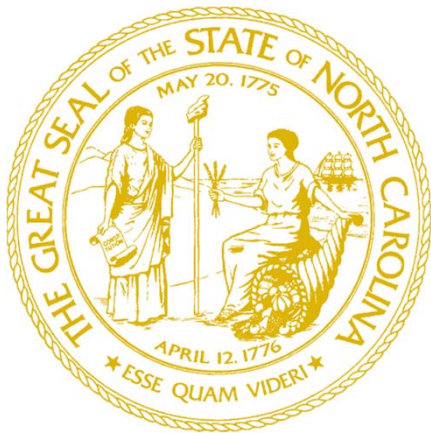


CRE Surveillance, Identification, Containment & Response

**SHARPPS Program
Communicable Disease Branch
North Carolina Division of Public Health
November 15, 2018**



CRE Surveillance, Identification, Containment & Response - PART ONE

SHARPPS Program

October 18, 2018



CRE Surveillance, Identification, **Containment & Response - PART TWO**

SHARPPS Program

November 15, 2018

Disclosures

- **Our speakers have no relevant financial disclosures or conflicts of interest related to content of this activity.**
- **Completion criteria: the participant must attend 100% of webinar and complete the participant evaluation to receive 1.0 CNE contact hours.**
- **There is no commercial support for this activity.**

Accreditation Statement

Continuing education credit will be provided through the Public Health Nursing and Professional Development (PHNPD) Unit.

Public Health Nursing and Professional Development, Department of Health and Human Services, is an approved provider of continuing nursing education by the North Carolina Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

Objectives

- **Discuss reporting of CRE**
- **Describe containment strategies for CRE**
- **Describe the role of public health in a unified response to CRE**

Carbapenem-resistant Enterobacteriaceae (CRE)

- Enterobacteriaceae = gram negative bacteria found in the digestive tract
 - *E. Coli*
 - *Klebsiella spp.*
- CRE = Enterobacteriaceae resistant to carbapenem antibiotics



Carbapenems

- Class of Beta-lactam antibiotics
 - Ertapenem
 - Meropenem
 - Imipenem
 - Doripenem
- Usually reserved to treat drug-resistant infections

BE ANTIBIOTICS AWARE: SMART USE, BEST CARE



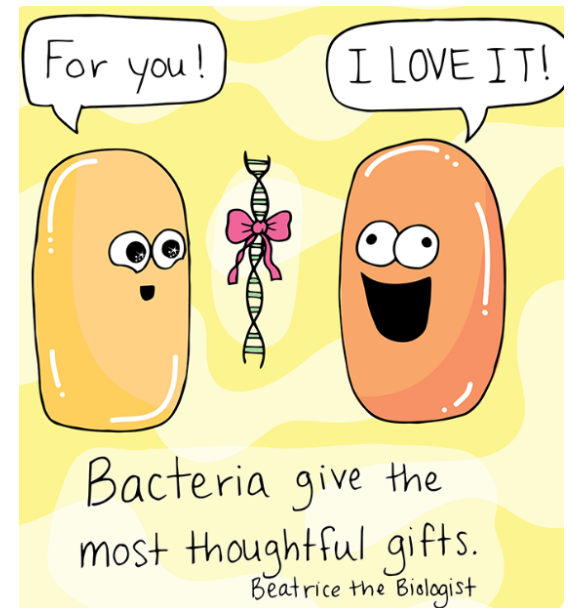
Artwork submitted by 11th grader, Mallori Mull of Mount Holly, NC, Winner of the 2017 NC Get Smart Artwork Competition

For more information, visit the NC Get Smart Campaign:
<http://epi.publichealth.nc.gov/cd/antibiotics/campaign.html>

