CP-CRE: The Hospital Perspective and Response

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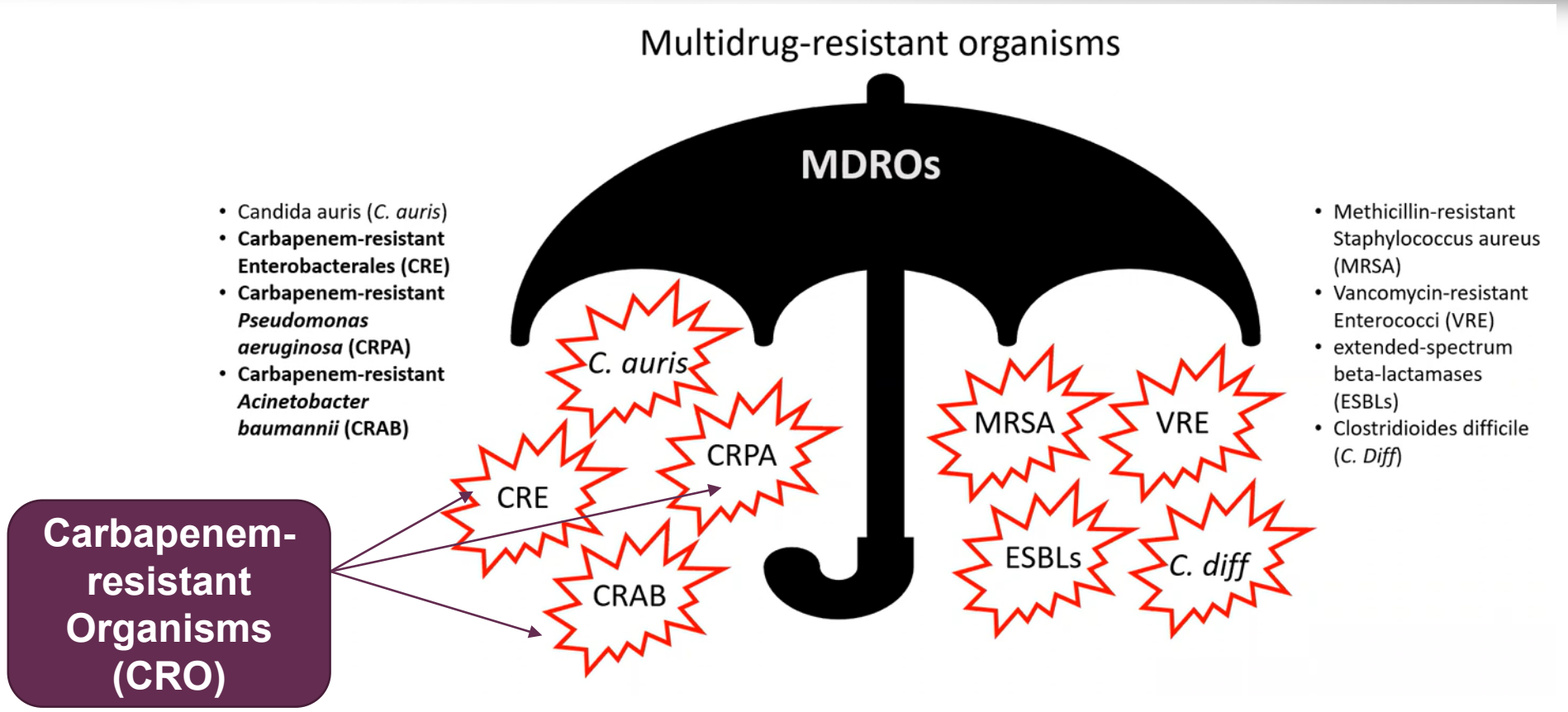
NHICEP 2/2/204

Objectives

- Explain what carbapenem resistant organisms and carbapenemase producing organisms are and why they are important to the healthcare setting.

- Describe how to investigate a case or cluster of significant multi-drug resistance organisms in an acute care setting.

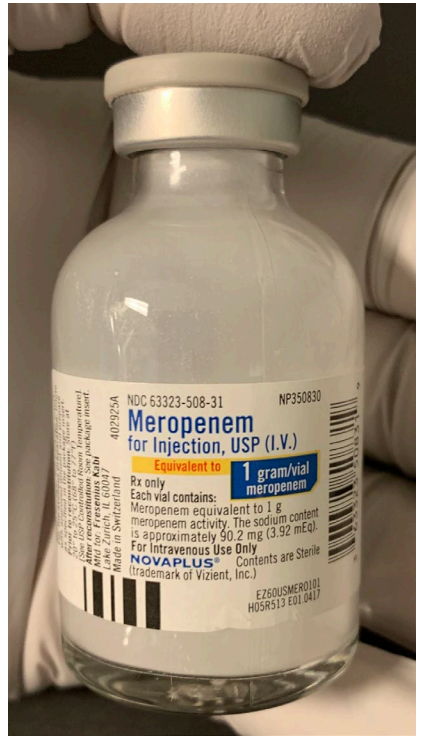
Multi-drug Resistant Organisms (MDROs)



- Slide from CDC Mid-Atlantic Webinar Series: [CDC Mid-Atlantic Webinar Series: Simplifying Carbapenem Resistant Organisms - YouTube]

Carbapenem Resistant Organisms (CRO)

- Any organism resistant to Carbapenem antibiotic regardless of having a carbapenemase or not
- Carbapemen antibiotics are often used to treat multi-drug resistant bacterial infections which makes treatments for CROs more complicated
- Often colonize in the digestive tract, wounds and respiratory tract and patients can remain colonized for months to years
- Infections often seen with pneumonia, bloodstream infections, UTIs and surgical sites/wounds



CDC Mid-Atlantic Webinar Series: Simplifying Carbapenem Resistant Organisms - YouTube

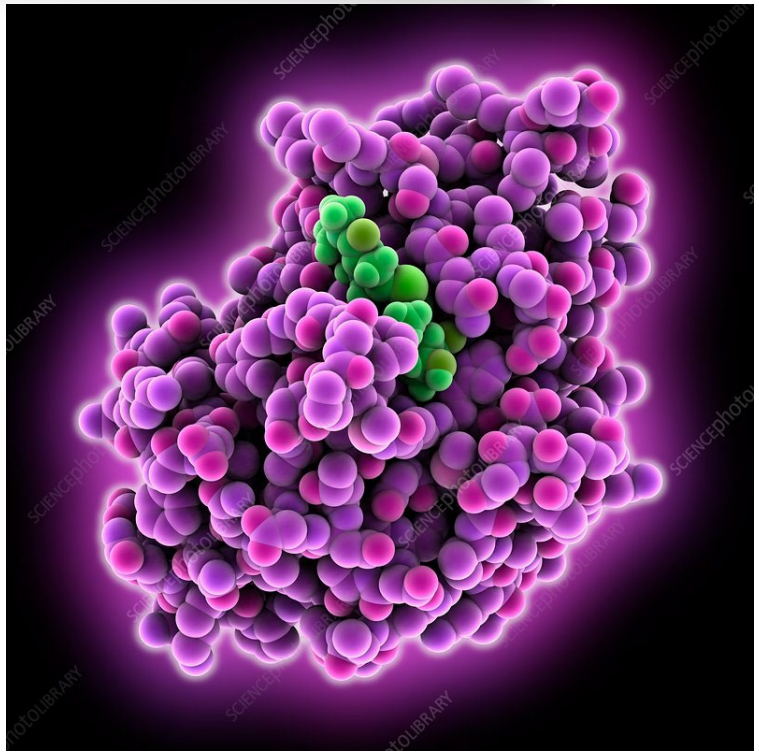
Carbapenemase-Producing Organisms

- Cabapenemases inactivate carbapenem antibiotics and other B-lactam antibiotics such as penicillins and cephalosporins
- “CP” is added to the front of the name, examples:
  - Carbapenemase-Producing Carbapenem-Resistant Enterbacterales (CP-CRE)
  - Carbapenemase-Producing Carbapenem-Resistant *Acinetobacter baumannii* (CP-CRAB)
- They are often on mobile genetic elements that can be transmitted from one bacterium to another
- 30% of CRE carry a carbapenemase

