Providencia*	*Serratia*
Enterobacter	*Proteus*	*Salmonella*	*Shigella*
Other Genera of Enterobacteriaceae			
Alishewanella	*Cedecea*	*Leminorella*	*Rahnella*
Alterococcus	*Citrobacter*	*Moellerella*	*Raoultella*
Aquamonas	*Cronobacter*	*Morganella*	*Samsonia*
Aranicola	*Dickeya*	*Obesumbacterium*	*Sodalis*
Arsenophonus	*Edwardsiella*	*Pantoea*	*Tatumella*
Azotivirga	*Erwinia*	*Pectobacterium*	*Trabulsiella*
Blochmannia	*Ewingella*	*Phlomobacter*	*Wigglesworthia*
Brenneria	*Grimontella*	*Photorhabdus*	*Xenorhabdus*
Buchnera	*Hafnia*	*Poodoomaamaana*	*Yersinia*
Budvicia	*Kluyvera*	*Plesiomonas*	*Yokenella*
Buttiauxella	*Leclercia*	*Pragia*	

Appendix B:

Table 1. Infection prevention recommendations for CRE cases in acute care settings

	Acute Care			
Infection Prevention Measure	**CP-CRE**		**Non-CP-CRE**	
	Infected	**Colonized**	**Infected**	**Colonized**
Standard Precautions	Yes	Yes	Yes	Yes
Contact Precautions	Yes	Yes	Yes	Yes
Private Room	Yes	Yes	Yes; if feasible	Yes; if feasible
Door signage	Yes	Yes	Yes	Yes
Designated or disposable equipment	Yes	Yes	Yes	Yes
Visitor Recommendations				
Perform hand hygiene often, and always after leaving resident's room.	Yes	Yes	Yes	Yes
Wear gown/gloves if contact with body fluids is anticipated	Yes	Yes	Yes	Yes
Wear gown/gloves if no contact with body fluids is anticipated	No	No	No	No

Table 2. Infection prevention recommendations for CRE cases in long term care settings

	Long Term Care			
Infection Prevention Measures	**CP-CRE**		**Non-CP-CRE**	
	Infected	**Colonized**	**Infected**	**Colonized**
Standard Precautions	Yes	Yes	Yes	Yes
Contact Precautions	Yes	Yes	Yes	No, unless at higher risk of transmission*
Private Room	Yes	Yes	Yes, if feasible	No, unless at higher risk of transmission*
Restricted to Room	Yes	No, unless at higher risk of transmission*	No, unless at higher risk of transmission*	No, unless at higher risk of transmission*
Door signage	Yes	Yes	Yes	No, unless at higher risk of transmission*
Designated or disposable equipment	Yes	Yes	Yes	No, unless at higher risk of transmission*
Enhanced Environmental Cleaning**	Yes	Yes	Yes	No
Visitor Recommendations				
Perform hand hygiene often, and always after leaving resident's room.	Yes	Yes	Yes	Yes
Wear gown/gloves if contact with body fluids is anticipated	Yes	Yes	Yes	Yes
Wear gown/gloves if no contact with body fluids is anticipated	No	No	No	No

*Contact precautions should be maintained and every effort made to provide a private room for residents who are at higher risk for transmission, for example, those who are ventilator-dependent, have uncontained incontinence of urine or stool, wounds with difficult to control drainage, or who engage in behavior that spreads infection.

**See page 7 of the CRE guideline for a detailed explanation of "enhanced environmental cleaning."