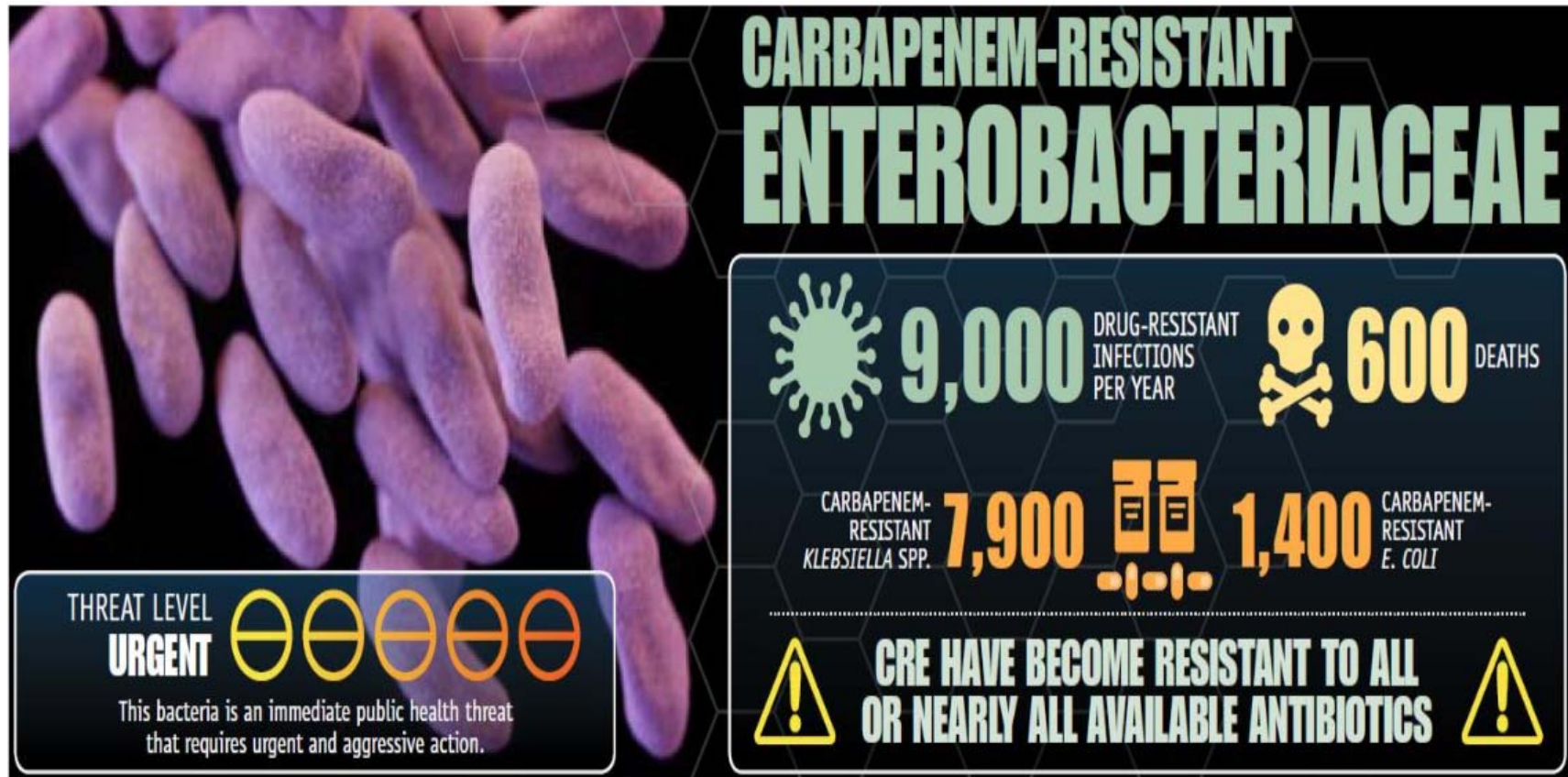


Carbapenemase producing CRE (CP CRE)

- Carbapenemase = enzyme that can break down carbapenem antibiotics
 - Klebsiella pneumoniae carbapenemase (KPC),
 - New Delhi metallo- β -lactamase (NDM),
 - Verona integron encoded metallo- β -lactamase (VIM),
 - Imipenemase metallo- β -lactamase (IMP)
 - Oxacillinase-48 (OXA-48)
- Mobile resistance elements



CRE: an urgent public health threat



CDC: Antibiotic Resistance Threats in the United States, 2013

What NC DPH is doing:

Detect MDROs

- Increased awareness
- Surveillance
- Testing at SLPH
- Colonization screening

Stewardship efforts

- Antimicrobial resistance subcommittee
- Be Antibiotics Aware Campaign
- STAR partners

Ensure rapid response & containment

- Systematic response to even single cases
- Infection prevention assessments
- Inter-facility communication
- Screening for colonization

Education

- Webinars
- Toolkits
- Presentations
- Guidance documents



Reporting

ADDITIONS TO 10A NCAC 41A .0101

Effective October 1, 2018

Additions to 10A NCAC 41A .0101

Additions include:

- Carbapenem-resistant Enterobacteriaceae (CRE) – 24 hours**

Reporting will:

- Facilitate early detection, rapid response and containment**
- Prevent transmission**
- Provide data to develop and implement prevention and control measures**

What to report?

- Identification of CRE from a clinical specimen associated with either infection or colonization –AND –

What to report?

- Identification of CRE from a clinical specimen associated with either infection or colonization –AND –
- All susceptibility results (if available) – AND –

What to report?

