Poll Everywhere

Using any phone or web-enabled device go to: PollEv.com/spice

Questions will appear on your screen as we go through the presentations.

For your convenience, you may prefer to download the app: Poll Everywhere

I understand the process for CRE reporting and surveillance

I can identify resources and key stakeholders related to CRE response

I can describe containment strategies for CRE

I am comfortable assessing infection prevention measures to prevent CRE transmission

I understand the process for initiating CRE colonization screening

CRE Surveillance, Identification, Containment & Response

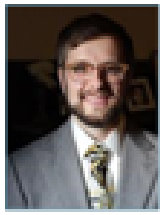
NC DPH SHARPPS
Communicable Disease Branch
North Carolina Division of Public Health

December 5, 2018

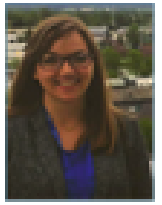
SHARPPS

Surveillance for Healthcare Associated & Resistant Pathogens Patient Safety Program

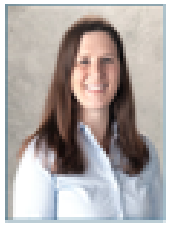
Jennifer MacFarquhar
Program Director



James Lewis
Medical Director



Heather Dubendris
Epidemiologist



Katie (Steider) Palladino
Epidemiologist

Deborah Dolan
Health Educator, Campaigns Coordinator

Savannah Carrico
Epidemiologist

Coming Soon!
Epidemiology Program Manager

Objectives

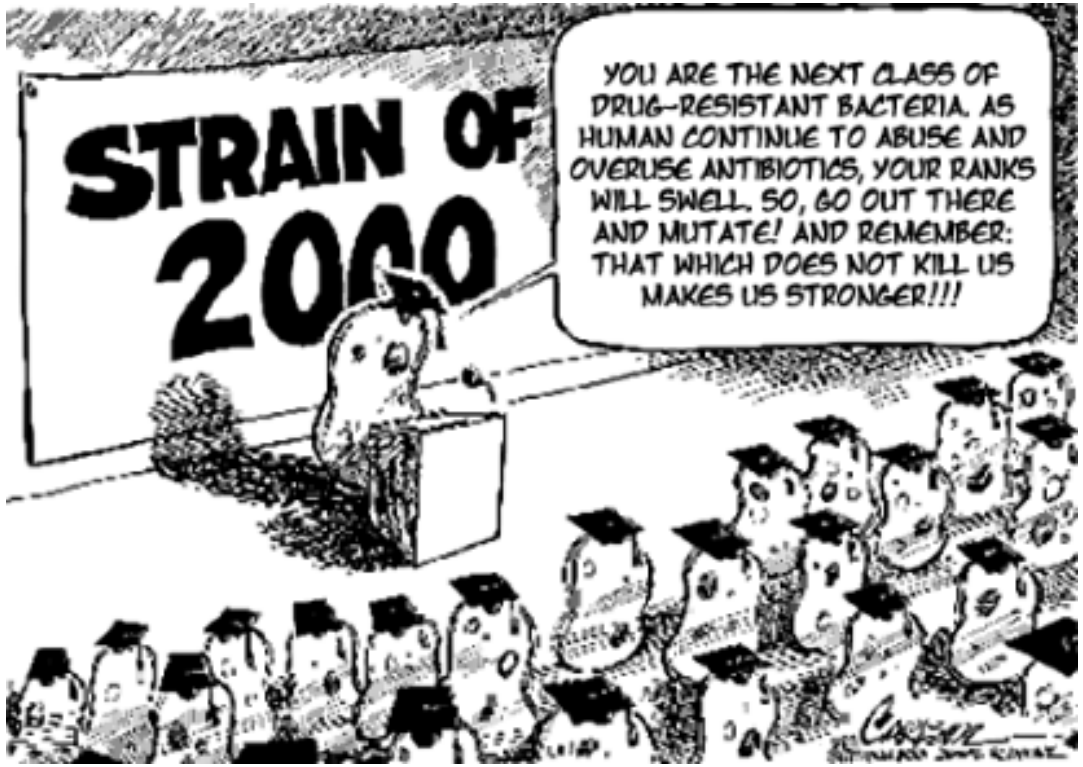
- Discuss the public health significance of CRE and the process for surveillance and detection
- Discuss unified response to CRE
- Describe containment strategies for CRE in individual facilities

Disclosure

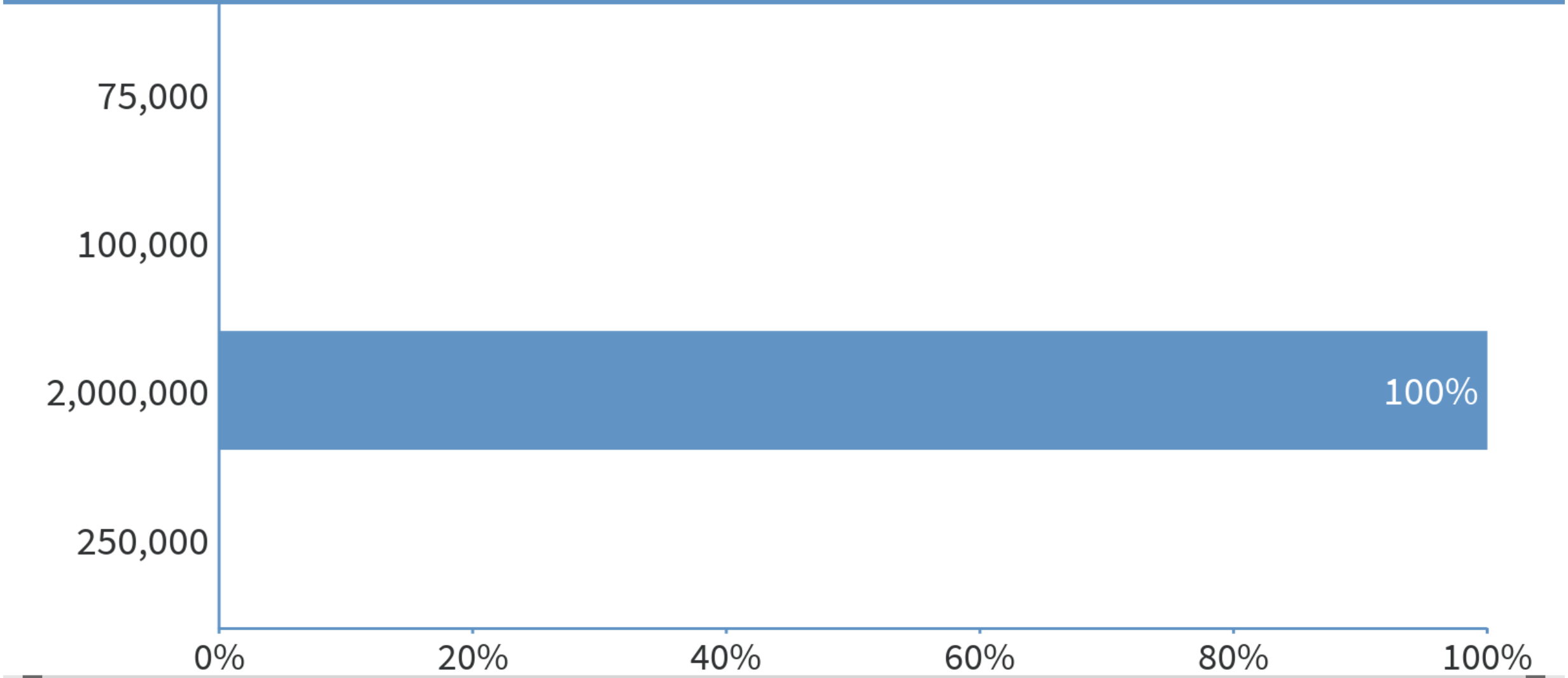
- The presenters for this session have no financial conflicts of interest to disclose

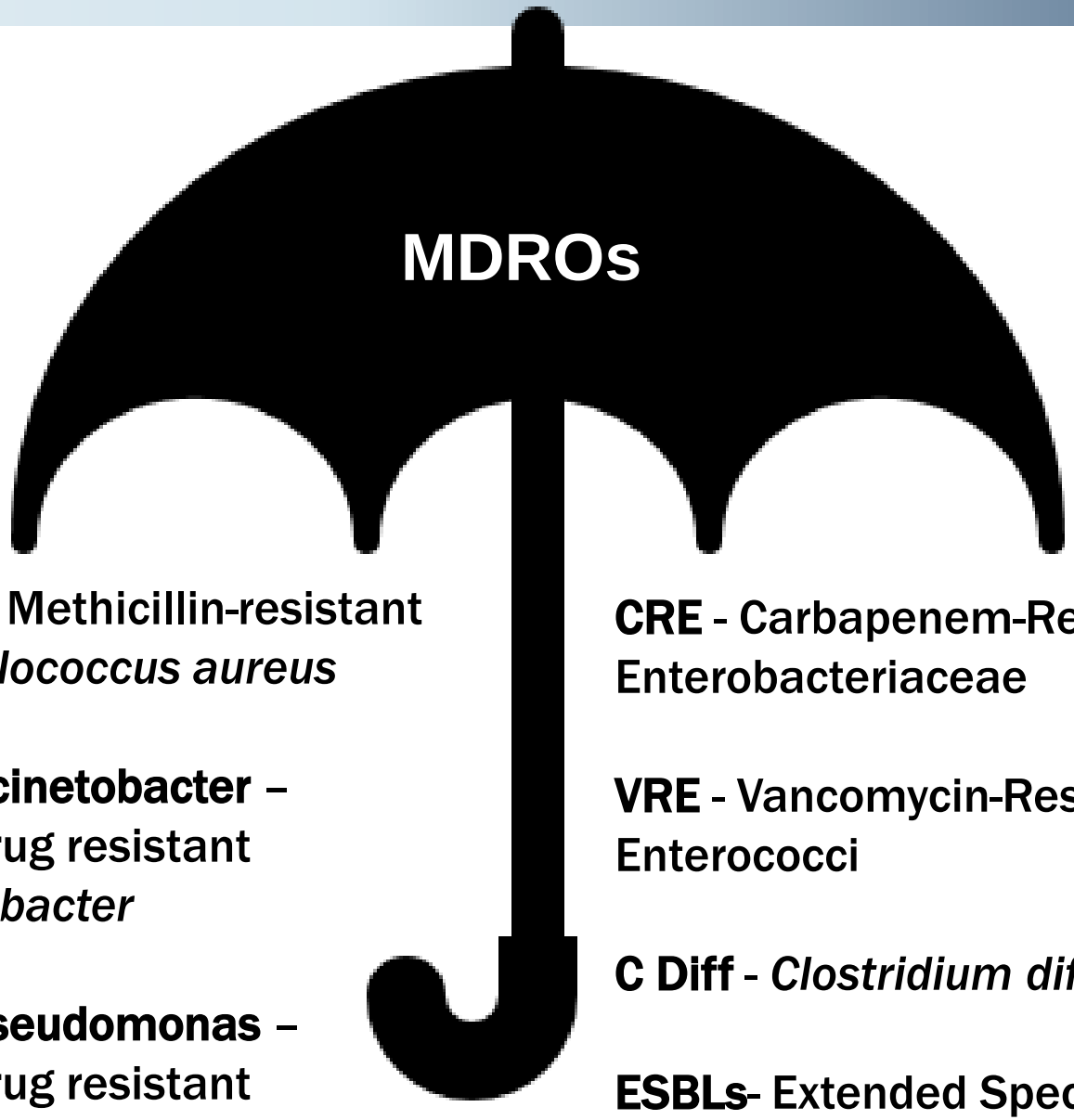
What is your background and training?

