

HOW, WHERE, AND WHAT: DO I HAVE A CRE OUTBREAK IN MY CARE SETTING? WHAT NEXT?

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OUTLINE

- Carbapenem-resistant Enterobacteriaceae (CRE) Facility Level Prevention Strategies and Resources
- CRE Outbreaks in the literature
- Cluster Investigation and Interventions
- MDRO/CRE Activities

CDC CRE SURVEILLANCE DEFINITION

Enterobacteriaceae that are:

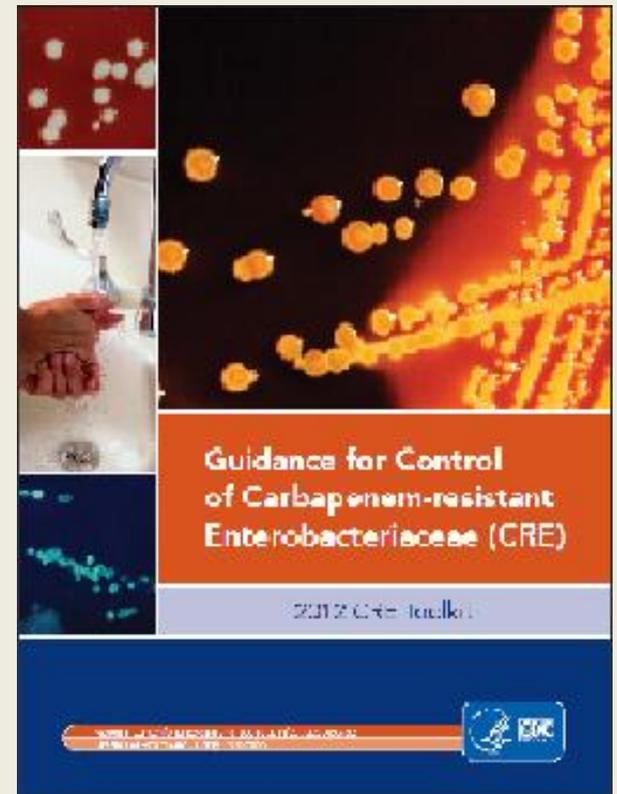
- **Nonsusceptible** to one of the following carbapenems: doripenem, meropenem, or imipenem

AND

- **Resistant** to all of the following third generation cephalosporins that were tested: ceftriaxone, cefotaxime, and ceftazidime

CDC 2012 CRE TOOLKIT

- CRE Case Definition and laboratory MIC breakpoints for resistance
- Prevention Strategies for Acute and Long-term Care
- Regional approach to CRE prevention and containment, according to prevalence rate
- Survey of Healthcare Facilities for Carbapenem-resistant Enterobacteriaceae (CRE)



CRE ACTIVE SURVEILLANCE METHODS

- **Screening of asymptomatic patients:**
 - Epidemiologically linked patients or roommates
 - Floors with current clusters
 - Patients transferred from certain facilities
 - Patients with history of international travel for healthcare
- **CDC recommends rectal swab or peri-anal swab for detection of CRE colonization**
 - Study of patients in Chicago long-term acute care hospitals found rectal/stool swabs to be the single most sensitive specimen for detecting KPC-producing Enterobacteriaceae colonization¹
 - Addition of inguinal skin swabs increased sensitivity to 100%

¹Thurlow CJ, Prabaker K, Lin MY, Lolans K, Weinstein RA, Hayden MK. Anatomic sites of patient colonization and environmental contamination with *Klebsiella pneumoniae* carbapenemase-producing Enterobacteriaceae at long-term acute care hospitals. *Infection Control Hospital Epidemiology*. 2012;34(1):56-61.