- Identification of CRE from a clinical specimen associated with either infection or colonization –AND –
- All susceptibility results (if available) – AND –
- All phenotypic or molecular test results (if conducted and available)

For the purposes of reporting, Carbapenem-Resistant *Enterobacteriaceae* (CRE) are defined as:

(1) *Enterobacter* spp., *E.coli* or *Klebsiella* spp. positive for a known carbapenemase resistance mechanism or positive on a phenotypic test for carbapenemase production

or

(2) *Enterobacter* spp., *E.coli* or *Klebsiella* spp. resistant to any carbapenem in the absence of carbapenemase resistance mechanism testing or phenotypic testing for carbapenemase production.

How to Report

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

- **Survey Monkey case report form**
 - Until NCEDSS Module is live

Risk package

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

Risk package

30. Acute care hospitalization within 1 month prior to initial culture?

32. Resident of a long-term care facility within 1 month prior to initial culture?

34. Long-term acute care hospital stay within 1 month prior to initial culture?

Risk package

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

Risk package

30. Acute care hospitalization within 1 month prior to initial culture?

32. Resident of a long-term care facility within 1 month prior to initial culture?

34. Long-term acute care hospital stay within 1 month prior to initial culture?

Risk for CRE transmission

Risk package

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

Risk package

47. Any international travel within 12 months prior to initial culture?

48. If yes, any healthcare exposure during this international travel?

Risk package

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

Risk package

47. Any international travel within 12 months prior to initial culture?

48. If yes, any healthcare exposure during this international travel?

Risk for carbapenemase production

Risk package

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

Risk package

42. Medical devices in place within 2 calendar days prior to culture?

44. Does the patient have open wounds?

Risk package

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

Risk package

42. Medical devices in place within 2 calendar days prior to culture?

44. Does the patient have open wounds?

Level of risk of case-patient for transmission

Laboratory

Carbapenemase-producing carbapenem-resistant Enterobacteriaceae (CP-CRE) Case Report Form

Laboratory

CASE DEFINITION

For the purposes of reporting, Carbapenem-Resistant Enterobacteriaceae (CRE) are defined as:

- (1) *Enterobacter* spp, *E. coli* or *Klebsiella* spp positive for a known carbapenemase resistance mechanism or positive on a phenotypic test for carbapenemase production; or
- (2) *Enterobacter* spp, *E. coli* or *Klebsiella* spp resistant to any carbapenem in the absence of carbapenemase resistance mechanism testing or phenotypic testing for carbapenemase production.

59. Antimicrobial Susceptibility Testing Performed

	Yes	Yes- Susceptible	Yes- Intermediate	Yes- Resistant	No
Amikacin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					
Cefepime	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					
Cefotaxime	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					
Ciprofloxacin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					
Ertapenem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					
Meropenem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					
Tigecycline	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					
Colistin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If yes, provide specific MIC ug/ml values					
<input type="text"/>					

Antimicrobial Susceptibility Testing Performed

Laboratory

ESBL, Confirmation Test

If yes, provide specific MIC ug/ml values

60. Was confirmatory testing performed (phenotypic or molecular)?

Yes

No

Laboratory

61. Phenotype Testing Performed:

Result

Carbapenem
Inactivation
method (CIM)

Modified
Carbapenem
Inactivation
Method (mCIM)

Modified Hodge
Test (MHT)

Metallo- β -
lactamase
testing (e.g., E-
test)

Other (please specify)

Laboratory

62. Molecular Testing Performed

Result

PCR



SLPH results

Carba R

Other (please specify)

Who should report?

- **For case-patient follow up**
 - County of residence (“permanent” or current healthcare facility)
- **For facility follow up (e.g. onsite infection prevention assessment)**
 - County where facility is located

What NC DPH is doing:

Detect MDROs

- Increased awareness
- Surveillance
- Testing at SLPH
- Colonization screening

Ensure rapid response & containment

- Systematic response to even single cases
- Infection prevention assessments
- Inter-facility communication
- Screening for colonization

Stewardship efforts

- Antimicrobial resistance subcommittee
- Be Antibiotics Aware Campaign
- STAR partners

Education

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- Toolkits
- Presentations
- Guidance documents

Investigation, containment and response

Goal: contain or slow spread of multidrug-resistant organisms



CRE Case Investigation

- Characterize the organism
- Identify if transmission is occurring
- Identify affected patients
- Ensure appropriate control measures are implemented

Standardized Response

- Confirm that a case meets the case definition
- Notify patient and healthcare facilities as appropriate
- Ensure implementation of control measures
- Review the patient's risk factor information
- Conduct a healthcare investigation
- Contact investigation
- Maintain heightened awareness (prospective surveillance) for additional cases in healthcare facility