Multidrug-Resistant Organisms (MDROs)



According to CDC, what is the estimated number of infections caused by antibiotic resistant pathogens in the U.S. annually?





MRSA - Methicillin-resistant *Staphylococcus aureus*

MDR Acinetobacter – Multi-drug resistant *Acinetobacter*

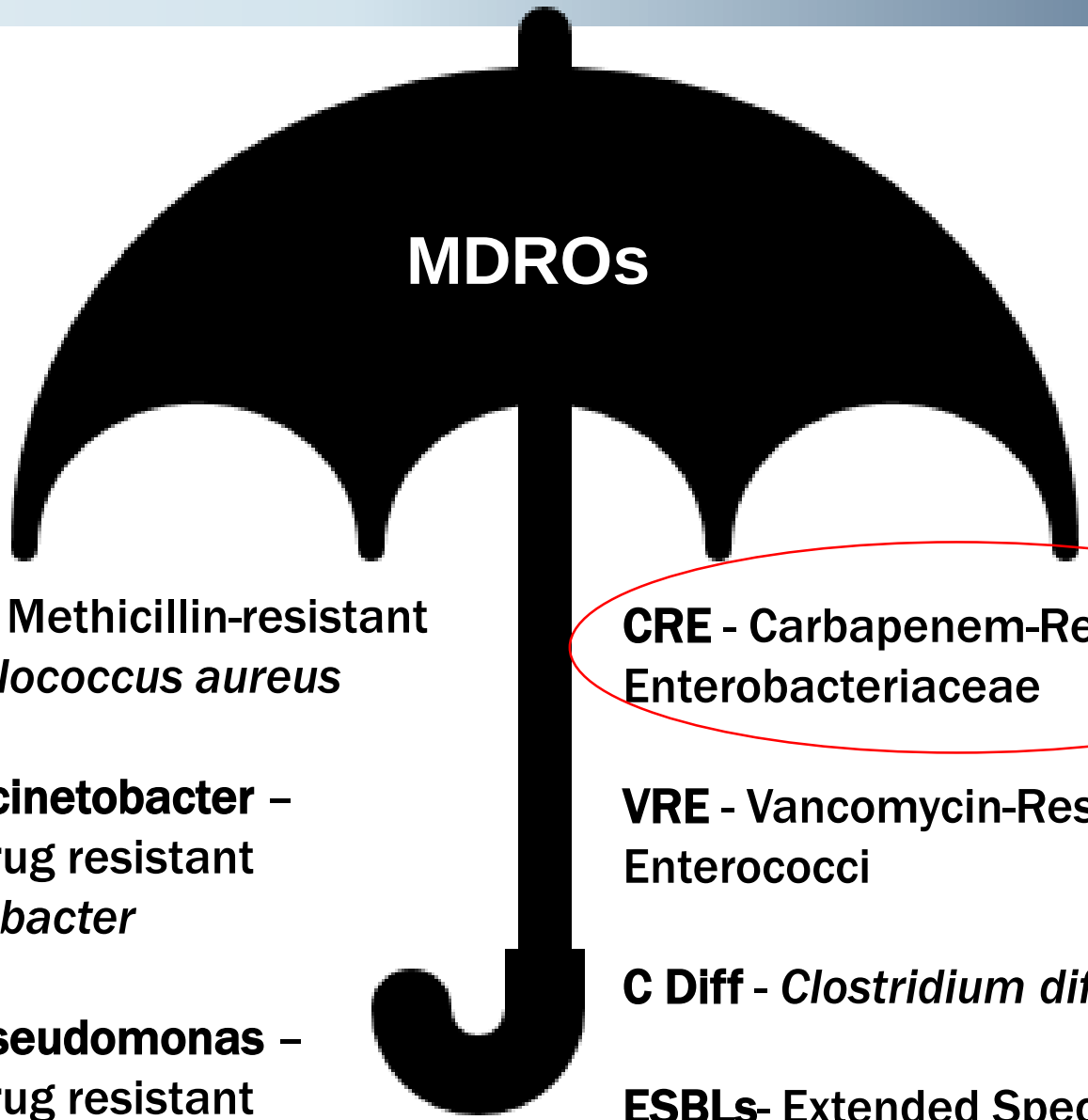
MDR Pseudomonas – Multi-drug resistant *Pseudomonas*

CRE - Carbapenem-Resistant Enterobacteriaceae

VRE - Vancomycin-Resistant Enterococci

C Diff - *Clostridium difficile*

ESBLs- Extended Spectrum Beta-Lactamase Producers



MRSA - Methicillin-resistant *Staphylococcus aureus*

MDR Acinetobacter – Multi-drug resistant *Acinetobacter*

MDR Pseudomonas – Multi-drug resistant *Pseudomonas*

CRE - Carbapenem-Resistant Enterobacteriaceae

VRE - Vancomycin-Resistant Enterococci

C Diff - *Clostridium difficile*

ESBLs- Extended Spectrum Beta-Lactamase Producers

Carbapenem-Resistant Enterobacteriaceae (CRE)

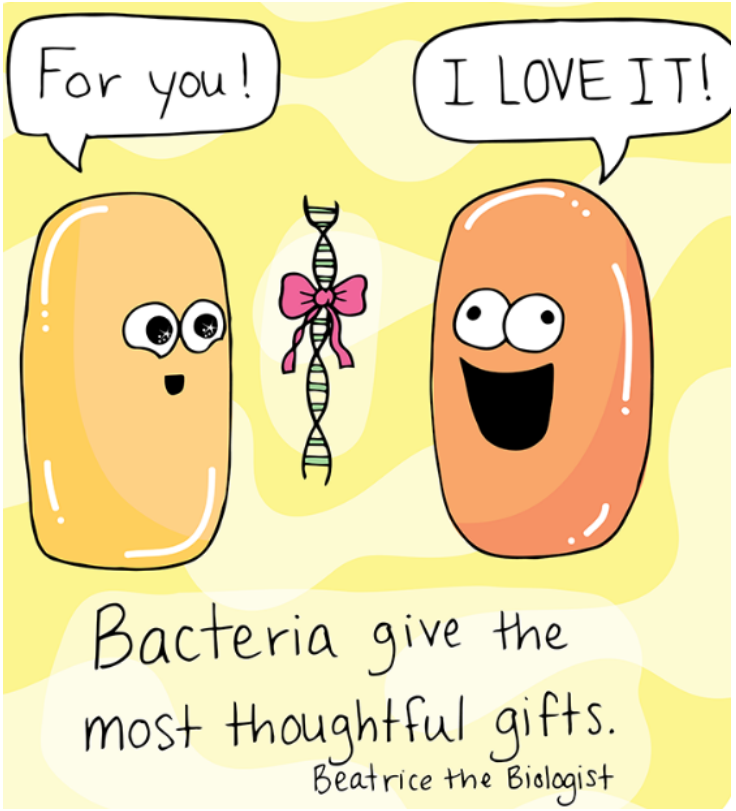
- Enterobacteriaceae = gram negative bacteria found in the digestive tract
  - *E. Coli*
  - *Klebsiella spp.*
- CRE = Enterobacteriaceae resistant to carbapenem antibiotics

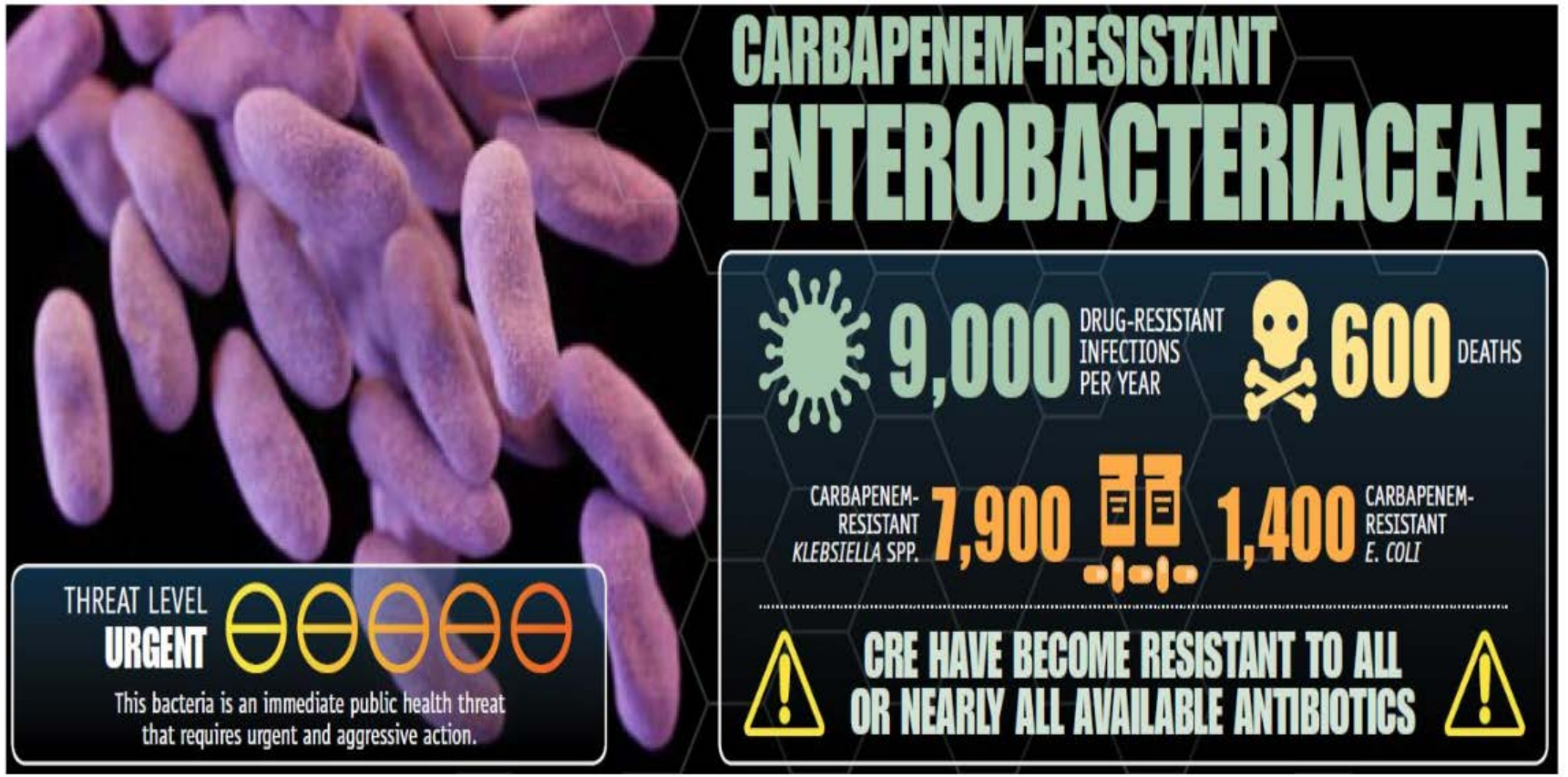
Carbapenems

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

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





CDC: Antibiotic Resistance Threats in the United States, 2013

What NC DPH is doing:

- **Detect MDROs**
  - Increased awareness
  - Sentinel 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
  - Get Smart to Be Antibiotics Aware
  - STAR partners
- **Education**
  - Webinars
  - Toolkits
  - Presentations
  - Guidance documents

