Appendix 1: Carbapenem-Resistant Enterobacteriacaea (CRE)

I. Definition: 2015 CDC definition of CRE are Enterobacteriaceae[1] that are:
   A. 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
   B. Documented to produce carbapenemase
   C. In addition, for bacteria that have intrinsic imipenem nonsusceptibility (i.e., *Morganella morganii*, *Proteus* spp., *Providencia* spp.), resistance to carbapenems other than imipenem is required.

II. Background: ***CP-CRE are of epidemiologic concern*** and drive the infection control strategies and patient isolation at UCSF Health.
   A. CRE are important for a number of reasons:
      1. These organisms are often resistant to multiple classes of antimicrobials substantially limiting treatment options.
      2. Infections caused by these organisms are associated with high mortality rates, up to 50% in some studies.
      3. Many CRE possess carbapenemases which can be transmitted from one Enterobacteriaceae to another potentially facilitating transmission of resistance.
      4. Enterobacteriaceae are a common cause of infections in both community and healthcare settings. Carbapenem resistance among these organisms could therefore have far-reaching impact.
   B. Carbapenem resistance among Enterobacteriaceae can be due to several different mechanisms.
      1. Non-carbapenemase-producing CRE (non CP-CRE): Some CRE possess a β-lactamase (e.g., AmpC or extended-spectrum β-lactamase (ESBL)) which can render an organism nonsusceptible to carbapenems.
      2. Carbapenemase-producing CRE (CP-CRE): Some CRE possess a carbapenemase (carbapenemase-producing CRE or CP-CRE) that directly breaks down carbapenems.
         a) Carbapenemase genes can be spread between bacteria with potential for widespread transmission of carbapenem resistance.

III. Microbiology Testing Methodology
   A. Patient samples sent for clinical bacterial cultures are assessed for growth of organisms. Enterobacteriaceae isolates meeting criteria for susceptibility testing (i.e. those that are predominant from an appropriate source and not considered to be part of normal flora)

are tested by broth microdilution (Trek Sensititre), E-test or disc diffusion (Kirby-Bauer) methods. Carbapenem-resistant isolates are confirmed by repeat MIC testing.

B. No separate screening test procedure is developed at the time of this writing. All samples sent for bacterial culture are tested.

IV. Infection Prevention Strategies

A. **CP-CRE** will be the target of infection control strategies at UCSF Health. Refer to CRE Testing and Isolation Algorithm:

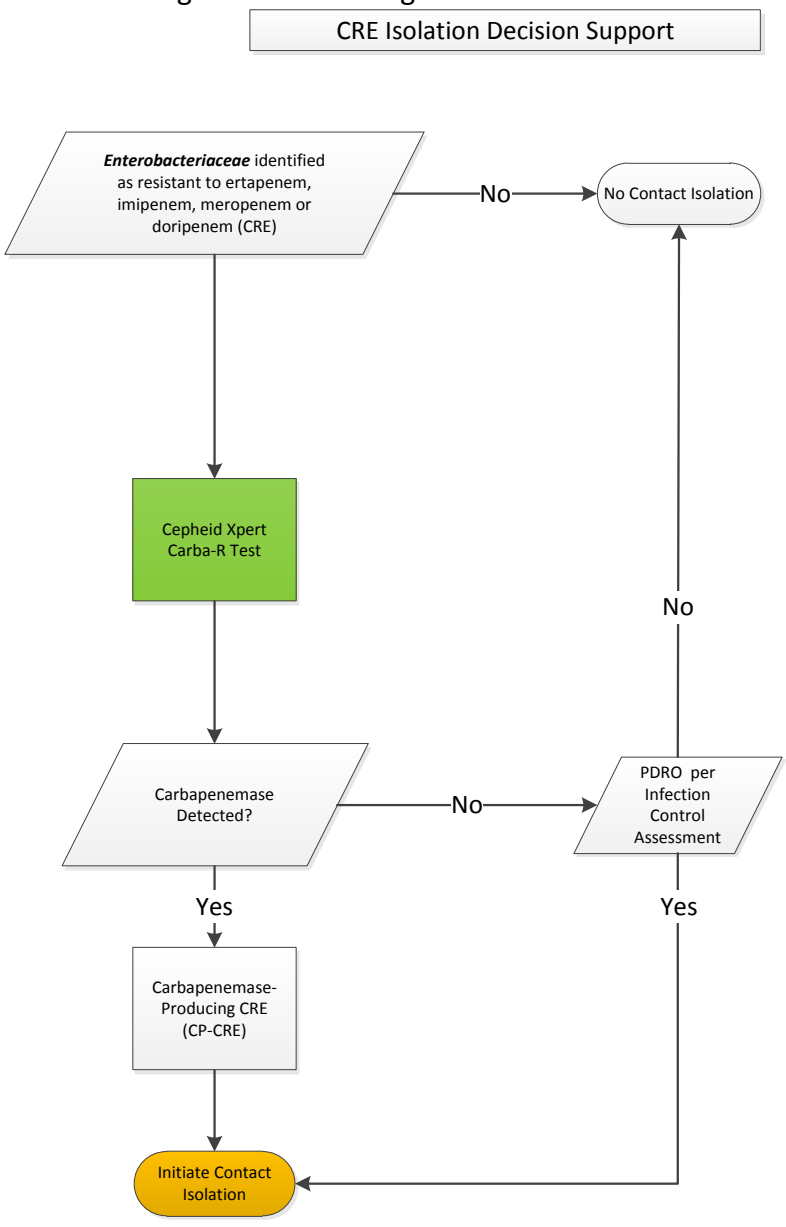


Figure 1. CRE Testing and Isolation Algorithm

B. Contact Isolation: Place patients with **CRE** in Contact Isolation pending results of the Cepheid Xpert Carba-R. If carbapenemase is detected (CP-CRE), continue Contact Isolation. If carbapenemase is not detected (non-CP-CRE), Contact Isolation may be discontinued unless recommended by HEIC and Infectious Diseases to continue.
    1. Discontinuing Contact Isolation: At this time, CDC does not provide recommendations for discontinuing Contact Isolation for a patient who has tested positive for CP-CRE.
        a) Continue Contact Isolation for the duration of hospitalization in which the CP-CRE was identified.
    2. Place patient in Contact Isolation for subsequent hospitalizations unless:
        a. DPH has determined Contact Isolation may be discontinued.
        b. Review by HEIC and Infectious Diseases determines discontinuing Contact Isolation is advised.

C. Core Measures for Interrupting Transmission of CRE
    1. Hand hygiene: Follow all UCSF instructions for cleaning hands (IC Policy 1.2) with every encounter with a patient with CRE.
        a) Monitor compliance with hand hygiene instructions.
        b) Provide immediate coaching for lapses
    2. Place patients with CP-CRE or history of CP-CRE in Contact Isolation, and continue Contact Isolation until discharge.
    3. Health care personnel education:
        a) Hand Hygiene
        b) Properly putting on and removing PPE
    4. Minimize use of indwelling devices (e.g., central lines, urinary catheters, endotracheal tubes)
    5. Practice antimicrobial stewardship -- please contact the Adult or Pediatric Antimicrobial Stewardship Programs (ASP) for guidance on antibiotic selection and duration.

III. UCSF Internal Reporting

A. UCSF Microbiology will report organisms meeting the 2015 CDC criteria for CRE to the patient's physician and HEIC. These calls will include the patient name, medical record number; location, organism and susceptibility pattern. Place patients on Contact Isolation pending results of carbapenemase testing (Figure 1).

B. HEIC will notify:
    1. Nursing on the unit housing the patient to ensure the patient identified with CP-CRE is placed into Contact Isolation until discharge.
    2. Case Management if the patient is currently an inpatient.
    3. City/County of San Francisco Department of Public Health (CCSF DPH):

a. Culture and sensitivity results,
b. Patient's face sheet
c. Date of discharge (when discharged)
    i. Fax Infection Control Transfer form

4. Alameda County:

C. Prior to discharge, Case Management will:
1. Notify the receiving facility, if patient identified with CP-CRE is transferred to another facility; contact isolation in a private room is required in the receiving facility.
2. Notify HEIC at least 24 hours prior to the patient's anticipated discharge via email or telephone 415-353-4343.
3. Fax completed Infection Control Transfer form to HEIC 415-353-4348.

D. If the patient is scheduled to be transferred to another facility, HEIC will communicate with Infection Prevention of the receiving facility to review the patient's CP-CRE history and status, and isolation capability of the receiving facility.

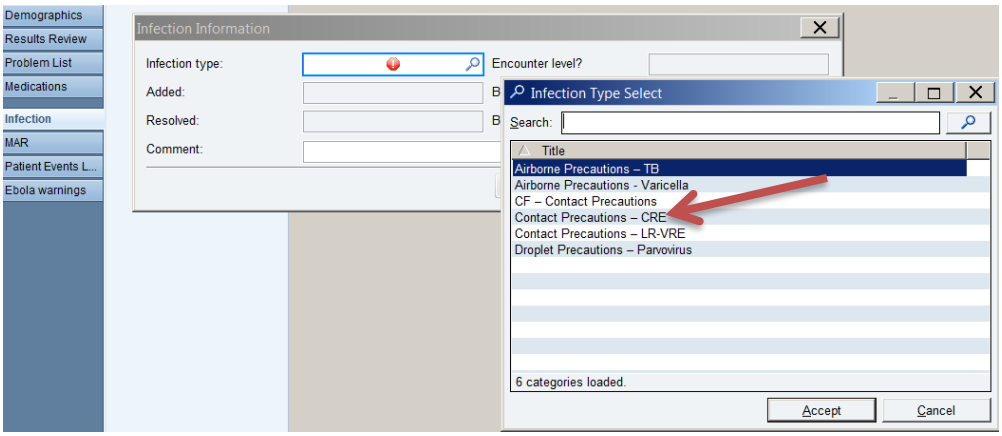
E. HEIC will consult with UCSF Infectious Diseases, CCSF DPH as necessary to ensure a smooth transition.