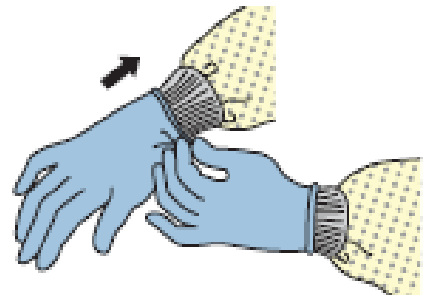
Standardized Response

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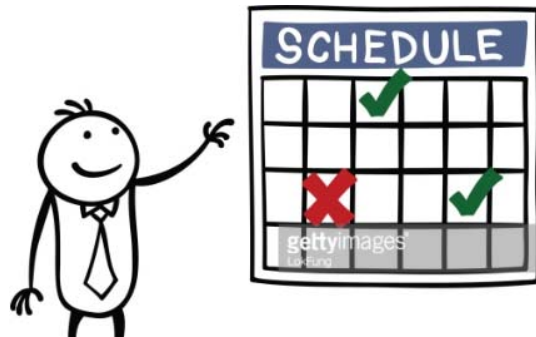
Standardized Response

- Confirm that a case meets the case definition
- • Notify patient and healthcare facilities as appropriate
- • Ensure implementation of control measures
- Review the patient's risk factor information
- Conduct a healthcare investigation
- Contact investigation
- Maintain heightened awareness (prospective surveillance) for additional cases in healthcare facility

Initial control measures



Gown and gloves



Prevent opportunities for transmission



Hand hygiene

Standardized Response

- Confirm that a case meets the case definition
- Notify patient and healthcare facilities as appropriate
- Ensure implementation of control measures
- Review the patient's risk factor information
- **Conduct a healthcare investigation**
 - Assess healthcare exposures
 - Conduct site visit as needed
- Contact investigation
- Maintain heightened awareness (prospective surveillance) for additional cases in healthcare facility

Site Visit: Observations

- Hand hygiene
 - Direct patient care (including wound care)
 - Environmental health
 - General infection prevention
-

Hand Hygiene Competency Checklist

Hand Hygiene Competency Validation
 Soap & Water
 Alcohol Based Hand Rub (ABHR) (60% - 95% alcohol content)

Type of validation: Return demonstration	<input type="checkbox"/> Orientation <input type="checkbox"/> Annual <input type="checkbox"/> Other
--	---

Employee Name: _____ Job Title: _____

Hand Hygiene with Soap & Water	Competent	
	YES	NO
1. Checks that sink areas are supplied with soap and paper towels		
2. Turns on faucet and regulates water temperature		
3. Wets hands and applies enough soap to cover all surfaces of hands		
4. Vigorously rubs hands for at least 15 seconds including palms, back of hands, between fingers, and wrists		
5. Rinses thoroughly keeping fingertips pointed down		
6. Dries hands and wrists thoroughly with paper towels		
7. Discards paper towel in wastebasket		
8. Uses paper towel to turn off faucet to prevent contamination to clean hands		
Hand Hygiene with ABHR		
9. Applies enough product to adequately cover all surfaces of hands		
10. Rubs hands including palms, back of hands, between fingers until all surfaces dry		
General Observations		
11. Direct care providers—no artificial nails or enhancements		
12. Natural nails are clean, well groomed, and tips less than ¼ inch long		
13. Skin is intact without open wounds or rashes		

PPE Competency Checklist

Personal Protective Equipment (PPE) Competency Validation
 Donning and Doffing
 Standard Precautions and Transmission Based Precautions

Type of validation: Return demonstration	<input type="checkbox"/> Orientation <input type="checkbox"/> Annual <input type="checkbox"/> Other
--	---

Employee Name: _____ Job Title: _____

Donning PPE	Competent	
	YES	NO
1. Perform Hand Hygiene		
2. Don Gown: Fully covering torso from neck to knees, arms to end of wrists		
3. Tie/fasten in back of neck and waist		
4. Don Mask/Respirator: Secure ties/elastic bands at middle of head & neck		
5. Fit flexible band to nose bridge		
6. Fit snug to face and below chin (Fit-check respirator if applicable)		
7. Don Goggles or Face Shield: Place over face and eyes; adjust to fit		
8. Don Gloves: Extend to cover wrist of gown		
Doffing PPE		

Site Visit: Control Measures

Environmental cleaning






Site Visit: Control Measures

Communicate CRE status to transferring and receiving facilities

<https://epi.publichealth.nc.gov/cd/hai/docs/InterfacilityTransferInstructionsandForm.pdf>

Transferring Facility Name*: _____
 Transferring Facility Address*: _____ INTERFACILITY TRANSFER FORM
 Transferring Facility Phone*: _____ Fax: _____
 Transferred to*: _____ Reason for transfer*: _____
 Transfer date/time*: _____ / _____ / _____ Attending physician*: _____ Phone*: _____