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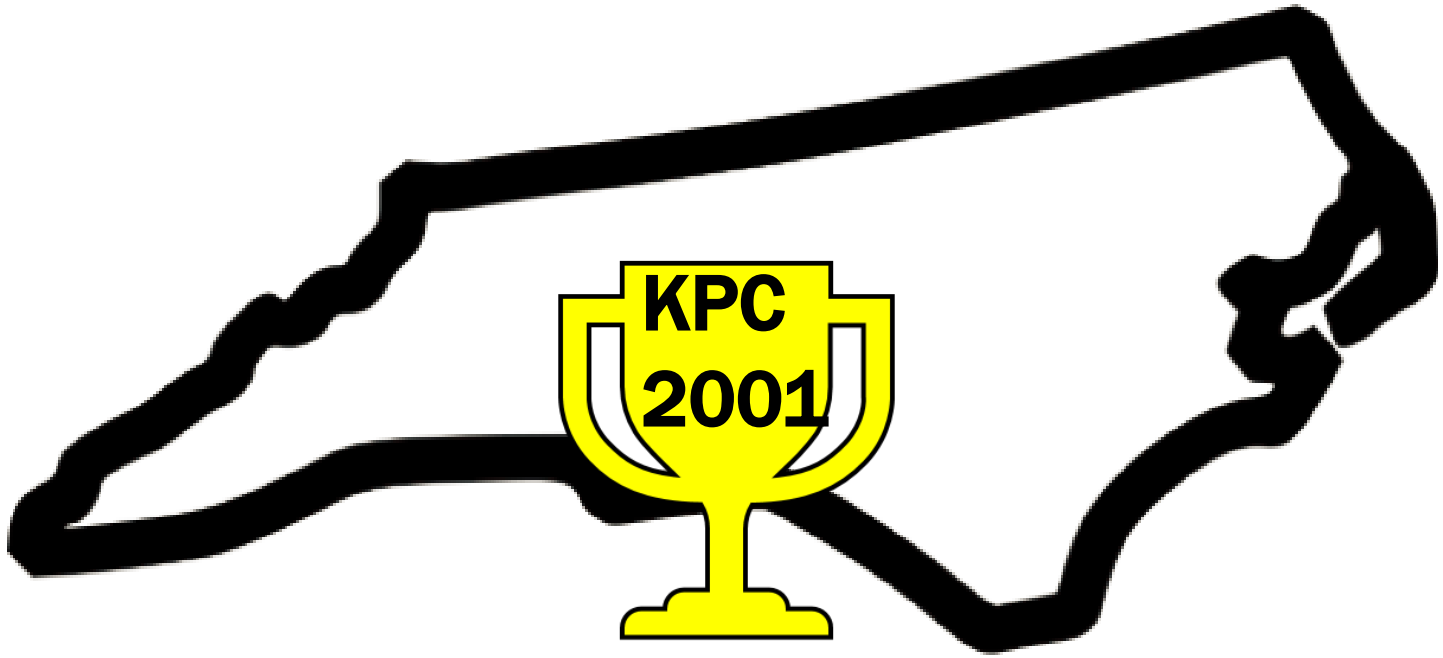
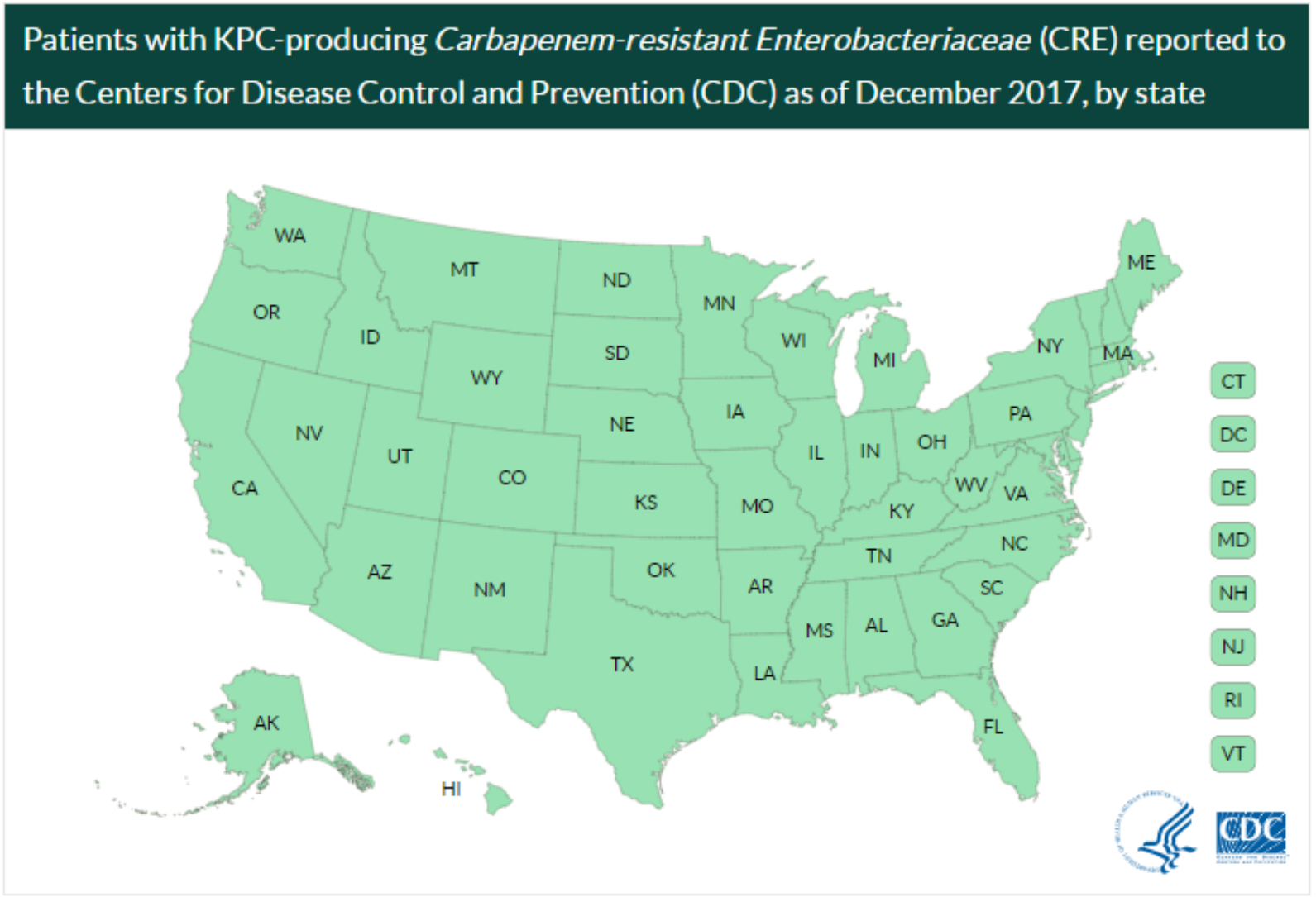
DETECTION & SURVEILLANCE

Coming in First



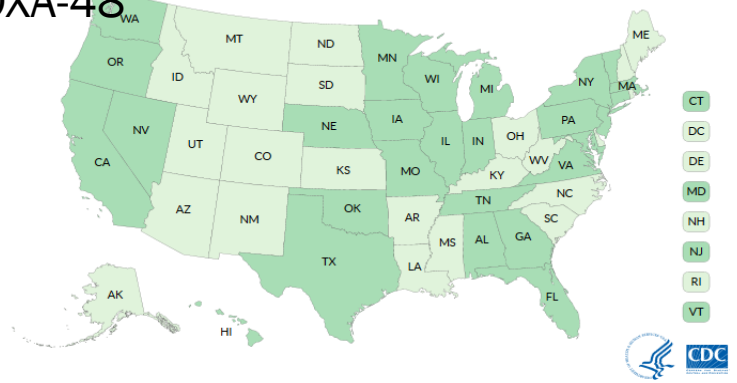
KPC has been reported in all 50 states



Detection of other CP-CRE varies by state

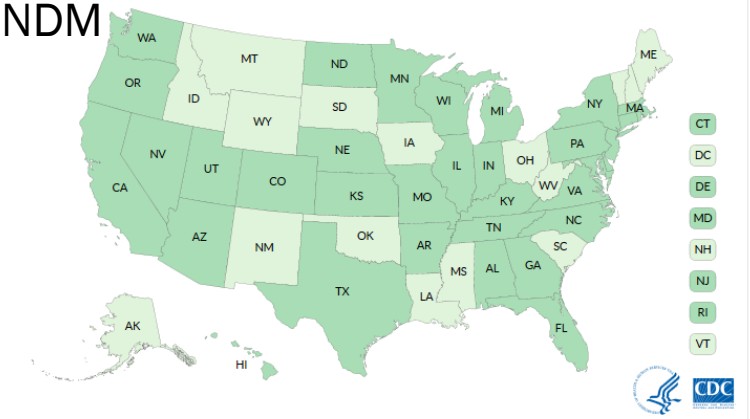
Patients with OXA-48-Type-producing *Carbapenem-resistant Enterobacteriaceae* (CRE) reported to the Centers for Disease Control and Prevention (CDC) as of December 2017, by state

OXA-48



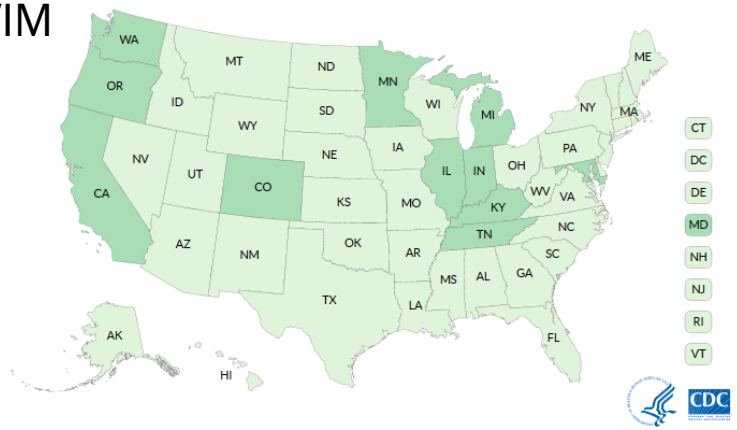
Patients with NDM-producing *Carbapenem-resistant Enterobacteriaceae* (CRE) reported to the Centers for Disease Control and Prevention (CDC) as of December 2017, by state

NDM



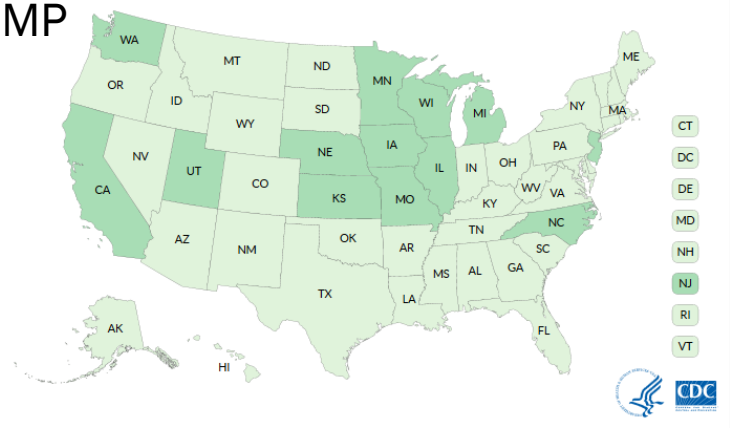
Patients with VIM-producing *Carbapenem-resistant Enterobacteriaceae* (CRE) reported to the Centers for Disease Control and Prevention (CDC) as of December 2017, by state