FACILITY-LEVEL PREVENTION STRATEGIES

- **8 Core Measures for Acute and Long-Term Care**
 - Hand hygiene
 - Contact precautions
 - Education of healthcare personnel
 - Minimizing use of invasive devices
 - Patient and staff cohorting
 - Laboratory protocol for notification
 - Antimicrobial stewardship
 - CRE Screening



CRE IN THE LITERATURE

CRE Infections and Associated Mortality

- **Mortality Outcomes: CRKP vs. CSKP**
 - Carbapenem resistance independently associated with higher mortality**
 - Also associated with increased mortality:
 - Age
 - Mechanical ventilation
 - ICU stay
 - Malignancy

CRE and Long-Term Care

- **LTACHs are reservoir for CRE**
 - 50% patients with CRE admitted from post acute care facilities in health system¹
 - During CDC investigation of a cluster, active surveillance cultures on LTCF patients revealed 49% colonized with CRE
 - Chicago cross-sectional single-day point prevalence surveys²
 - 30.4% LTACH patients colonized with CRE
 - 9% acute care hospital ICU patients colonized

1. Perez, et al. J Antimicrob Chemother 2010;65:127

2. Lin MY. et al. CID 2013-advance access published August 28, 2013

Lessons from Recent CRE Outbreaks

- The 2011 NIH Outbreak
 - Meticulous implementation of IC precautions
 - HH – “2 pumps/20 seconds”
 - Patient and staff cohorting
 - Rigorous active surveillance cultures
 - Value of environmental decontamination?
- **Halting transmission from the environment**
 - *High touch surfaces*
 - *Sink drains*
 - *Equipment- ventilators*

CLUSTER DETECTION

CRE-Klebsiella Cluster Identification

- **Early October 2012:**
 - Astute IP investigated 2 patients admitted to PPMC Medical ICU in late September with CRE-*Klebsiella pneumoniae* pneumonias
 - Both came from the same LTCF
 - A 3rd patient from same LTCF was admitted in October with CRE-Klebsiella UTI

CRE-Klebsiella Cluster Identification

- IC reported infections back to LTCF
 - LTCF not previously aware of colonization or infections with CRE in facility residents
- IC reported cluster to Philadelphia Department of Public Health
 - IC raised concern about possible CRE transmission within specific LTCF

CRE-Klebsiella Cluster Identification: Actions

– Communication with HUP IC

- 4th case identified at HUP from same LTCF

– Empiric Contact Isolation Precautions

- PPMC and HUP instituted this for all patients from the LTCF in question coming to EDs, or for admission, to our institutions

– Automatic Flag/Alert

- Admissions department developed an automatic alert to flag patients from LTCF-1 for Contact Isolation

CRE-Klebsiella Cluster Investigation

- **Additional Investigation Fall 2012:**
 - 2 additional patients from LTCF admitted to PPMC with CRE infections
 - PDPH is coordinating investigation of cluster
 - All available isolates from UPHS patients sent to CDC for testing
 - A patient from a 2nd LTCF identified with the same CRE-*Klebsiella* infection after 1 of above patients was discharged to 2nd LTCF

CRE Klebsiella Cluster: Cases

Patient	Age	Sex	Infection Site	LTCF	Death	Isolate Tested Confirmed CRE Clone
1	91	F	Lower respiratory	A	Disc to LTCF B	Yes
2	70	M	Lower respiratory	A	Y	No specimen available
3	65	F	Lower respiratory	A		Yes
4	91	F	Urinary tract	A	Y	No specimen available
1	91	F	Lower Respiratory	A/B		Yes (see above)
5	81	M	Bloodstream	A	Y	Yes
6	79	F	Urine	A		Yes
7	58	F	Decubitus	B*		Yes

CRE Klebsiella Cluster: Ongoing Transmission

- Patient 1 went to LTCF B after first infection
 - Spent approximately 1 month at LTCF B
 - Re-admitted from LTCF B with recurrent LRTI and expired
- Patient 7 was admitted from LTCF B with CRE infection of decubitus ulcer
- PPMC initiated empiric Contact Isolation Precautions for all patients coming from LTCF B
- January 2013:
 - 3 additional CRE cases from LTCFs (1 from A, 1 from B, and 1 from a 3rd LTCF)

CRE Klebsiella Cluster: Summary

Within 48 hrs the following key actions were taken to prevent CRE transmission in our hospital:

1. IP recognized unusual occurrence of 2 cases of CRE from same facility, closely related in time
 - Reported to Hospital Epidemiologist, LTCF and PDPH
2. Communication and Action Plan
 - Informed HUP and ED
 - Able to identify additional case at HUP and consistently implement empiric isolation precautions in both facilities
3. Partnered with PDPH
 - Partnership with PDPH was **critical** to investigation and prevention of further transmission

PDPH CLUSTER INVESTIGATION



FACILITY A CHARACTERISTICS

- **Single building with 3 floors**
- **> 150 beds**
- **> 200 staff members**
- **Dedicated Infection Control Nurse**

INVESTIGATION OBJECTIVES

- Prevent further spread of CRE within the SNF
- Identify CRE colonized patients
- Educate staff about CRE and CRE prevention, including contact precautions

PDPH RESPONSE

- Initial meeting to discuss infection control and review charts with Infection Control Nurse at Facility A
- Requested medical records from prior hospitalizations and spoke with IP at primary transfer hospital regarding CRE prevalence
- Second visit
 - Observational survey of infection control and hand hygiene
 - Point prevalence survey
- In-services for all facility staff
- Coordination of mechanism testing at CDC

FACILITY A RESPONSE

- Conducted point prevalence survey of 3rd Floor
 - 53 Peri-rectal swabs collected by nurses
 - Testing done at private lab and paid for by facility
 - Current lab couldn't handle capacity – had to find new lab
- Second point prevalence survey of 4th Floor
 - Utilized random sampling
- Currently conducting CRE surveillance for new admissions