Patient/resident demographics and vital signs (date/time taken _____ / _____)
 Last Name*: _____ First Name*: _____ DOB*: _____ MRN: _____
 BP*: _____ P*: _____ R*: _____ T(F)*: _____ O₂ SAT*: _____ HT(in): _____ WT(lb): _____ Diabetic? _____ Glucose: _____
 Language English Other: _____ Mental status* Alert Oriented Other: _____
 Allergies* None Yes: _____ Pain Level (0-10): _____ Site: _____
 At risk alerts* None Falls Aspiration Pressure ulcers Seizures Elopement Other: _____
 Advanced directives* DNR DNI MOST Living Will Proxy, Contact _____

Current isolation precautions*/required PPE (Check, if indicated)
 No Yes, specify Contact Droplet Airborne
 PPE, specify   

Organisms / infections* None Yes, specify type/date

Current infection	Hx/Colonized	Pending result
Date	Date	Date
Methicillin-resistant Staphylococcus aureus (MRSA)	<input type="checkbox"/>	<input type="checkbox"/>
Vancomycin-resistant Enterococci (VRE)	<input type="checkbox"/>	<input type="checkbox"/>
Acinetobacter not susceptible to carbapenems	<input type="checkbox"/>	<input type="checkbox"/>
Enterobacteriaceae resistant to carbapenems (i.e. CRE)	<input type="checkbox"/>	<input type="checkbox"/>
Extended-spectrum beta-lactamase producer (ESBL)	<input type="checkbox"/>	<input type="checkbox"/>
Clostridium difficile (C. diff)	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____ (e.g. Group A Streptococcus (GAS), lice, scabies, disseminated shingles, norovirus, flu, TB, etc.)	<input type="checkbox"/>	<input type="checkbox"/>

Current or recent (last 7 days) symptoms None Yes, specify
 Draining wounds Concerning rash (e.g. vesicular) Cough/uncontrolled respiratory secretions
 Vomiting Acute diarrhea or incontinent of stool Other: _____

Sensory status and activities of daily living*

Vision	Hearing	Speech	Ambulate	Transfer	Toileting	Meals	Hygiene	Dressing
<input type="checkbox"/> Good	<input type="checkbox"/> Good	<input type="checkbox"/> Good	<input type="checkbox"/> Self	<input type="checkbox"/> Self	<input type="checkbox"/> Self	<input type="checkbox"/> Self	<input type="checkbox"/> Self	<input type="checkbox"/> Self
<input type="checkbox"/> Poor	<input type="checkbox"/> Poor	<input type="checkbox"/> Difficult	<input type="checkbox"/> Assist	<input type="checkbox"/> Assist	<input type="checkbox"/> Assist	<input type="checkbox"/> Assist	<input type="checkbox"/> Assist	<input type="checkbox"/> Assist
<input type="checkbox"/> Blind	<input type="checkbox"/> Deaf	<input type="checkbox"/> Aphasia	<input type="checkbox"/> Not able	<input type="checkbox"/> Not able	<input type="checkbox"/> Incontinent	<input type="checkbox"/> Tube	<input type="checkbox"/> Not able	<input type="checkbox"/> Not able
Sfy: _____	Sfy: _____				Sfy: _____	Date: _____		

Current devices / recent (last 90 days) procedures* None Yes, specify
 Tracheostomy tube Hemodialysis catheter Procedure, specify type _____ and date _____
 Gastrostomy tube Urinary catheter (date inserted) _____ Central line/PICC (date inserted) _____

Current medications* None Yes, refer to attached MAR

Vaccination / test history* None Yes, specify

Vaccine/test	Influenza (seasonal)	Pneumococcal	Zoster	Td	Tdap	Tuberculin skin test
Date administered						
Self-report vaccine/test receipt?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes Result: <input type="checkbox"/> Pos <input type="checkbox"/> No <input type="checkbox"/> Neg

Personal items sent with patient/resident None Specify (e.g. glasses, etc.): _____