VIM



Patients with IMP-producing *Carbapenem-resistant Enterobacteriaceae* (CRE) reported to the Centers for Disease Control and Prevention (CDC) as of December 2017, by state

IMP



Maps are routinely updated and available from : https://www.cdc.gov/hai/organisms/cre/trackingcre.html

Surveillance in NC

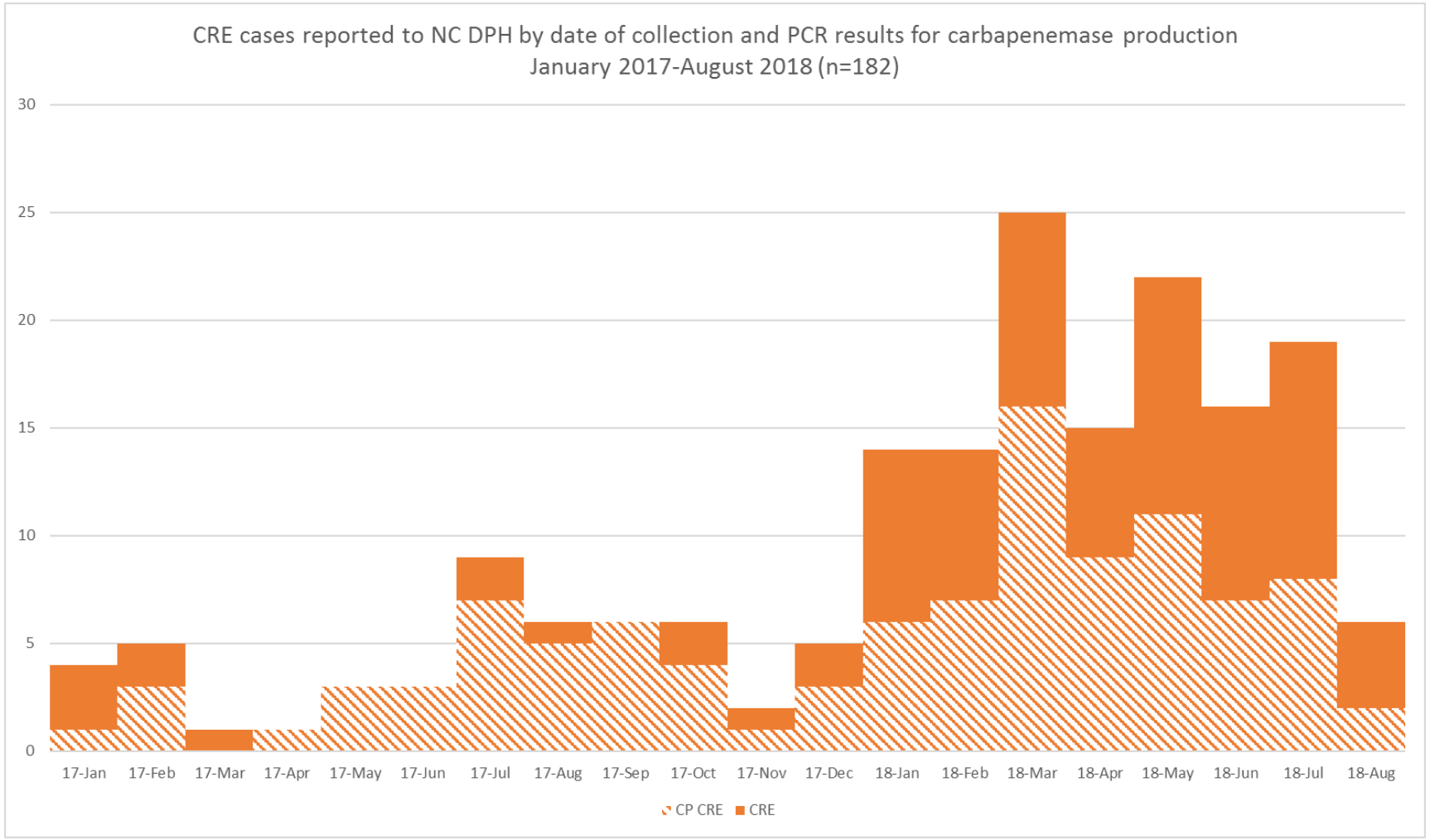
Sentinel site surveillance

Targeted recruitment for sentinel surveillance, special projects and outbreak response.

Mar. 2015 – Sep. 2016	Nov. 2016 – June 2017	July 2017-present

Accepted Isolates but did not actively recruit sites

Sentinel surveillance efforts



*Excludes duplicate CRE (Same Carbapenemase/organism; repeat clinical isolates in a 12 month period; screening results subsequent to a clinical result)

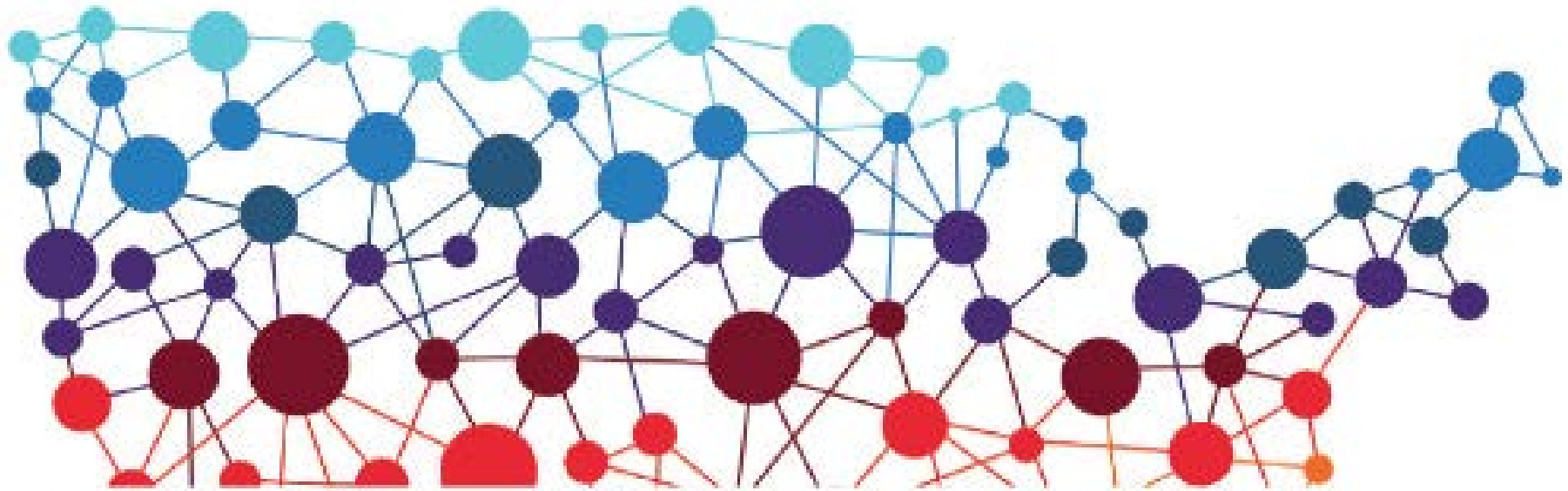
Sentinel surveillance efforts

57% of reported CRE reported to NC DPH are carbapenemase producing

Sentinel surveillance efforts

The Prevalence of types of carbapenemases among reported CP-CRE, North Carolina January 2017-August 2018 (n=103)

Utilizing the Antibiotic Resistance Lab Network (ARLN) to detect colonization:



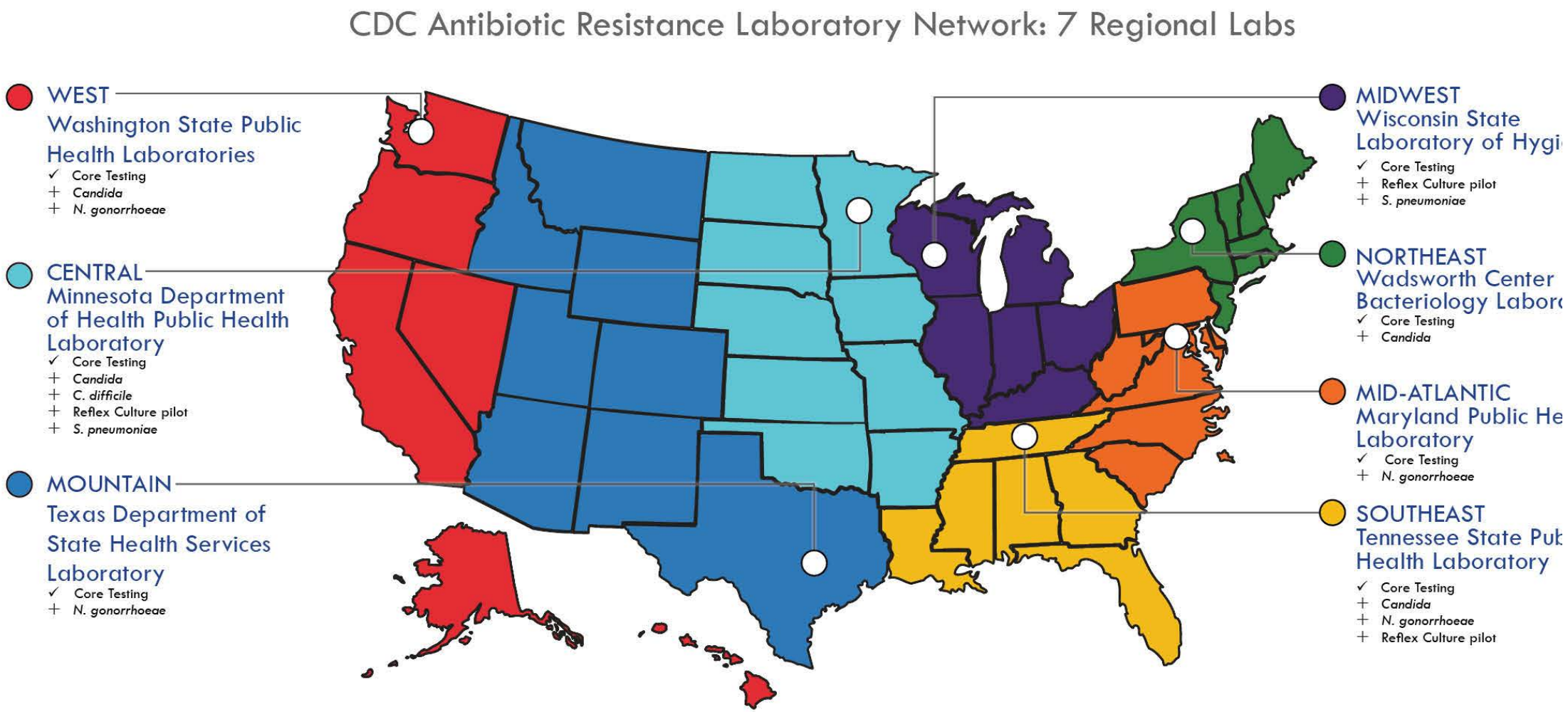
NC SLPH funded to characterize CRE

1. Antimicrobial susceptibility testing (AST) to confirm phenotypic detection of CRE

2. Phenotypic methods to detect carbapenemase production
   - Carbapenem Inactivation Method (CIM) -- preferred method

3. Molecular Detection
   - KPC, NDM, and OXA 48-like
   - VIM, IMP, *mcr-1* - optional

Antibiotic Resistance Lab Network (ARLN)