CDC Mid-Atlantic Webinar Series: Simplifying Carbapenem Resistant Organisms - YouTube

Examples of Carbapenemases

- *Klebsiella pneumoniae* carbapenemase (KPC)
  - Identified in 2001, most common in US
- New Delhi Metallo-beta-lactamase (NDM)
  - More resistant than KPC
- Verona Integron-Encoded Metallo-beta-lactamase (VIM)
- Imipenemase (IMP)
- Oxacillinase-48 (OXA-48)

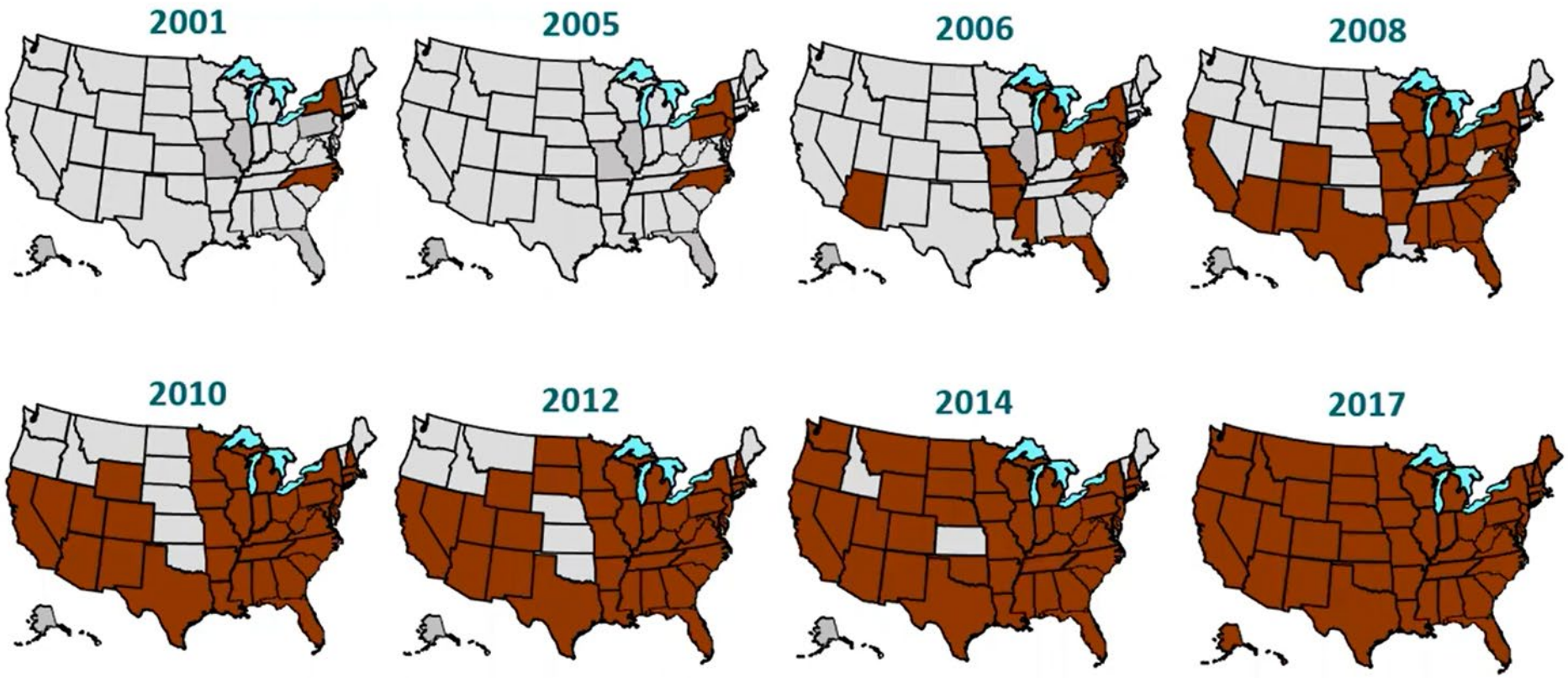


Credit: LAGUNA DESIGN / SCIENCE PHOTO LIBRARY
New Delhi metallo-beta-lactamase molecule. Computer model showing the structure of the enzyme New Delhi metallo-beta-lactamase (NDM-1). It is used by bacteria to inactivate antibiotics. The enzyme (pink) is shown with a meropenem antibiotic it has broken down (green).

https://www.cdc.gov/hai/organisms/cre/technical-info.html

Carbapenemases can Spread Rapidly

KPC-CRE found in the US spread from 2 states in 2001 to 50 states, DC, and PR by 2017



https://www.cdc.gov/hai/organisms/cre/trackingcre.html

- Slide from CDC Mid-Atlantic Webinar Series: CDC Mid-Atlantic Webinar Series: Simplifying Carbapenem Resistant Organisms - YouTube

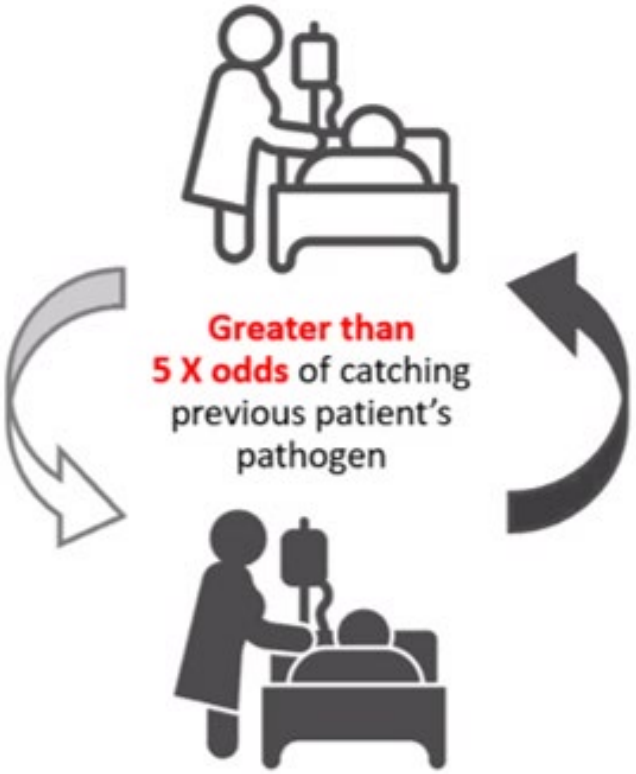
Transmission

- Direct or indirect contact with patients infected or colonized with a CRO
- Contaminated environment or equipment
- Unclean hands of healthcare workers
- Sink drains and toilets
  - Splashes from sink drains onto patient care supplies
  - Aerosolization from contaminated shower heads and toilets
  - Preparing injections or medications near sinks
  - Improper tap water use in respiratory care

HAIs and Water: https://www.cdc.gov/hai/prevent/environment/water.html

Transmission from Environment to Patient

- Largest study to date on transmission between inpatients found that patients have greater than 5x odds of catching the pathogens of the patient in the bed before them
- The roommate also has greater than 4x odds of having the same pathogens
  - This is likely caused by healthcare workers transmitting organisms between beds by poor hand hygiene practices and poor cleaning and disinfection of the environment



Free download available here.