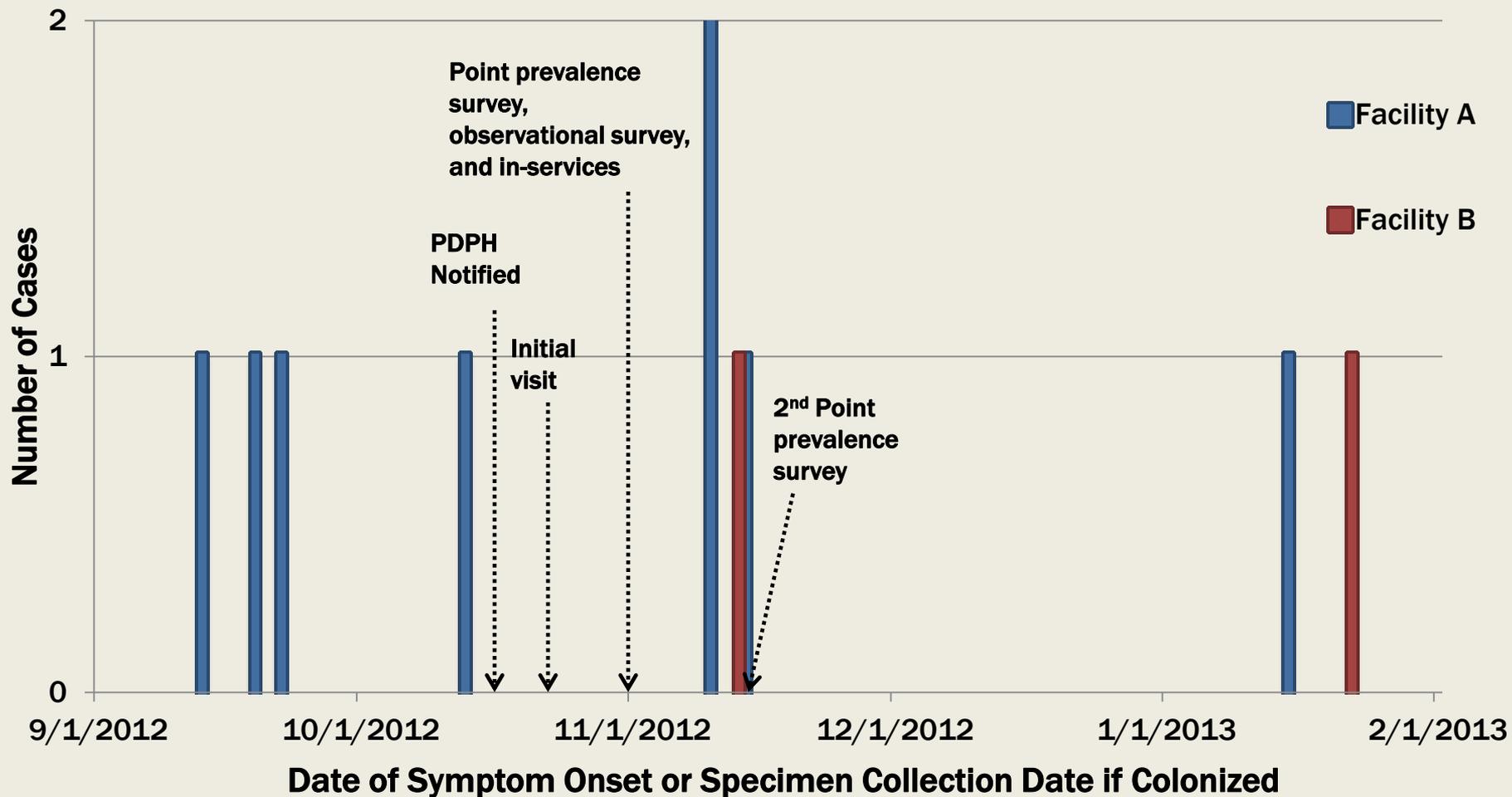
INVESTIGATION CASE DEFINITION

- CRE positive isolate collected from SNF residents:
 - During stay at SNF
 - Within 48 hours of hospitalization OR
 - From clinical cultures taken within 1 week of hospitalization if symptoms were present upon admission

TRANSFER AND SPREAD AT 2ND FACILITY

- Case patient was transferred to Facility B after hospitalization
 - Communication of CRE infection and education upon transfer
 - Notification and education after 2 subsequent Facility B cases were detected by PPMC

PHILADELPHIA SNF CRE CLUSTER EPI CURVE, SEP 2012 - FEB 2013



CHARACTERISTICS OF FACILITY A CASE PATIENTS (N=8)

Case Characteristics	Cases n (%) or median (range)
Median Age (years)	74.5 (62-91)
Female	5 (63%)
Deceased	4 (50%)
Median time at SNF A	4 months (2 days - 9 years)
Incontinent	7 (88%)
Resistance Mechanism	
KPC	5 (63%)
Not Tested	3 (38%)
Clinical Diagnosis	
UTI	3 (38%)
UTI and Septicemia	2 (25%)
Pneumonia	2 (25%)
Colonized	1 (13%)
Race	
Black	5 (63%)
White	1 (13%)
Asian	1 (13%)
Other	1 (13%)

INVESTIGATION FINDINGS

- Facility A and B were unaware of CRE upon initial notification
- Contact precautions were not observed during first visit to Facility A
- First point prevalence survey detected no CRE
 - Did identify a carbapenem-insensitive isolate
- Second point prevalence survey detected one individual colonized with CRE

INVESTIGATION CHALLENGES

- Limited knowledge of CRE prevalence in Philadelphia
- Difficulty advising contact precautions for long-term residents
 - Based on continence and degree of nursing care
- Difficulty finding a private lab to complete CRE surveillance testing

PDPH RECOMMENDATIONS

- **Single rooms and contact precautions for all persons with history of CRE and need for assistance with activities of daily life (ADL)**
- **Modified contact precautions for patients that are continent and able to complete ADL on their own**
 - **Patients need to be reminded to wash hands**
- **No need for continued cultures to determine if still colonized**
- **An inter-facility transfer form should be utilized**

CURRENT AND FUTURE CRE ACTIVITIES



RECOGNIZED CRE NEEDS

- Education regarding CRE and proper interventions and precautions
- Better communication between facilities during patient transfers
- Better understanding of current CRE prevalence in Philadelphia
- Additional testing for resistance mechanisms in persons with history of international healthcare visits