ADDITIONS TO 10A NCAC 41A .0101

Effective October 1, 2018

Additions to 10A NCAC 41A .0101

Additions include:

- Carbapenem-resistant Enterobacteriaceae (CRE) – 24 hours
- *Candida auris* – 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:

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or

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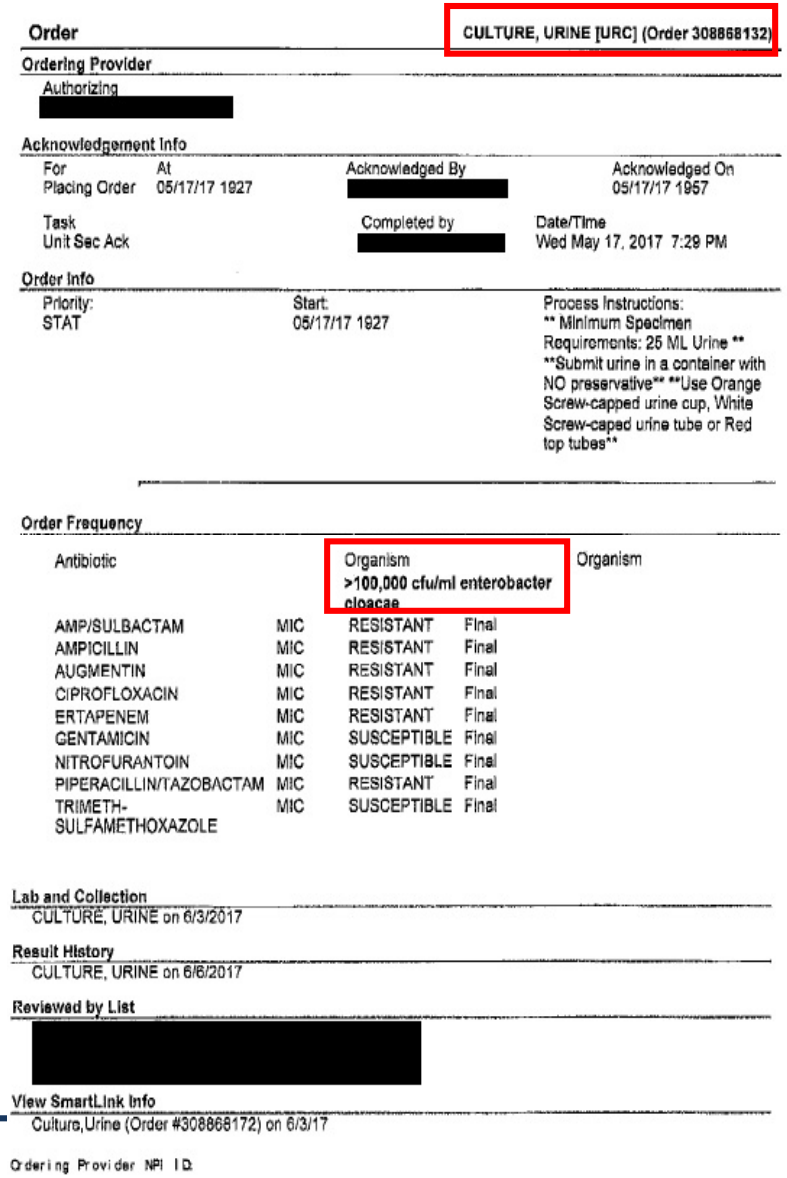
Lab reports: look for organism identity

- Organism identification
  - May use a culture or “NAAT” (“nucleic acid amplification test”) or “PCR”



Order CULTURE, URINE [URC] (Order 308868132)

Ordering Provider

Authorizing [redacted]

Acknowledgement Info

For	At	Acknowledged By	Acknowledged On
Placing Order	05/17/17 1927	[redacted]	05/17/17 1957

Task	Completed by	Date/Time
Unit Sec Ack	[redacted]	Wed May 17, 2017 7:29 PM

Order Info

Priority: STAT

Start: 05/17/17 1927

Process Instructions: ** Minimum Specimen Requirements: 25 ML Urine ** **Submit urine in a container with NO preservative** **Use Orange Screw-capped urine cup, White Screw-caped urine tube or Red top tubes**

Order Frequency

Antibiotic		Organism >100,000 cfu/ml enterobacter cloacae	Organism
AMP/SULBACTAM	MIC	RESISTANT	Final
AMPICILLIN	MIC	RESISTANT	Final
AUGMENTIN	MIC	RESISTANT	Final
CIPROFLOXACIN	MIC	RESISTANT	Final
ERTAPENEM	MIC	RESISTANT	Final
GENTAMICIN	MIC	SUSCEPTIBLE	Final
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final

Lab and Collection

CULTURE, URINE on 6/3/2017

Result History

CULTURE, URINE on 6/6/2017

Reviewed by List

[redacted]

View SmartLink Info

Culture,Urine (Order #308868172) on 6/3/17

Ordering Provider NPI ID

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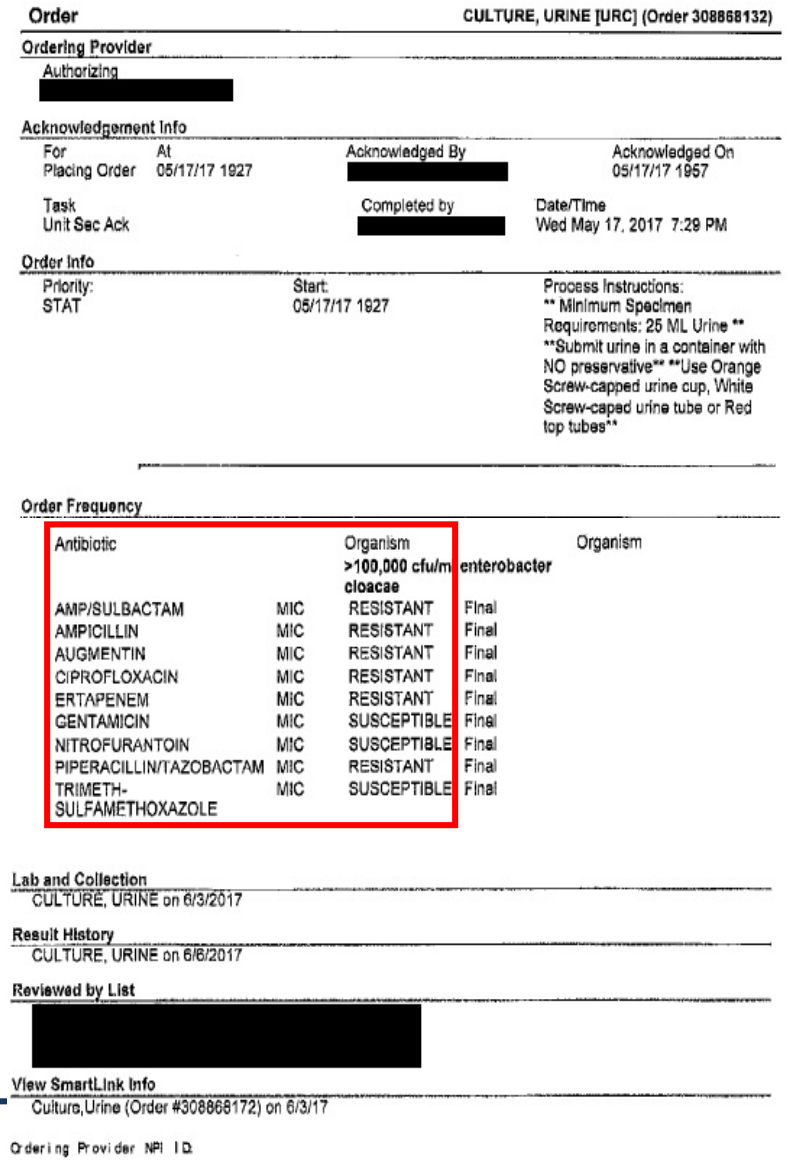
Lab reports: look for susceptibility results

- Antimicrobial susceptibility results
  - Also called “MICs” (“minimum inhibitory concentration”) with “interps” (“interpretation”)



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GENTAMICIN	MIC	SUSCEPTIBLE	Final
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Lab and Collection

CULTURE, URINE on 6/3/2017

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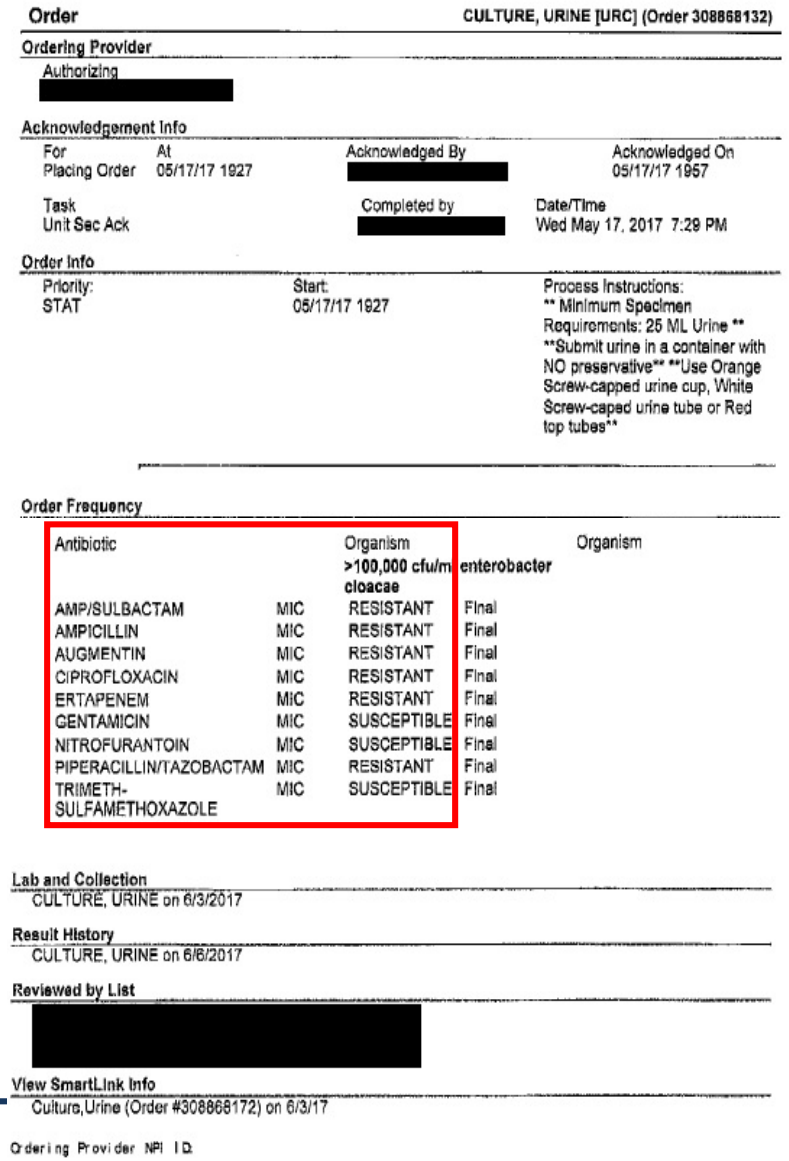
Culture,Urine (Order #308868172) on 6/3/17