Cohen B, Liu J, Cohen AR, Larson E. Association between healthcare-associated infection and exposure to hospital roommates and previous bed occupants with the same organism. Infection Control Hosp Epidemiol. 2018 May, 39(5):541-546.

Morbidity and Mortality Weekly Report (*MMWR*)

Cluster of Carbapenemase-Producing Carbapenem-Resistant *Pseudomonas aeruginosa* Among Patients in an Adult Intensive Care Unit — Idaho, 2021–2022

Weekly / August 4, 2023 / 72(31);844–846

- "CP-CRPA was detected in two patients who each spent approximately 1 month in the same intensive care unit (ICU) room, 4 months apart. Isolates from both patients contained a carbapenemase-producing gene. The same gene type was also detected in isolates from one of the ICU room sinks. Control measures included discontinuing room use pending sink drain biofilm disinfection."
- Prolonged mechanical ventilation

https://www.cdc.gov/mmwr/volumes/72/wr/mm7231a2.htm

Prevention

- Healthcare worker hand hygiene, patient hand hygiene
- Timely and accurate identification of patients and placement on transmission based precautions
  - Private room with a bathroom
  - Dedicate non-critical medical equipment and use disposable when possible
  - PPE – gown and gloves
  - Reinforce standard precautions
- Identify patients that received care outside of US in last 6 months

https://www.cdc.gov/hai/organisms/cre/cre-clinicians.html

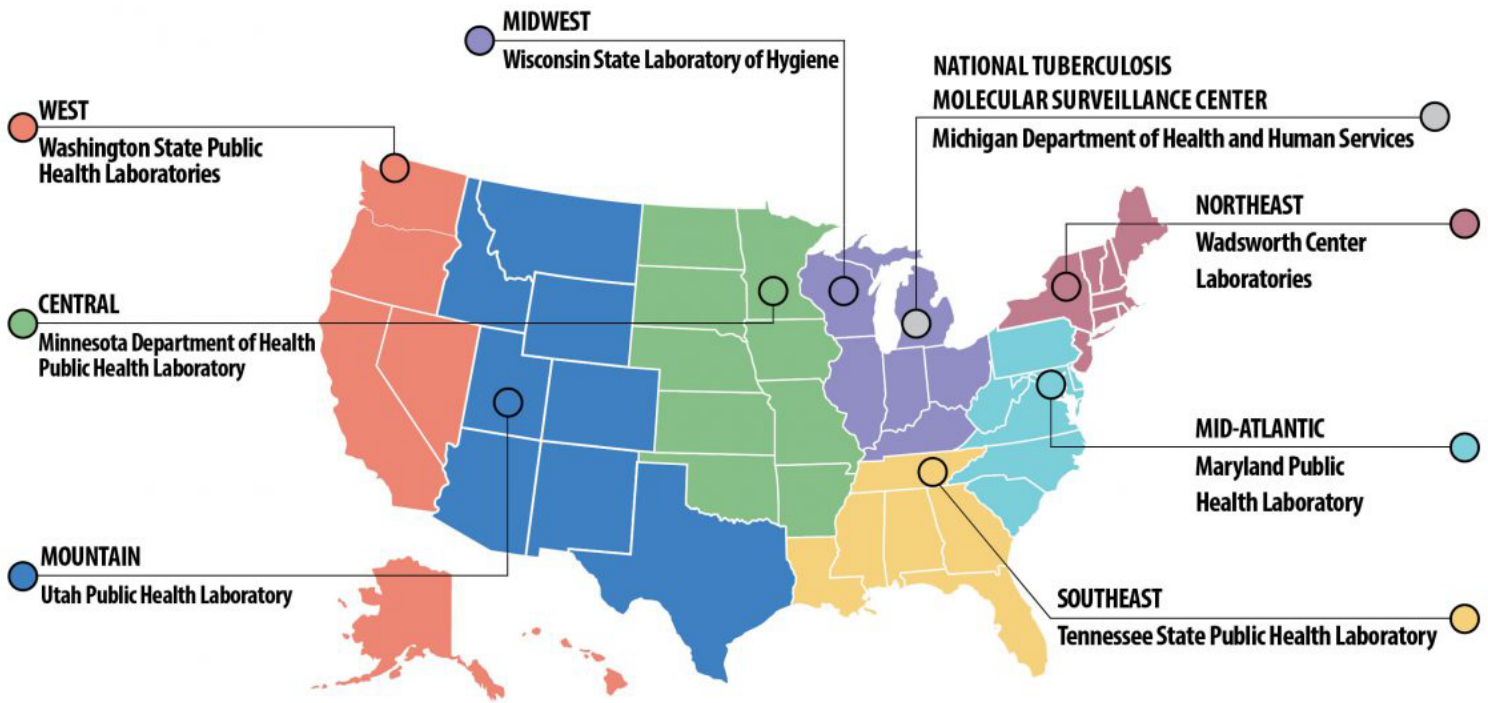
Prevention Continued

- Antibiotic stewardship
- Discontinue medical devices as soon as possible (e.g. indwelling urinary catheter)
- Cleaning and disinfecting the environment and equipment
- Clean and disinfect countertops, handles, faucets and sink basins
- Keep patient care items at least 3ft away from sinks, toilets and hoppers
- Do not discard patient waste or drinks/food in sinks