CITY-WIDE EFFORTS

- Created and distributed CRE Survey to hospital IPs and LTCF infection control nurses
- Educational tool-kit in process for LTCFs
 - In-services planned for future
- Created PDPH Inter-facility transfer form
- Distributed CRE Health Alert on April 8, 2013
- Voluntary reporting of CRE
 - Alerting transfer facilities and assisting with infection control recommendations



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Health Advisory

New Carbapenem-Resistant Enterobacteriaceae Warrant Action by Healthcare Providers April 8, 2013

Carbapenem-resistant Enterobacteriaceae (CRE) are untreatable or difficult-to-treat multidrug-resistant organisms that have developed high-levels of resistance to antibiotics including carbapenems (e.g., imipenem, meropenem, etc.). The majority of CRE in the United States identified in the past decade produce a carbapenemase called *Klebsiella pneumoniae* carbapenemase (KPC). However, non-KPC carbapenemases (e.g., New Delhi Metallo- β -lactamase and Verona Integron-mediated Metallo- β -lactamase) are emerging in the United States. Because of increased reports of these multidrug-resistant organisms, CDC and the Philadelphia Department of Public Health (PDPH) are alerting clinicians about the need for additional prevention steps regarding CRE. Key points include:

- While still uncommon, reports of unusual forms of CRE (non-KPC carbapenemase producers) in the United States are increasing. Of the 37 unusual forms of CRE that have been reported in the U.S., the last 15 have been reported since July, 2012.
- Aggressive action is required by healthcare providers to prevent the emergence and spread of these unusual CRE.
- Key elements of CRE prevention are detailed in CDC guidance (see below) and include use of contact precautions.
- Because the vast majority of these unusual organisms were isolated from patients who received overnight medical treatment outside of the United States, it is important to characterize CRE in such patients who are subsequently hospitalized in the United States.
- All cases of CRE linked to Long-term Care Facilities should be reported to PDPH at (215) 685-6742.

Recommendations

CDC continues to recommend that facilities follow the CDC guidance for preventing the spread of CRE in healthcare settings). Facilities should:

- Ensure that CRE-infected or -colonized patients are on Contact Precautions.
- Reinforce and evaluate adherence to hand hygiene and Contact Precautions for healthcare personnel who come into contact with the patient (e.g., enter the patient's room).
- Since cultures of clinical specimens will identify only a minority of patients with CRE, screen epidemiologically linked patient contacts for CRE colonization with stool, rectal, or perirectal cultures. At a minimum, this should include persons with whom the CRE patient shared a room, but might also include patients who were treated by shared healthcare personnel.
- Dedicate rooms and staff to CRE patients when possible. It is preferred that staff caring for CRE patients do not also care for non-CRE patients.
- Remove temporary medical devices as soon as they are no longer needed.
- Should the patient be transferred to another facility, ensure that the presence of CRE colonization or infection is communicated to the accepting facility. A transfer form is attached and available at (<https://hip.phila.gov>).

Requested Actions

- Retain CRE isolates from patients who have a history of overnight healthcare treatment outside of the U.S. during the preceding 6 months. Contact PDPH at (215) 685-6742 to coordinate resistance mechanism testing at CDC.
- Notify PDPH at (215) 685-6742 if a patient with CRE is a resident of a Long-term Care Facility and also notify

CITY-WIDE EFFORTS CONTINUED

- **Advisory group created with Philadelphia clinicians and Infection Preventionists experienced in MDRO control**
 - Created to determine need, interest in a city-wide CRE/MDRO control effort, and to shape the future Health Department role
- **Working with National Association of City and County Health Officials (NACCHO) and other selected local health departments to develop methods and materials to address Healthcare Associated Infections at the local level**
 - Philadelphia's focus is CRE

THANK YOU!

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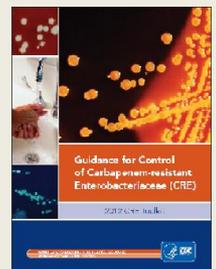
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- Danielle Hafetz, RN, BSN, CIC
- Barbara Schrader, RN, BHA

■ Skilled Nursing Facility Staff

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