Ordering Provider NPI ID

Lab reports: look for susceptibility results

- Antimicrobial susceptibility results
  - Also called “MICs” (“minimum inhibitory concentration”) with “interps” (“interpretation”)
  - Look for interpretations:
    - S = “susceptible”; listed drug can be used to treat
    - I = “intermediate”; listed drug may not be effective treatment
    - R = “resistant”; listed drug can not be used to treat



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Authorizing [redacted]

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Task	Completed by	Date/Time
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Order Frequency

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AMPICILLIN	MIC	RESISTANT	Final
AUGMENTIN	MIC	RESISTANT	Final
CIPROFLOXACIN	MIC	RESISTANT	Final
ERTAPENEM	MIC	RESISTANT	Final
GENTAMICIN	MIC	SUSCEPTIBLE	Final
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Lab and Collection

CULTURE, URINE on 6/3/2017

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Laboratory evidence for Carbapenemase Production or Resistance Mechanism

- Phenotypic methods for carbapenemase production:
  - Carba NP
  - Metallo-β-lactamase testing (e.g., E-test)
  - Modified Carbapenem Inactivation Method (mCIM)
  - Carbapenem Inactivation Method (CIM)
  - Modified Hodge Test (MHT) positive

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  - Carbapenem Inactivation Method (CIM)
  - Modified Hodge Test (MHT) positive

- **Molecular methods for resistance mechanism:**
  - **PCR (for KPC, NDM, OXA-48, IMP, or VIM)**
  - **Xpert Carba-R (for KPC, NDM, OXA-48, VIM, IMP)**

Example molecular method result

Test Name	Results	Date Reported
Cepheid GeneXpert Carba-R assay		09/06/2018
KPC	KPC gene DETECTED by real time rtPCR.	
IMP	IMP gene NOT DETECTED by real time rtPCR.	09/06/2018
NDM	NDM gene NOT DETECTED by real time rtPCR.	09/06/2018
OXA	OXA-48 gene NOT DETECTED by real time rtPCR.	09/06/2018
VIM	VIM gene NOT DETECTED by real time rtPCR.	09/06/2018

Example molecular method result

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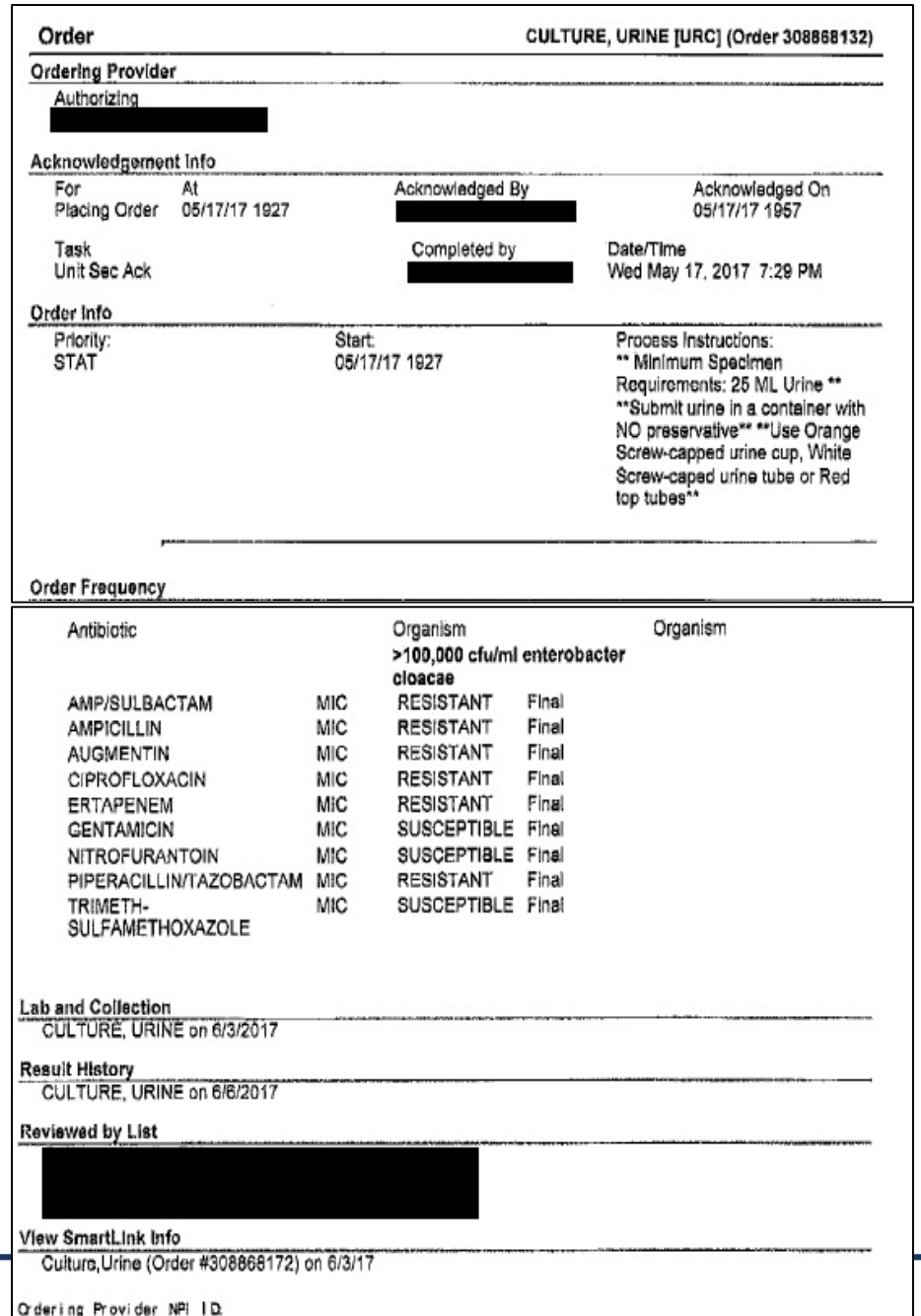
VIM	VIM gene NOT DETECTED by real time rtPCR.	09/06/2018

Exercise 1

What do you think?



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NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final

Lab and Collection

CULTURE, URINE on 6/3/2017

Result History

CULTURE, URINE on 6/6/2017

Reviewed by List

[redacted]

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Culture,Urine (Order #308868172) on 6/3/17

Ordering Provider NPI ID

Exercise 1

What do you think?

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NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final

Exercise 1

What do you think?

- **Organism**
- **Susceptibility**

Antibiotic		Organism >100,000 cfu/ml enterobacter cloacae	
AMP/SULBACTAM	MIC	RESISTANT	Final
AMPICILLIN	MIC	RESISTANT	Final
AUGMENTIN	MIC	RESISTANT	Final
CIPROFLOXACIN	MIC	RESISTANT	Final
ERTAPENEM	MIC	RESISTANT	Final
GENTAMICIN	MIC	SUSCEPTIBLE	Final
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final

HINT: Carbapenem antibiotics include:

- Doripenem
- Ertapenem
- Imipenem
- Meropenem

Exercise 1

What do you think?

- Organism
- Susceptibility

Antibiotic		Organism >100,000 cfu/ml enterobacter cloacae	
AMP/SULBACTAM	MIC	RESISTANT	Final
AMPICILLIN	MIC	RESISTANT	Final
AUGMENTIN	MIC	RESISTANT	Final
CIPROFLOXACIN	MIC	RESISTANT	Final
ERTAPENEM	MIC	RESISTANT	Final
GENTAMICIN	MIC	SUSCEPTIBLE	Final
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final

Exercise 1

What do you think?

- Organism

Enterobacter cloacae

- Susceptibility

Resistant to ertapenem

Antibiotic		Organism >100,000 cfu/ml enterobacter cloacae	
AMP/SULBACTAM	MIC	RESISTANT	Final
AMPICILLIN	MIC	RESISTANT	Final
AUGMENTIN	MIC	RESISTANT	Final
CIPROFLOXACIN	MIC	RESISTANT	Final
ERTAPENEM	MIC	RESISTANT	Final
GENTAMICIN	MIC	SUSCEPTIBLE	Final
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final

Exercise 1

What do you think?

- Organism

Enterobacter cloacae

- Susceptibility

Resistant to ertapenem

CRE alert

Antibiotic		Organism >100,000 cfu/ml enterobacter cloacae	
AMP/SULBACTAM	MIC	RESISTANT	Final
AMPICILLIN	MIC	RESISTANT	Final
AUGMENTIN	MIC	RESISTANT	Final
CIPROFLOXACIN	MIC	RESISTANT	Final
ERTAPENEM	MIC	RESISTANT	Final
GENTAMICIN	MIC	SUSCEPTIBLE	Final
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final

Exercise 2

What do you think?

Result

Urine Culture, Routine
Result 1

Klebsiella pneumoniae Abnormal

25,000-50,000 colony forming units per mL

Antimicrobial Susceptibility

** S = Susceptible; I = Intermediate; R = Resistant **
P = Positive; N = Negative
MICS are expressed in micrograms per mL

Antibiotic	RSLT#1	RSLT#2	RSLT#3	RSLT#4
Amoxicillin/Clavulanic Acid	R			
Ampicillin	R			
Cefazolin	R			
Cefepime	R			
→ Ceftriaxone	R			
Cefuroxime	R			
Cephalothin	R			
Ciprofloxacin	R			
Ertapenem	S			
Gentamicin	S			
Imipenem	S			
Levofloxacin	R			
Nitrofurantoin	I			
Piperacillin	R			
Tetracycline	R			
Tobramycin	R			
Trimethoprim/Sulfa	R			

Exercise 2

What do you think?

- Organism
- Susceptibility

Result

Urine Culture, Routine
Result 1

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Ampicillin	R			
Cefazolin	R			
Cefepime	R			
→ Ceftriaxone	R			
Cefuroxime	R			
Cephalothin	R			
Ciprofloxacin	R			
Ertapenem	S			
Gentamicin	S			
Imipenem	S			
Levofloxacin	R			
Nitrofurantoin	I			
Piperacillin	R			
Tetracycline	R			
Tobramycin	R			
Trimethoprim/Sulfa	R			

Exercise 2

What do you think?

- **Organism**

K. pneumoniae

- **Susceptibility**

S to Ertapenem

S to Imipenem

Result

Urine Culture, Routine
Result 1

Klebsiella pneumoniae Abnormal

25,000-50,000 colony forming units per mL

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Cefepime	R			
Ceftriaxone	R			
Cefuroxime	R			
Cephalothin	R			
Ciprofloxacin	R			
Ertapenem	S			
Gentamicin	S			
Imipenem	S			
Levofloxacin	R			
Nitrofurantoin	I			
Piperacillin	R			
Tetracycline	R			
Tobramycin	R			
Trimethoprim/Sulfa	R			

Exercise 2

What do you think?

- Organism

K. pneumoniae

- Susceptibility

S to Ertapenem

S to Imipenem

NOT CRE

Result

Urine Culture, Routine
Result 1

Klebsiella pneumoniae Abnormal

25,000-50,000 colony forming units per mL

Antimicrobial Susceptibility

** S = Susceptible; I = Intermediate; R = Resistant **
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Cefazolin	R			
Cefepime	R			
Ceftriaxone	R			
Cefuroxime	R			
Cephalothin	R			
Ciprofloxacin	R			
Ertapenem	S			
Gentamicin	S			
Imipenem	S			
Levofloxacin	R			
Nitrofurantoin	I			
Piperacillin	R			
Tetracycline	R			
Tobramycin	R			
Trimethoprim/Sulfa	R			

Criteria to distinguish new from existing cases:

- Different organisms/species/carbapenemases are counted as separate events from other organisms/species/carbapenemases.
- There is at least a 12-month interval from previous notification event for clinical cases.
- A person with a clinical case should not be counted as a screening/surveillance case thereafter (e.g., patient with known infection who later has colonization of GI tract is not counted as more than one case).
- A person with a screening case can be later categorized as a clinical case (e.g., patient with positive peri-rectal screening swab who later develops blood stream infection would be counted in both categories).