CDC AR Lab Network

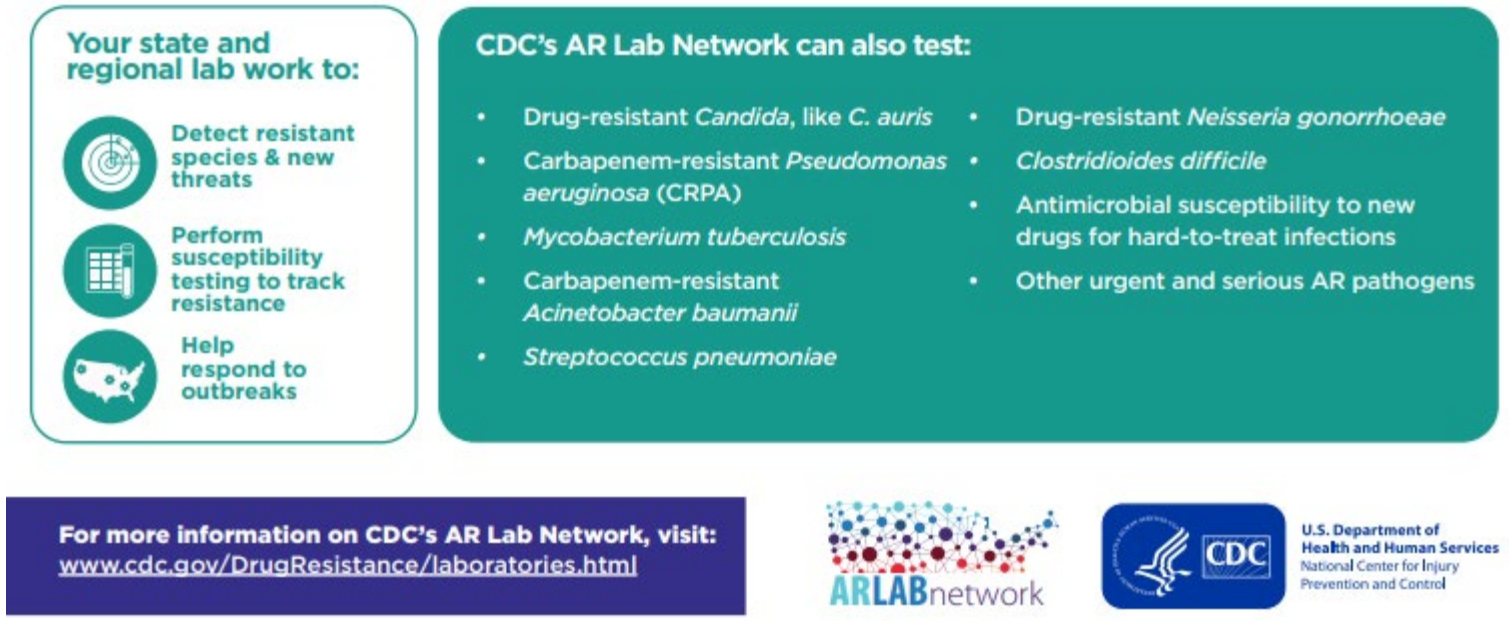
ARLABnetwork

- Includes labs in 50 states, several cities and Puerto Rico with 7 regional labs
- Our regional lab is Wadsworth Center Laboratories in New York



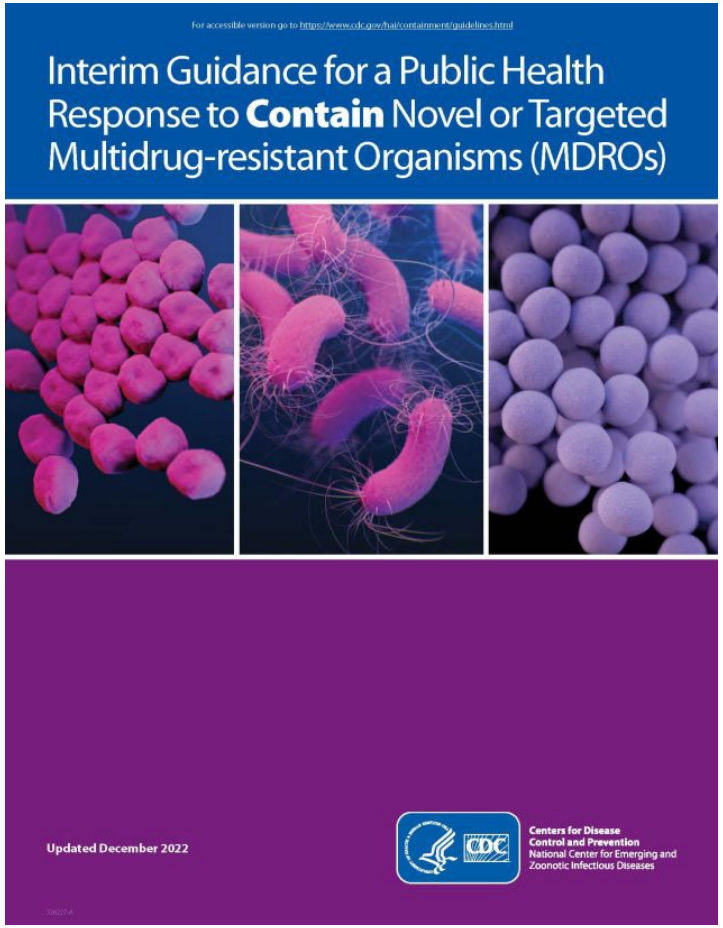
Testing – CDC AR Lab Network

- Testing is available through the CDC Antimicrobial Resistance Lab Network for free and results are usually within 2 days or less
  - Colonization screening detects gastrointestinal colonization (rectal swab) and is used to detect pathogens for contacts of cases, clusters, and in patients that received care outside the US