Contact information _____

Notes: _____

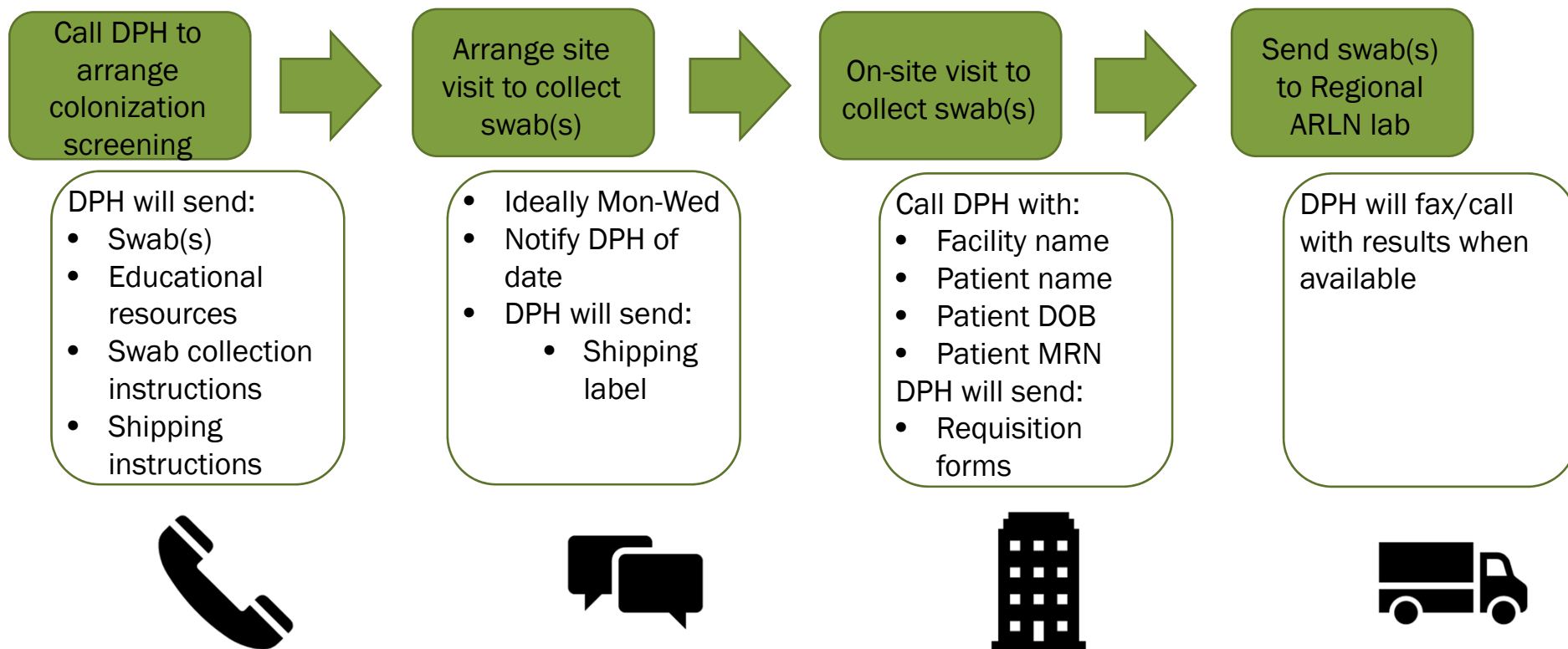
Standardized Response

- Confirm that a case meets the case definition
- Notify patient and healthcare facilities as appropriate
- Ensure implementation of control measures
- Review the patient's risk factor information
- Conduct a healthcare investigation
- **Contact investigation**
- Maintain heightened awareness (prospective surveillance) for additional cases in healthcare facility

Contact Investigation

- In consultation with DPH,
 - Screen roommates (and potentially others) that are epidemiologically linked because of healthcare exposure
 - This is a swab collected....

Colonization screening process



Standardized Response

- Confirm that a case meets the case definition
- Notify patient and healthcare facilities as appropriate
- Ensure implementation of control measures
- Review the patient's risk factor information
- Conduct a healthcare investigation
- Contact investigation
- **Maintain heightened awareness (prospective surveillance) for additional cases in healthcare facility**

Carbapenem-Resistant Enterobacteriaceae (CRE) Investigation Overview

Carbapenemase-producing CRE (CP-CRE) are of primary public health concern and as such, an investigation should be opened within 24 hours of confirming identification of CP-CRE. Notify facilities, providers, and infected/colonized patients as appropriate. Conduct an investigation to assess the risk factors for transmission in the affected setting. Implement control measures such as contact precautions as soon as possible. Discuss the need for screenings of potentially exposed individuals. The appropriate screenings can be performed through the State Laboratory of Public Health (SLPH) and by the Antibiotic Resistance Laboratory Network (ARLN) free of charge and the Communicable Disease Branch (CDB) is available to help coordinate these screenings. Screening recommendations may differ between healthcare settings. CDB is available for consultation regarding investigations, please call the Epidemiologist on call at 919-733-3419. Refer to <https://www.cdc.gov/hai/outbreaks/docs/Health-Response-Contain-MDRO.pdf> for additional information.