When should isolates be sent to the State Laboratory of Public Health?

- *Enterobacter* spp., *E. coli* or *Klebsiella* spp. resistant to any carbapenem in the absence of carbapenemase resistance mechanism testing

- Identification of CRE producing a carbapenemase other than KPC may be requested for additional testing.

How to report

- ELR, Fax or phone to local health department
- Local health department will capture case information in Survey Monkey case report form
  - Until NCEDSS module is live

What will the local health department ask about the case?

- Other healthcare facility exposures (e.g., long-term care facility)?
- International travel/international healthcare?
- Medical devices in place within 2 days prior to culture?
- Wound care?

What NC DPH is doing:

- **Detect MDROs**
  - Increased awareness
  - Sentinel 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
  - Get Smart to Be Antibiotics Aware
  - STAR partners

- **Education**
  - Webinars
  - 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 promptly implemented

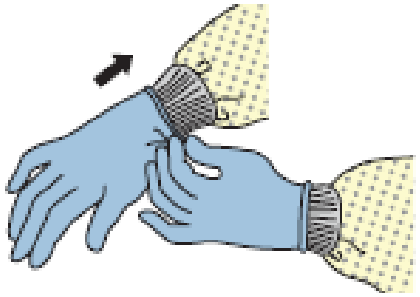
Prioritize responses given:

1. Organism and mechanism
2. Setting
3. Available resources

Standardized response

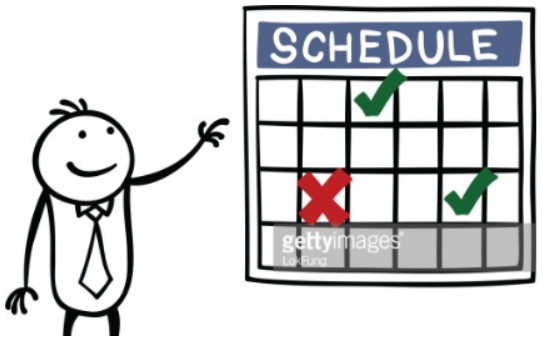
- Confirm that a case meets the case definition
- Notify patient and healthcare facilities as appropriate
- Ensure implementation of control measures
- Review the patient's risk factor information
- Conduct a healthcare investigation
- Contact investigation
- Maintain heightened awareness (prospective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

Control measures



Gown and gloves

Hand hygiene



Prevent opportunities for transmission

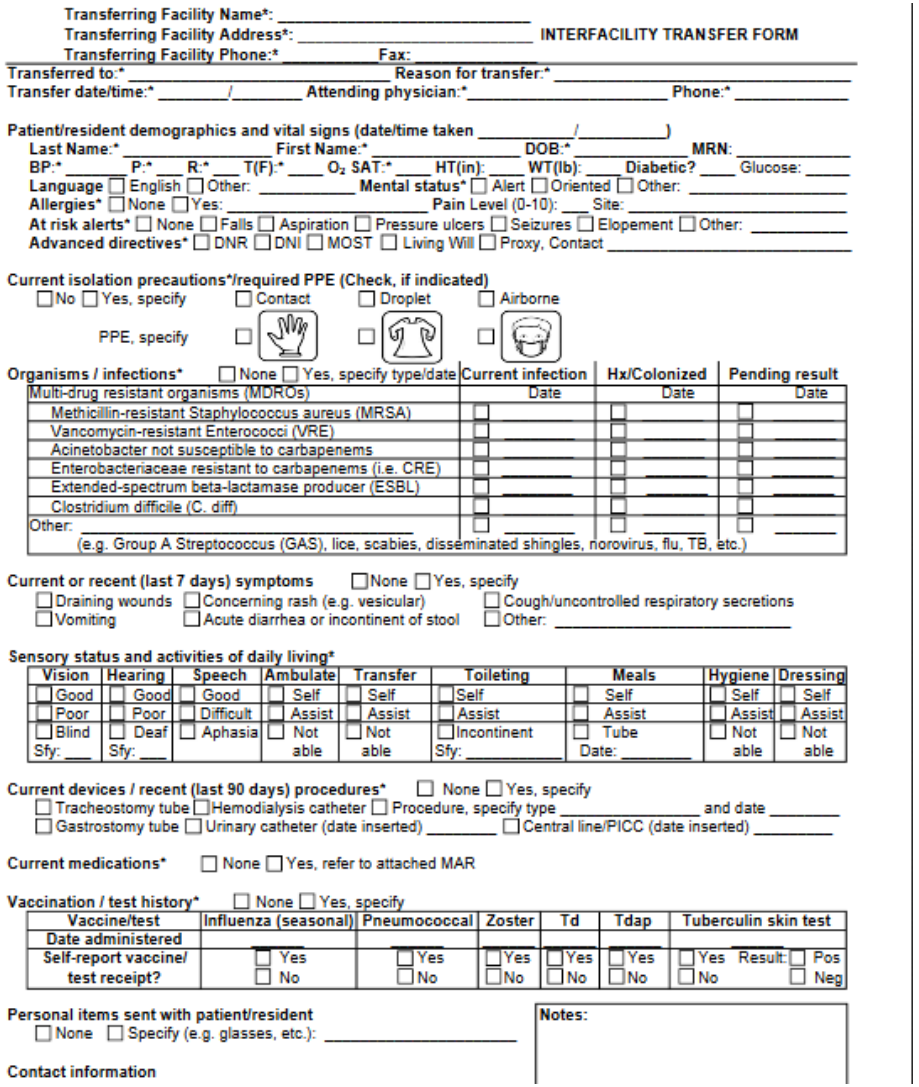
Control measures

Environmental cleaning

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):* ___ O_2 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

Multi-drug resistant organisms (MDROs)	Current infection Date	Hx/Colonized Date	Pending result Date
Methicillin-resistant Staphylococcus aureus (MRSA)	☐	☐	☐
Vancomycin-resistant Enterococci (VRE)	☐	☐	☐
Acinetobacter not susceptible to carbapenems	☐	☐	☐
Enterobacteriaceae resistant to carbapenems (i.e. CRE)	☐	☐	☐
Extended-spectrum beta-lactamase producer (ESBL)	☐	☐	☐
Clostridium difficile (C. diff)	☐	☐	☐
Other: _____	☐	☐	☐

(e.g. Group A Streptococcus (GAS), lice, scabies, disseminated shingles, norovirus, flu, TB, etc.)

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
☐ Good	☐ Good	☐ Good	☐ Self	☐ Self	☐ Self	☐ Self	☐ Self	☐ Self
☐ Poor	☐ Poor	☐ Difficult	☐ Assist	☐ Assist	☐ Assist	☐ Assist	☐ Assist	☐ Assist
☐ Blind Sfy: ___	☐ Deaf Sfy: ___	☐ Aphasia	☐ Not able	☐ Not able	☐ Incontinent Sfy: _____	☐ Tube Date: _____	☐ Not able	☐ Not able

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

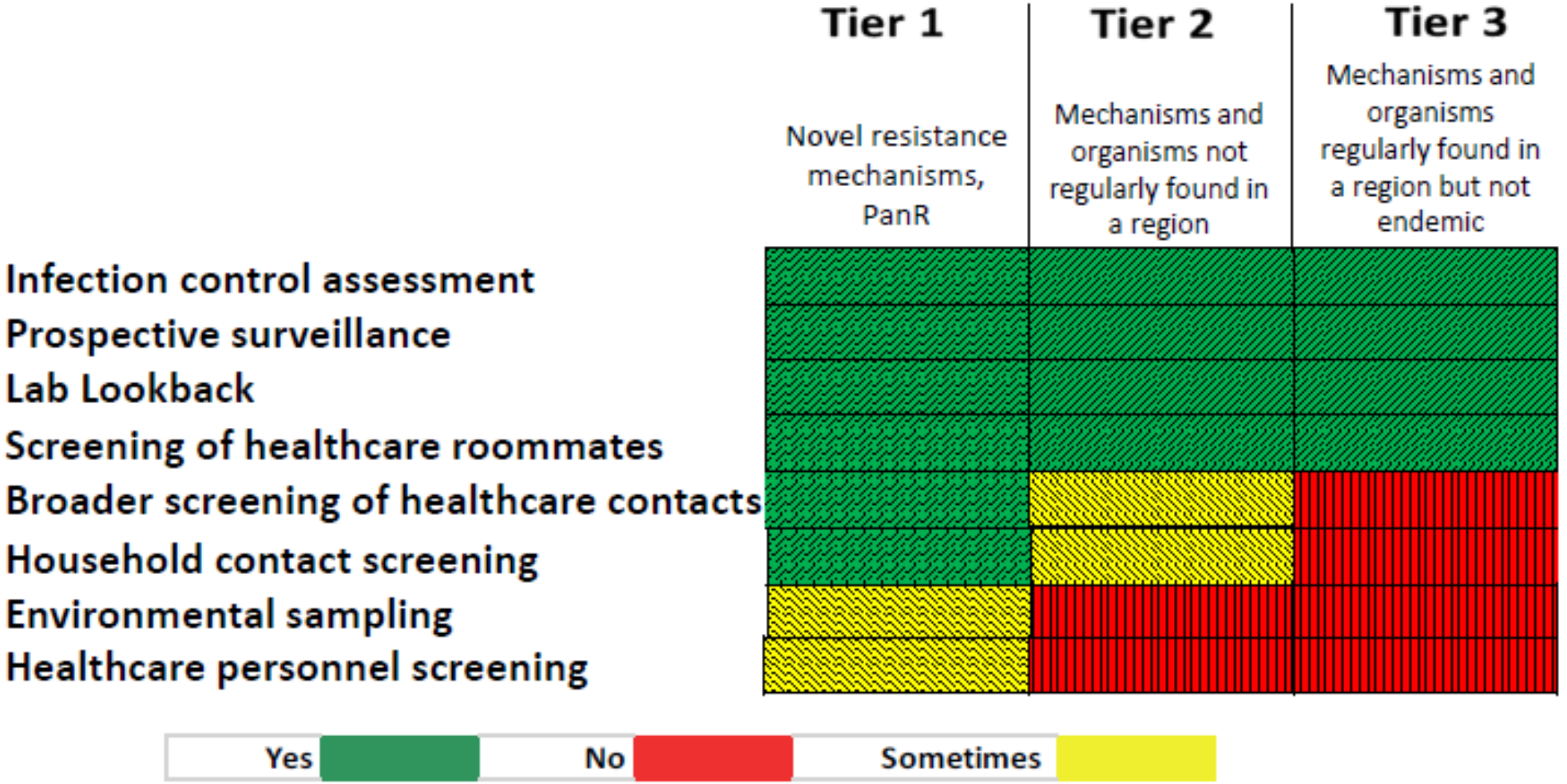
Vaccine/test	Influenza (seasonal)	Pneumococcal	Zoster	Td	Tdap	Tuberculin skin test
Date administered	_____	_____				_____
Self-report vaccine/ test receipt?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes Result: ☐ Pos ☐ No ☐ Neg