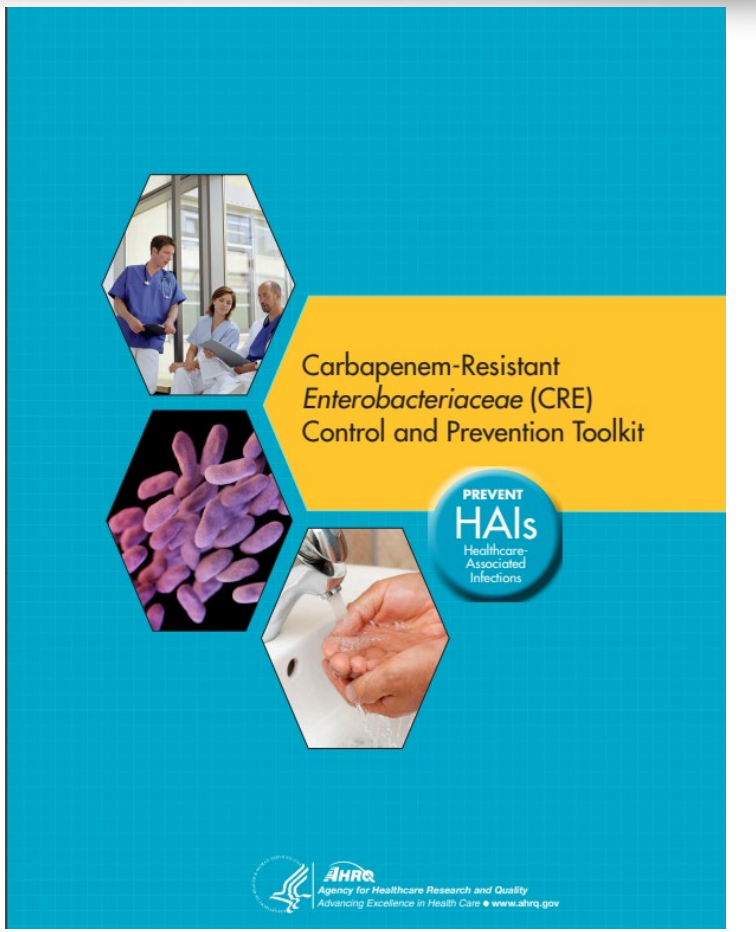


https://www.cdc.gov/drugresistance/pdf/CRE-lab-test-508.pdf

Resources



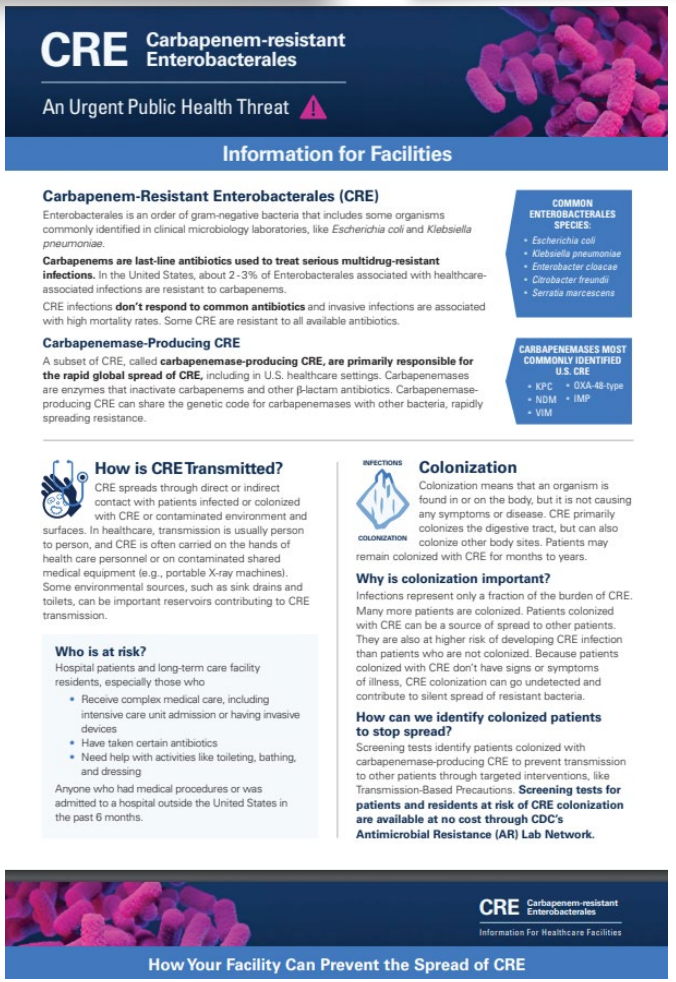
https://www.cdc.gov/hai/mdro-guides/containment-strategy.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fhai%2Fcontainment%2Findex.html



https://www.ahrq.gov/sites/default/files/publications2/files/cretoolkit_0.pdf

CDC Factsheets

- CRE Factsheet
  - https://www.cdc.gov/hai/pdfs/cre/CRE-handout-V7-508.pdf
- CRPA Factsheet
  - https://www.cdc.gov/hai/pdfs/cre/CRPA-handout-V7-508.pdf
- CRAB Factsheet
  - https://www.cdc.gov/hai/pdfs/cre/CRAB-handout-V7-508.pdf



CRE Carbapenem-resistant Enterobacterales

An Urgent Public Health Threat

Information for Facilities

Carbapenem-Resistant Enterobacterales (CRE)

Enterobacterales is an order of gram-negative bacteria that includes some organisms commonly identified in clinical microbiology laboratories, like *Escherichia coli* and *Klebsiella pneumoniae*.

Carbapenems are last-line antibiotics used to treat serious multidrug-resistant infections. In the United States, about 2-3% of Enterobacterales associated with healthcare-associated infections are resistant to carbapenems.

CRE infections **don't respond to common antibiotics** and invasive infections are associated with high mortality rates. Some CRE are resistant to all available antibiotics.

COMMON ENTEROBACTERALES SPECIES:
- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Enterobacter cloacae*
- *Citrobacter freundii*
- *Serratia marcescens*

Carbapenemase-Producing CRE

A subset of CRE, called **carbapenemase-producing CRE, are primarily responsible for the rapid global spread of CRE,** including in U.S. healthcare settings. Carbapenemases are enzymes that inactivate carbapenems and other β-lactam antibiotics. Carbapenemase-producing CRE can share the genetic code for carbapenemases with other bacteria, rapidly spreading resistance.

CARBAPENEMASES MOST COMMONLY IDENTIFIED U.S. CRE
- KPC
- OXA-48-type
- NDM
- IMP
- VIM

How is CRE Transmitted?

CRE spreads through direct or indirect contact with patients infected or colonized with CRE or contaminated environment and surfaces. In healthcare, transmission is usually person to person, and CRE is often carried on the hands of health care personnel or on contaminated shared medical equipment (e.g., portable X-ray machines). Some environmental sources, such as sink drains and toilets, can be important reservoirs contributing to CRE transmission.

Who is at risk?

Hospital patients and long-term care facility residents, especially those who
- Receive complex medical care, including intensive care unit admission or having invasive devices
- Have taken certain antibiotics
- Need help with activities like toileting, bathing, and dressing

Anyone who had medical procedures or was admitted to a hospital outside the United States in the past 6 months.

INFECTIONS COLONIZATION

Colonization

Colonization means that an organism is found in or on the body, but it is not causing any symptoms or disease. CRE primarily colonizes the digestive tract, but can also colonize other body sites. Patients may remain colonized with CRE for months to years.

Why is colonization important?

Infections represent only a fraction of the burden of CRE. Many more patients are colonized. Patients colonized with CRE can be a source of spread to other patients. They are also at higher risk of developing CRE infection than patients who are not colonized. Because patients colonized with CRE don't have signs or symptoms of illness, CRE colonization can go undetected and contribute to silent spread of resistant bacteria.

How can we identify colonized patients to stop spread?

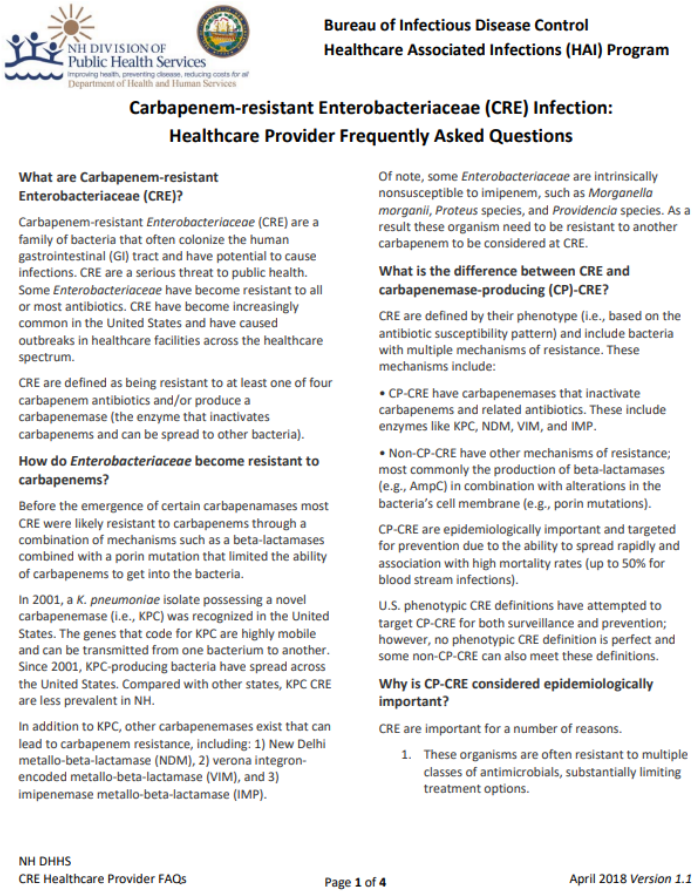
Screening tests identify patients colonized with carbapenemase-producing CRE to prevent transmission to other patients through targeted interventions, like Transmission-Based Precautions. **Screening tests for patients and residents at risk of CRE colonization are available at no cost through CDC's Antimicrobial Resistance (AR) Lab Network.**

CRE Carbapenem-resistant Enterobacterales

Information For Healthcare Facilities

How Your Facility Can Prevent the Spread of CRE

NH DHHS Factsheets



NH DIVISION OF Public Health Services
Improving health, preventing disease, reducing costs for all
Department of Health and Human Services

Bureau of Infectious Disease Control
Healthcare Associated Infections (HAI) Program

Carbapenem-resistant Enterobacteriaceae (CRE) Infection:
Healthcare Provider Frequently Asked Questions

What are Carbapenem-resistant Enterobacteriaceae (CRE)?