Basic Steps of a CRE Investigation

1. Confirm case meets definition	<ul style="list-style-type: none"> If the organism is <i>Escherichia coli</i>, <i>Enterobacter</i> spp., or <i>Klebsiella</i> spp. and is resistant to one or more carbapenems (minimum inhibitory concentrations of ≥ 4 mcg/ml for meropenem, imipenem, and doripenem or ≥ 2 mcg/ml for ertapenem) it meets case definition for CRE If no phenotypic or molecular testing has been performed on the isolate, arrange to have it sent to the State Laboratory of Public Health for characterization Facilities capable of performing phenotypic or molecular testing should save isolates testing positive for carbapenemase production or for a specific mechanism of resistance if possible, as they may be asked to forward these to SLPH for additional characterization within one month Implement contact precautions for patient as soon as CRE is identified
2. Notifying the Facility, Providers, and Patients as appropriate	<ul style="list-style-type: none"> Notify the facility, providers, and patients (infected or colonized) and conduct a healthcare investigation <ul style="list-style-type: none"> Review healthcare exposure (typically for the past 30 days) Notify identified healthcare facilities Ensure appropriate control measures are in use (i.e. contact precautions and appropriate environmental cleaning)
3. Perform Risk Assessment of Patient	<ul style="list-style-type: none"> Review patient's exposures and risk factors including: <ul style="list-style-type: none"> Recent international hospitalizations Antibiotic use within the past 30 days Hemodialysis treatment Recent domestic hospitalizations (notify facility if appropriate) Recent procedures (endoscopies, surgeries etc.) Indwelling Medical Device Use (Intravenous catheters, urinary catheters, tracheostomy tubes etc.) Open wounds (If yes, which wound clinic is attended and notify if appropriate) Recent Long Term Care Facility admission (Document name of facility and notify if appropriate) Refer to Case Report Form for more information
4. Conduct IP Assessment (in consultation with the North Carolina Division of Public Health)	<ul style="list-style-type: none"> Assess infection prevention (IP) practices and opportunities for transmission <ul style="list-style-type: none"> Risk of Transmission Hand hygiene compliance of healthcare workers Does the patient share a room? Was the patient on contact precautions during healthcare stay? Did the patient share any devices for procedures (endoscopes etc.)? Are there any environmental reservoirs (Do cleaning services use FDA approved cleaners)? Interfacility communication regarding MultiDrug-Resistant Organisms if the patient was transferred A site visit to one or more facilities may be warranted (consult DPH for more information)
5. Conduct a Contact Investigation	<ul style="list-style-type: none"> CDC recommends screening roommates and others that are epidemiologically linked due to recent healthcare exposure The following are considerations to make when assessing who to screen <ul style="list-style-type: none"> Recent healthcare exposure Mechanism of Resistance Contact Precautions Infection Prevention assessment The North Carolina Division of Public Health is available to facilitate surveillance screening and coordination with the Antibiotic Resistance Laboratory Network
6. Prospective Surveillance	<ul style="list-style-type: none"> Monitor infection prevention practices to reduce transmission within the facility Monitor facility for new CRE or carbapenemase producing CRE cases

For more information: <https://epi.publichealth.nc.gov/cd/lhds/manuals/cd/toc.html>

Partnership is essential

- **CDC & Antibiotic Resistant Laboratory Network (ARLN)**
- **State Laboratory of Public Health (SLPH)**
- **North Carolina Division of Health Service Regulation (DHSR)**
- **Statewide Program for Infection Prevention and Epidemiology (SPICE)**
- **Local Health Departments**
- **Facilities**

Coordinated Approaches Prevent MDROs

More patients get infections when facilities do not work together.

(Example: 5 years after CRE enters 10 facilities in an area sharing patients)



CRE will impact **12%** of patients.



CRE will impact **8%** of patients.