F. CCSF DPH will communicate with the local jurisdiction of the patient's destination as necessary.

G. Local jurisdictions have varying reporting requirements; if CMR is requested, requesting jurisdiction will be directed to communicate with the patient's provider.

IV. Documentation

A. HEIC will document in the patient's medical record:
1. Consult note (if the patient is currently an inpatient) identifying the pathogen(s) as CP-CRE, and the need for Contact Isolation.
2. On the Infection tab, complete the Infection portion of the record to indicate CP-CRE. This will identify the patient as CP-CRE positive upon future admissions to UCSF.



3. Consult note (if the patient is currently an inpatient) documenting the conversation between HEIC and the receiving facility, if patient is transferred to another facility.

B. Case Management will complete the CDPH Interfacility Infection Control Transfer Form (see below).
   1. CCSF DPH may be contacted to assist a facility without experience caring for a patient with CP-CRE.

III. Departments of Public Health required reporting:

A. As of this writing, CP-CRE are not reportable in the City and County of San Francisco Department of Public Health (CCSF DPH), the State of California or to the Centers for Disease Control and Prevention.

B. Several counties in the State of California require reporting cases of CP-CRE; CCSF DPH will communicate with those counties, should patients with CP-CRE be transferred to or from those jurisdictions.

C. HEIC will monitor reporting requirements and adhere to evolving reporting requirements.

INFECTION CONTROL TRANSFER FORM

This form should be sent with the patient/resident upon transfer. It is NOT meant to be used as criteria for admission, only to foster the continuum of care once admission has been accepted.

Affix any patient labels here.

Demographics

Patient/Resident *(Last Name, First Name)*:		,
Date of Birth:	**MRN:**	**Transfer Date:**
Sending Facility Name:		
Contact Name:	**Contact Phone:**	
Receiving Facility Name:		

⚠ **Currently in Isolation Precautions?** ☐ Yes
If Yes, check: ☐ Contact ☐ Droplet ☐ Airborne ☐ Other:

☐ **No** isolation precautions

Organisms

Did or does have (send documentation, e.g. culture and antimicrobial susceptibility test results with applicable dates):	Current (or previous) infection or colonization, or ruling out *
MRSA	☐
VRE	☐
Acinetobacter resistant to carbapenem antibiotics	☐
E. coli, *Klebsiella* or *Enterobacter* resistant to carbapenem antibiotics (CRE)	☐
E. coli or *Klebsiella* resistant to expanded-spectrum cephalosporins (ESBL)	☐
C. difficile	☐
Other^:	☐ **(current or ruling out*)**
^*e.g. lice, scabies, disseminated shingles, norovirus, influenza, TB, etc.*	
***Additional information if known:**	

☐ **No known MDRO or communicable diseases**

Symptoms

Check yes to any that currently apply:**

☐ Cough/uncontrolled respiratory secretions
☐ Incontinent of urine
☐ Vomiting
☐ Acute diarrhea or incontinent of stool
☐ Draining wounds
☐ Other uncontained body fluid/drainage
☐ Concerning rash (e.g.; vesicular)

****NOTE: Appropriate PPE required ONLY if incontinent/drainage/rash NOT contained.**

☐ **No symptoms / PPE not required as "contained"**

PPE

PERSONAL PROTECTIVE EQUIPMENT CONSIDERATIONS

☐ ☐ ☐

CHECK ALL PPE TO BE CONSIDERED AT RECEIVING FACILITY

Answers to sections above

ANY YES

ALL NO

Person completing form:
Role: Date:

Other MDRO Risk Factors

Is the patient currently on antibiotics? ☐ Yes ☐ No

Antibiotic:	Dose, Frequency:	Treatment for:	Start date:	Stop date:

Does the patient currently have any of the following devices? ☐ Yes ☐ No

☐ Central line/PICC, Date inserted:
☐ Hemodialysis catheter
☐ Urinary catheter, Date inserted:
☐ Suprapubic catheter
☐ Percutaneous gastrostomy tube
☐ Tracheostomy
☐ Fecal management system

IZ

Were immunizations received at sending facility? ☐ Yes ☐ No
If yes, specify: Date(s):