Carbapenem-resistant *Enterobacteriaceae* (CRE) are a family of bacteria that often colonize the human gastrointestinal (GI) tract and have potential to cause infections. CRE are a serious threat to public health. Some *Enterobacteriaceae* have become resistant to all or most antibiotics. CRE have become increasingly common in the United States and have caused outbreaks in healthcare facilities across the healthcare spectrum.

CRE are defined as being resistant to at least one of four carbapenem antibiotics and/or produce a carbapenemase (the enzyme that inactivates carbapenems and can be spread to other bacteria).

How do *Enterobacteriaceae* become resistant to carbapenems?

Before the emergence of certain carbapenamases most CRE were likely resistant to carbapenems through a combination of mechanisms such as a beta-lactamases combined with a porin mutation that limited the ability of carbapenems to get into the bacteria.

In 2001, a *K. pneumoniae* isolate possessing a novel carbapenemase (i.e., KPC) was recognized in the United States. The genes that code for KPC are highly mobile and can be transmitted from one bacterium to another. Since 2001, KPC-producing bacteria have spread across the United States. Compared with other states, KPC CRE are less prevalent in NH.

In addition to KPC, other carbapenemases exist that can lead to carbapenem resistance, including: 1) New Delhi metallo-beta-lactamase (NDM), 2) verona integron-encoded metallo-beta-lactamase (VIM), and 3) imipenemase metallo-beta-lactamase (IMP).

Of note, some *Enterobacteriaceae* are intrinsically nonsusceptible to imipenem, such as *Morganella morganii*, *Proteus* species, and *Providencia* species. As a result these organism need to be resistant to another carbapenem to be considered at CRE.

What is the difference between CRE and carbapenemase-producing (CP)-CRE?

CRE are defined by their phenotype (i.e., based on the antibiotic susceptibility pattern) and include bacteria with multiple mechanisms of resistance. These mechanisms include:

- CP-CRE have carbapenemases that inactivate carbapenems and related antibiotics. These include enzymes like KPC, NDM, VIM, and IMP.
- Non-CP-CRE have other mechanisms of resistance; most commonly the production of beta-lactamases (e.g., AmpC) in combination with alterations in the bacteria's cell membrane (e.g., porin mutations).

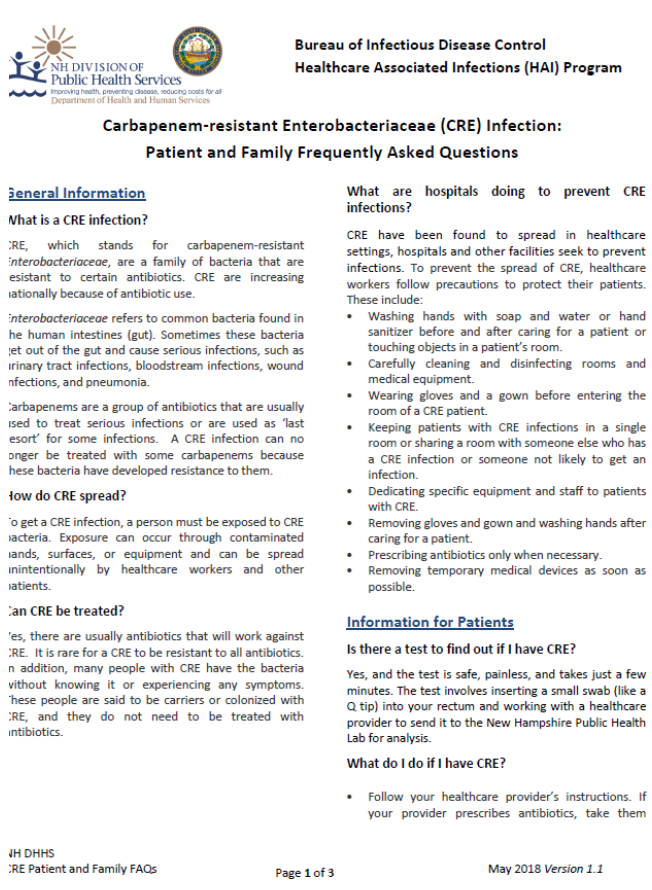
CP-CRE are epidemiologically important and targeted for prevention due to the ability to spread rapidly and association with high mortality rates (up to 50% for blood stream infections).

U.S. phenotypic CRE definitions have attempted to target CP-CRE for both surveillance and prevention; however, no phenotypic CRE definition is perfect and some non-CP-CRE can also meet these definitions.

Why is CP-CRE considered epidemiologically important?

CRE are important for a number of reasons.

1. These organisms are often resistant to multiple classes of antimicrobials, substantially limiting treatment options.



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Carbapenem-resistant Enterobacteriaceae (CRE) Infection:
Patient and Family Frequently Asked Questions

General Information

What is a CRE infection?

CRE, which stands for carbapenem-resistant *Enterobacteriaceae*, are a family of bacteria that are resistant to certain antibiotics. CRE are increasing nationally because of antibiotic use.

Enterobacteriaceae refers to common bacteria found in the human intestines (gut). Sometimes these bacteria get out of the gut and cause serious infections, such as urinary tract infections, bloodstream infections, wound infections, and pneumonia.

Carbapenems are a group of antibiotics that are usually used to treat serious infections or are used as 'last resort' for some infections. A CRE infection can no longer be treated with some carbapenems because these bacteria have developed resistance to them.

How do CRE spread?

To get a CRE infection, a person must be exposed to CRE bacteria. Exposure can occur through contaminated hands, surfaces, or equipment and can be spread unintentionally by healthcare workers and other patients.

Can CRE be treated?

Yes, there are usually antibiotics that will work against CRE. It is rare for a CRE to be resistant to all antibiotics. In addition, many people with CRE have the bacteria without knowing it or experiencing any symptoms. These people are said to be carriers or colonized with CRE, and they do not need to be treated with antibiotics.

What are hospitals doing to prevent CRE infections?

CRE have been found to spread in healthcare settings, hospitals and other facilities seek to prevent infections. To prevent the spread of CRE, healthcare workers follow precautions to protect their patients. These include:

- Washing hands with soap and water or hand sanitizer before and after caring for a patient or touching objects in a patient's room.
- Carefully cleaning and disinfecting rooms and medical equipment.
- Wearing gloves and a gown before entering the room of a CRE patient.
- Keeping patients with CRE infections in a single room or sharing a room with someone else who has a CRE infection or someone not likely to get an infection.
- Dedicating specific equipment and staff to patients with CRE.
- Removing gloves and gown and washing hands after caring for a patient.
- Prescribing antibiotics only when necessary.
- Removing temporary medical devices as soon as possible.