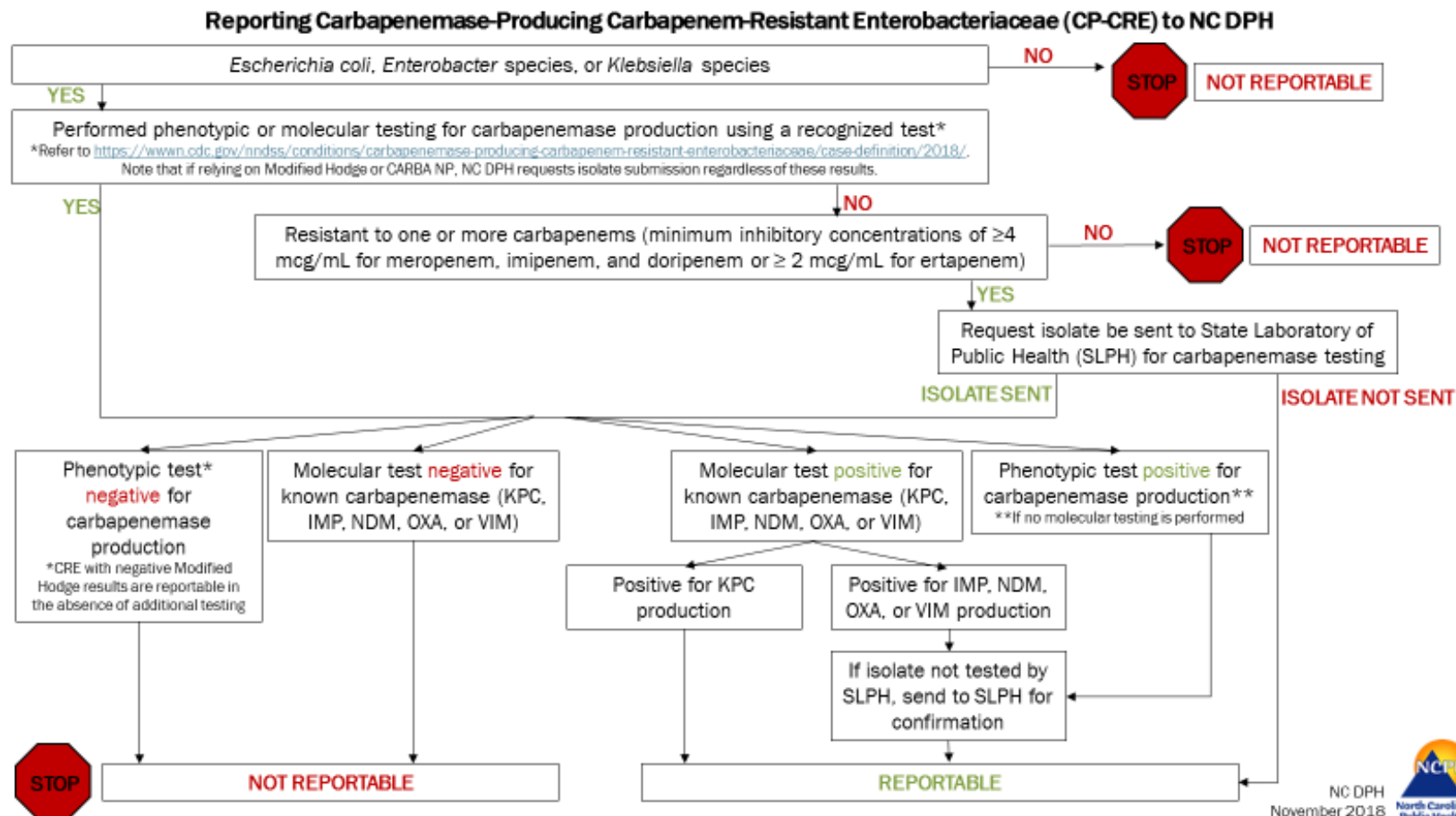
CRE will impact **2%** of patients.

SOURCE: CDC Vital Signs, August 2015.

Resources:

- https://epi.publichealth.nc.gov/cd/lhds/manuals/cd/reportable_diseases.html
- ****NEW** Carbapenem Resistant Enterobacteriaceae (CRE)**
 - [Investigation overview](#)
 - [Case Definition](#)
 - [Algorithm for new cases](#)
 - Case report form ****Temporary until NCEDSS is Live****
 - [Carbapenemase-producing carbapenem-resistant Enterobacteriaceae \(CP-CRE\) Case Report Form Survey](#)
 - [CRE Lab Guide](#)
 - Resources:
 - [CDC CRE Toolkit](#)
 - [Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms \(MDROs\)](#)
 - [MDRO toolkit for long-term care and assisted living facilities](#)
 - [Management of MDROs](#)

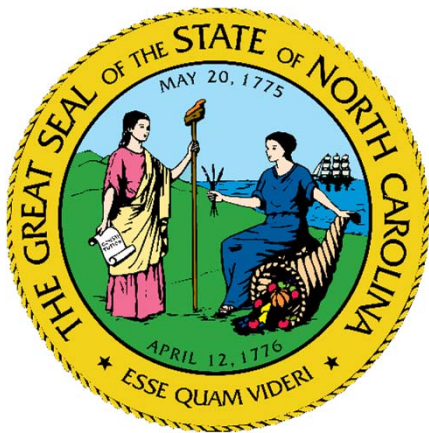
Reporting Algorithm



Containment resources:

- **Management of Multidrug Resistant Organisms in Healthcare Settings, 2006**
https://www.cdc.gov/hicpac/mdro/mdro_to_c.html
- **Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms (MDROs)**
<https://www.cdc.gov/hai/outbreaks/docs/Health-Response-Contain-MDRO.pdf>
- **Facility Guide for Control of CRE**
<https://www.cdc.gov/hai/pdfs/cre/CRE-guidance-508.pdf>
- **Antimicrobial Stewardship**
<http://epi.publichealth.nc.gov/cd/antibiotics/campaign.html>
- NCHAI@DHHS.NC.GOV





Questions?

SHARPPS inbox: NCHAI@DHHS.NC.GOV
Epi-On-Call: 919-733-3419