Information for Patients

Is there a test to find out if I have CRE?

Yes, and the test is safe, painless, and takes just a few minutes. The test involves inserting a small swab (like a Q tip) into your rectum and working with a healthcare provider to send it to the New Hampshire Public Health Lab for analysis.

What do I do if I have CRE?

- Follow your healthcare provider's instructions. If your provider prescribes antibiotics, take them

https://www.dhhs.nh.gov/programs-services/disease-prevention/infectious-disease-control/healthcare-associated-infections-2

Investigating CP-CRE in a Healthcare Facility

Carbapenem Resistant Enterobacterales (CRE)

2017

- Enterobacterales are an order of different types of bacteria such as *E. coli* and *Klebsiella pneumoniae*
- Patients on ventilators, have devices (e.g. urinary catheter), taking long courses of antibiotics, receiving complex care, have weak immune systems are at most risk
- Seen in patients that have received care outside of the US in the past 6 months

https://www.cdc.gov/hai/organisms/cre/technical-info.html

When to Investigate

- One case of any unusual multi-drug resistant organism or an organism with an unusual resistance pattern in a healthcare facility warrants an investigation (e.g CRAB, CP-CRE)
- CROs are reportable in NH even though it says CRE because the CROs are still considered “unusual occurrences” in NH
- If the isolate is not at the NH Public Health Lab already, coordinate to have it sent

CDC HAI Outbreak Investigation Toolkit: https://www.cdc.gov/hai/outbreaks/outbreaktoolkit.html
Outbreak Response and Incident Management: SHEA Guidance and Resources for Healthcare Epidemiologists in United States Acute-Care Hospitals https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7113030/

Investigating 1 Case

- Ensure patient is on transmission based precautions if not already and provide education to providers, nursing and ancillary staff (eg. EVS) on your policy for caring for these patients
- Work with your laboratory to identify additional cases or unusual resistance patterns
- Notification to key stakeholders in your organization
- Ensure Infectious Disease is consulted for treatment if the patient has an infection
- Work with the pharmacy to ensure treatment guidance is available for providers based on the ID consult if needed
- Educate the patient and family on prevention measures
- If the CRO was present on admission, notify the transferring facility
- Flag the chart so precautions are implemented for future visits and notify PCP so they are aware and can flag their chart

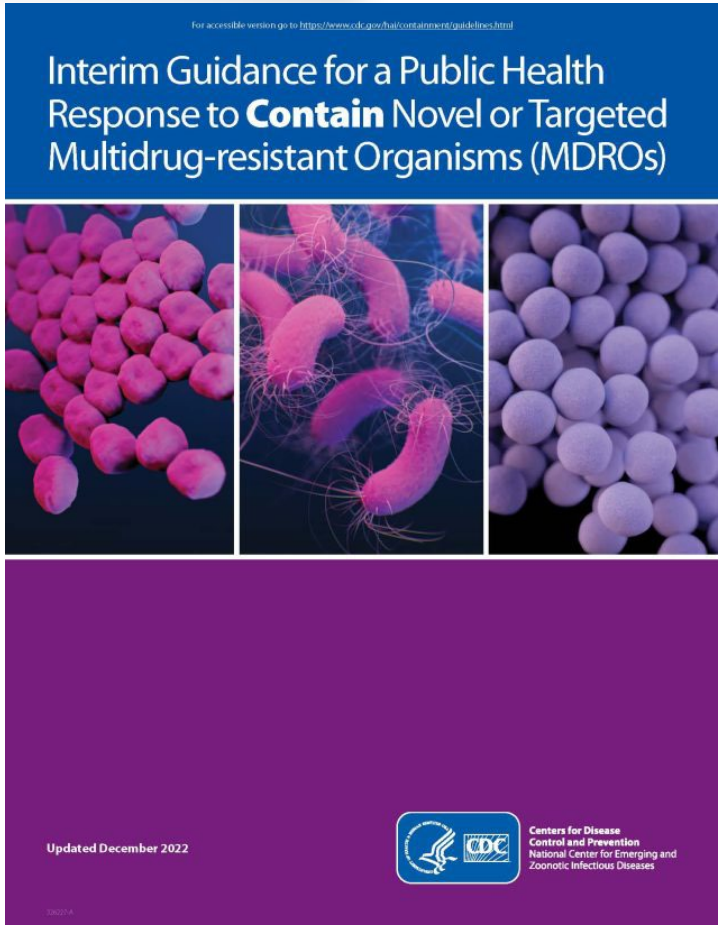
Investigating 1 Case

- Chart review
  - Admission note/H&P
  - Progress notes
  - Discharge notes
  - All microbiology reports and cultures
  - Location of all rooms the patient has been in and identification of roommates
  - Dates they were on transmission based precautions
  - Procedures
  - Devices (e.g. IUC, vent, CL)
  - Wound care
  - Imaging results
  - Dialysis
  - Antibiotics
  - Were they incontinent during the admission?
  - Care in the previous 30 days (other facilities such as LTCF/rehab, ambulatory surgery, specialty care)
  - Care outside the country in the previous 6 months?

Some information gathered from: https://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/gsi-hai.pdf

Screening

- Consult with NH DHHS and notify and screen roommates or other high risk contacts
- Reference page 14 in the CDC document, Tier 2 for NH for CP-CRE at the time of this investigation
  - Screen epidemiologically linked patient even if the index case was on precautions
  - Screen roommates and patients that shared a bathroom
  - Screen patients currently admitted to the room where the index case stayed at least one night due to risk of persistent environmental contamination and/or plumbing
- “In general, screening individuals with a history of colonization or infection with a targeted MDRO with the aim of discontinuing transmission based precautions is not recommended.”



Notifying & Screening Contacts

- Consider the following in your plan:
  - Who needs to give you approval to notify patients?
  - Who will notify them?
  - How will you notify them?
  - Will you provide a letter?
  - How will you coordinate screening if they are admitted? Discharged?
  - If there are any costs associated with it, will you waive? How do you have it waived?
  - Will you send results to their PCP or notify their PCP?
  - Who will you need to notify in your leadership team to let them know?

Cluster/Outbreak Investigation

1. Prepare for the outbreak investigation
2. Confirm the diagnosis
3. Establish the existence of an outbreak
4. Identify the cases and define the case definition (line list)
5. Describe the outbreak (epicurve person, place, time)
6. Consider control measures and implement
7. Develop hypotheses – why did this outbreak occur?
8. Evaluate and refine hypotheses (plan for additional studies if needed)
9. Evaluate control and preventative measures
10. Communicate findings

Adapted from CDC Field Epidemiology Manual: https://www.cdc.gov/eis/field-epi-manual/chapters/Field-Investigation.html and https://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/gsi-outbreak-general.pdf and https://sph.unc.edu/epid/focus/

Prepare for the Outbreak Investigation Confirm the diagnosis

- Visit CDC website and read through guidance, make sure recommendations have not changed
- Review the microbiology results, make sure it is not an entry error
- Identify resources and subject matter experts
- Discuss with providers, nursing, Infectious Disease
- Gather your factsheets or other tools you may need

Establish the Existence of an Outbreak

- Are the cases epidemiologically linked? More cases than baseline?
- Timeframe – how close or spaced out are the cases?
- Location/Place – Are they from the same unit, procedure area?
- Person - Are they linked socially or roommates?

Below are 2 examples, in which scenario are the cases more likely to be epidemiologically linked?

Case 1: 70yo female, first PCP appointment and urine culture taken for UTI symptoms and comes back CP-CRE NDM

Case 2: 50yo male traveled to the Middle East and is admitted and a leg wound cultures comes back CP-CRE NDM

Case 1: 76yo male receives dialysis 3 days a week and has a urine culture that comes back as CP-CRE NDM

Case 2: 82yo female received dialysis 4 days a week and her AV fistula has a ulcer that grows CP-CRE NDM

Identify the Cases and Define the Case Definition

- Create a line list
- Use geographic mapping or list out locations to identify common places the patients could have been
- Identify additional cases, consider colonization screening
- Case Definition Example: Patients with cultures or screening tests that result in CP-CRE NDM that received care after June 2023 at X healthcare facility.

Reminder! Keep the stakeholders informed.
Who are your stakeholders? How do you stop the rumor mill? How do you keep everyone informed but don't overshare? Be ready to answer the question from healthcare workers on whether or not they should be screened.

	A	B	C	D	E	F	G	H
1	Name	MRN	DOB	Infection (dates of active infection) or Colonized	Type of Test	Date of Test	Diagnoses During Admission when the NDM was Identified	Chronic Conditions

	I	J	K	L	M	N	O	P	Q
	Immunocompromised (e.g. neutropenic, HIV)	Diabetes (Y or N)	Antibiotic Treatments for Infection	Wound Care Y/N	Mechanical Ventilation Y/N	Respiratory Therapy Y/N	Hemodialysis Y/N	Stool Incontinence Y/N	Imaging Results from Locatio

Describe the Outbreak

- Create an Epicurve
- Analyze the data collected in the line list

Learn how to make an epicurve: https://www.cdc.gov/training/QuickLearns/CreateEpi/

Consider Control Measures and Implement

- Many of the control measures are activities we already do, conduct observations and audits to see if they are being done correctly
  - Hand hygiene, PPE, cleaning and disinfecting, proper glove use, storage of supplies, central line care, IUC care, oral care
- Rounding and tracers
  - Wound care by wound nurses, bedside nurses, providers
  - Outpatient providers and ambulatory care
- Gemba walk – talk to the front line and watch to see what is really happening (https://safetyculture.com/topics/gemba-walk/)
- Sinks – splash guards being used appropriately? Do you need splash guards installed? Water flow too slow or too fast? Aerators clean? Sinks leaking?

CDC Infection Control Assessment and Response (ICAR) Tools

- “ICAR tools are used to systematically assess a healthcare facility’s IPC practices and guide quality improvement activities”
- Targeted for acute care, long term care and outpatient settings
- Series of modules that individuals performing the assessment may use

Module 1 – Training, Audits, Feedback [PDF – 5 pages]
Module 2 – Hand Hygiene [PDF – 7 pages]
Module 3 – Transmission-Based Precautions (TBP) [PDF – 30 pages]
Module 4 – Environmental Services (EVS) [PDF – 18 pages]
Module 5 – High-level Disinfection and Sterilization [PDF – 13 pages]
Module 6 – Injection Safety [PDF – 11 pages]
Module 7 – Point of Care (POC) Blood Testing [PDF – 8 pages]
Module 8 – Wound Care [PDF – 9 pages]
Module 9 – Healthcare Laundry [PDF – 9 pages]
Module 10 – Antibiotic Stewardship [PDF – 5 pages]
Module 11 – Water Exposure [PDF – 18 pages]

https://www.cdc.gov/hai/prevent/infection-control-assessment-tools.html

CMC Sink Assessment Tool

Sink Assessment

Department: Date: Inspector:

Room	Existing Splash Guard?	Splash Guard not broken?	Splash Guard Clean?	Soap within Reach of Sink?	Paper Towel Dispenser in Reach of Sink?	Presence of Aerator?	Sink Clean?	Sink Caulking Intact?	Sink free of Damage?	Presence of Sink/Faucet Leaks?	Gooseneck Faucet?	Notes
Cardiac 1												
Cardiac 2												

CDC Water Infection Control Risk Assessment (WICRA) for Healthcare Settings

- Used to evaluate water sources, modes of transmission, patient susceptibility, patient exposure and can be used to help develop the Water Management Plan or to update the plan

Water Infection Control Risk Assessment (WICRA) for Healthcare Settings

Facility Name: Hospital A **Assessment Location:** Burn ICU

Performed By (names): Jane Smith and John Doe **Assessment Date:** 10/01/2020

WMP Team Role(s) *(check all that apply):*

- ☑ Hospital Epidemiologist/Infection Preventionist
- ☐ Risk/Quality Management Staff
- ☐ Equipment/Chemical Acquisition/Supplier
- ☑ Facilities Manager/Engineer
- ☐ Infectious Disease Clinician
- ☐ Other *(please specify):*
- ☐ Environmental Services
- ☐ Consultant
- ☐ Compliance/Safety Officer

Location	Water Source	Modes of Transmission	Patient Susceptibility Highest = 4 High = 3 Moderate = 2 Low = 1	Patient Exposure High = 3 Moderate = 2 Low = 1 None = 0	Current Preparedness Poor = 3 Fair = 2 Good = 1	Total Risk Score = Patient Susceptability *x* Patient Exposure *x* Preparedness	Comments
BICU Inpatient Rooms	Sink counter storage of patient care supplies	Indirect contact; splashing onto supplies	4	3	3	36	Install splash guards; QI for sink hygiene; and flushing

Develop/refine hypotheses – Why did this outbreak occur?

- Consider observations and what you know about transmission
- Analyze risk factors
- With input from public health, if there is a common place or risk where transmission could have occurred, consider:
  - A point prevalence screening (PPS) to look for transmission (e.g. all patients on a unit)
  - Risk based screening (e.g. all patients on a vent)
- With input from public health, if there is a common reservoir that caused transmission, consider environmental sampling, for example, the sinks

Evaluate Control and Preventative Measures

- Implement any additional control measures needed based on the analysis and investigation
- Ongoing data collection and monitoring
  - Any additional infections?
  - Surveillance screening
  - Hand Hygiene
  - PPE
  - Cleaning and Disinfecting
  - Water Management

Communicate Findings

- Communicate findings to stakeholders
  - Different messages may be needed for various groups, especially when there are different levels of education or languages but it is important all receive messaging
- Educate staff on findings and prevention measures
- Discuss at Infection Prevention Committee and other committees as appropriate (e.g. Physical Environment Committee, Medical Executive Committee)
- Document the investigation

Before Hand Hygiene

After Hand Hygiene

MISSION IMPAWSSIBLE: P.U.P.

Please Use Purell

Listen up—here's your mission…

- If you see someone miss an opportunity to clean their hands when caring for a patient, say:

  "Don't forget to PUP"

- The new code phrase will help all of our employees **feel empowered to remind each other** of the importance of cleaning their hands.

This is an easy and fun way to ensure there are no missed opportunities to keep us **infection free**!

CMC CATHOLIC MEDICAL CENTER | Infection Prevention

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