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

Contact information

Notes:

Containment response elements



Contact investigation

- In consultation with DPH,
  - Screen roommates (and potentially others) that are epidemiologically linked because of healthcare exposure

Colonization screening process

Request for colonization screening

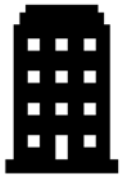
In consultation with LHD, DPH will send:
- Swab(s)
- Educational resources
- Swab collection instructions
- Shipping instructions

Arrange site visit with LHD to collect swab(s)

- Ideally Mon-Wed
- Arrange for staff to collect swab(s)
- Provide LHD with:
  - Facility address
  - Patient name
  - Patient DOB
  - Patient MRN
- DPH will send:
  - Shipping label

On-site visit to collect swab(s)

- Facilitate swabbing
- Facilitate packaging and FedEx pickup (if needed)
- DPH will send:
  - Requisition forms



Send swab(s) to Regional ARLN lab

- LHD will fax/call with results when available

Swab collection kit

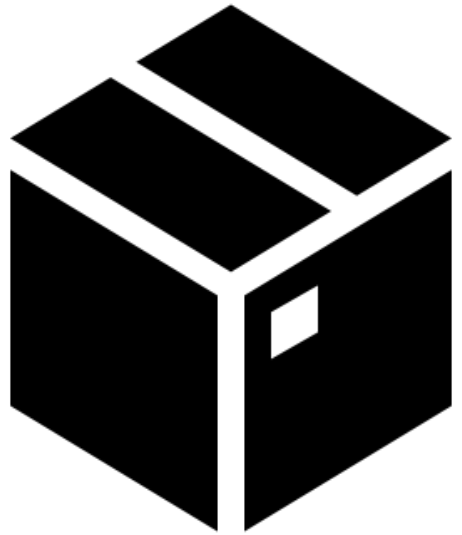
1. Biohazard bag (with absorbent material)
2. Collection instructions
3. Parafilm
4. Swab

Swab collection process

1. Perform hand hygiene and apply appropriate PPE.
2. Remove swab from packaging.
3. Carefully insert both tips of swab approximately 1 cm beyond the anal sphincter and rotate gently. Refer to collection instructions for appropriate amount of sample.
4. Uncap transport tube and insert swab.
5. Cap transport tube and seal with Parafilm.
6. Label the transport tube with patient name, date of birth, and collection date.
7. Place transport tube in biohazard bag and seal.
8. Place requisition form in outer pocket of biohazard bag.

Packing and shipping

Guidance for packing and shipping Category B biological substances via FedEx will be provided prior to swab collection



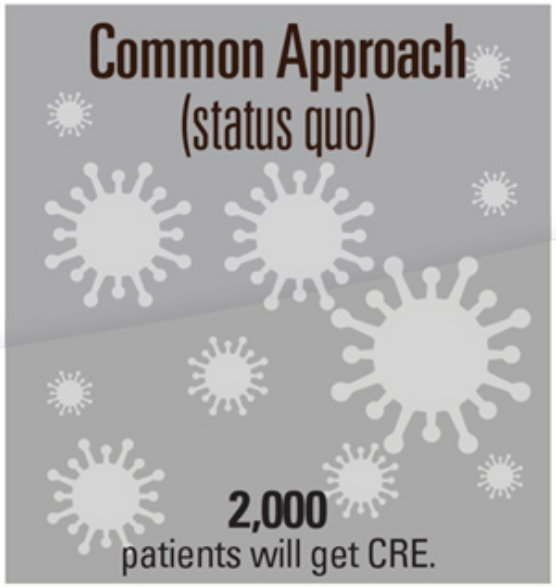
Partnership is essential

- 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.

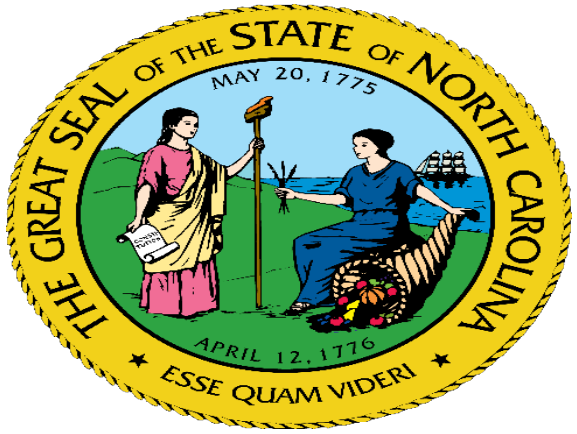
How Can My Facility Prevent transmission of MDROs?

1. Staff education
2. Laboratory notification
3. Cohort residents and staff
4. Contact precautions
5. Hand Hygiene
6. Environmental cleaning
7. Communicate MDRO status
8. Review infection prevention policies and procedures
9. Antimicrobial Stewardship

How Can My Facility Prevent transmission of MDROs?

- Communicate with your laboratory
  - methods for CRE identification
  - capacity to test for CP-CRE
- Perform periodic reviews of laboratory data
  - quantify incidence
  - detect changes in overall trends
- Consider performing rectal screening to detect CRE colonization when admitting patients who have been hospitalized outside the U.S. within the past 6 months

Questions?



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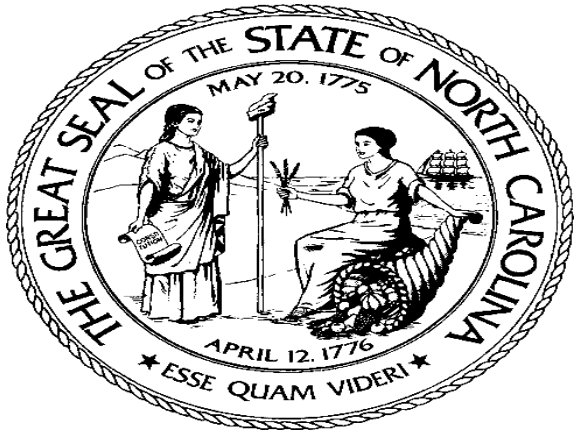
Epi-On-Call: 919-733-3419



CRE Tabletop for Infection Preventionists

PART ONE: NOTIFICATION

PART ONE: NOTIFICATION

March 6, 2018

When reviewing your microbiology labs for routine surveillance at acute care hospital A (ACH A), you identify a 63 year old male patient (Mr. Z) with a *Klebsiella oxytoca* isolate from a wound culture taken on March 2.

The isolate is resistant to ertapenem.

No additional testing was performed.

Is this reportable to NC DPH?

Yes, the result should be reported but the isolate does not need to be sent to the state lab becuase we confirmed it was CRE **A**

Yes, the result should be reported and the isolate should be forwarded to the state lab **B**

No, Klebsiella oxytoca are not covered under the new CRE reporting rule **C**

No, because the only carbapenem the isolate is resistant to is ertapenem **D**

PART ONE: NOTIFICATION

March 6, 2018

You report the case of CRE to your local health department and the isolate is forwarded to the state lab for resistance mechanism testing.

PART ONE: NOTIFICATION

March 9, 2018

The health department calls to let you know the state lab results are in. The isolate tests positive for Verona Integron-encoded metallo-β-lactamase (VIM). VIM is a plasmid-mediated Carbapenemase that is rare in the U.S. This is the first VIM Producing CRE for the hospital and for the region.

What does this lab result mean? Choose all that apply

The isolate is a carbapenemase producing CRE (CP-CRE)

Additional case investigation is warranted

Additional public heatlh action is warranted

What should your facility do to prevent transmission?

What are some key questions to ask to begin planning your containment strategy?

Remember!

- You know that in healthcare settings, *Klebsiella* bacteria are primarily spread through person-to-person contact
- This is a novel CRE mechanism so your goal is containment!

Consider:

1. Where do you go for additional information to plan your response?
2. What are some key questions to ask to begin planning your containment strategy?

PART TWO: CASE HISTORY

PART TWO: CASE HISTORY

January 1-31 2018 Hospital X – Athens, Greece

On January 1, while on vacation in Greece, Mr. Z suffered a stroke. He was hospitalized in Athens in an ICU.

During his stay he developed a sacral decubitus ulcer. As part of treatment, Mr. Z received several courses of antibiotics.

On January 31, Mr. Z was discharged and flew home with family.

PART TWO: CASE HISTORY

January 31, 2018 Hospital A – USA

After landing in the U.S., his family brought him directly to the emergency room at Hospital A and he was admitted.

The decubitus ulcer showed no sign of infection. Mr. Z remained bed-bound. He was continent of stool, but required assistance with activities of daily living.

Mr. Z had no roommates during his stay. He was not on contact precautions.

PART TWO: CASE HISTORY

<u>February 1-28, 2018</u> Nursing Home 1 – USA

Late on February 1, Mr. Z was transferred to the Nursing Home A. He was admitted to a double occupancy room with Roommate Y.

Mr. Z was not on contact precautions.

On February 23, Mr. Z's wound began to look worse and he developed a fever. He was empirically started on antibiotics. His fever continued and he developed diarrhea.

PART TWO: CASE HISTORY

March 1-4, 2018 Hospital A – USA

On March 1, Mr. Z was readmitted to the hospital and on March 2, Mr. Z's physician ordered for the decubitus ulcer to be cultured.

On March 4, the CRE result was reported from the clinical laboratory and Mr. Z was placed on contact precautions.

What risk factors did the patient have for CP-CRE?

Exposure to domestic animals, international hospitalizations, recent use of antibiotics

International hospitalizations, history of smoking, lack of exercise

International hospitalizations, recent use of antibiotics, open wound

Open wound, exposure to domestic animals, history of smoking

Why might the LTCF or health department call you about the CP-CRE result?

To blame you for sending a CRE case patient to the LTCF

Notifying facilities where the case had recent healthcare is part of public health response because regional prevention measures are key to control

To brag about being the first facility to identify this mechanism of resistance

Because Mr. Z's friend wrote about it on Facebook

Consider: Based on the patient's case history, 1. How would you evaluate the potential for transmission? What are key next steps for Hospital A?

PART THREE: FACILITY ASSESSMENT

PART THREE: FACILITY ASSESSMENT

After a site visit performed at your hospital in conjunction with the health department, you find multiple issues including:

- Poor adherence to hand hygiene
- Patient care equipment stored around inpatient room sinks
- Improper application/removal of PPE

Which of the following are risk factors for CP-CRE transmission? Choose all that apply

- Failure to clean physical therapy equipment between patients
- Poor staff adherence to hand hygiene
- Limited availability of gowns and gloves for contact precautions
- Patient care equipment stored around inpatient room sinks
- Improper application/removal of PPE
- Reusing scissors during wound care

Several infection prevention issues were identified at Hospital A.

How would you:

1. Immediately address the infection prevention concerns?

2. Identify if transmission has occurred?

PART FOUR: SCREENING

PART FOUR: SCREENING

March 9, 2018

In consultation with the health department, your facility screens:

5 hospital patients who overlapped with Mr. Z's current hospital admission in the same unit for three or more days before he was placed on contact precautions

Mr. Y (Mr. Z's roommate at LTCF 1, who has been transferred to your hospital with pneumonia)

Remember!

DPH can coordinate colonization screening through our regional antimicrobial resistant laboratory network (ARLN) lab

Consider:

1. What data do you want to collect on those you screen?
2. What sites are appropriate for CRE screening?
3. How will swabs be acquired?

PART FOUR: SCREENING

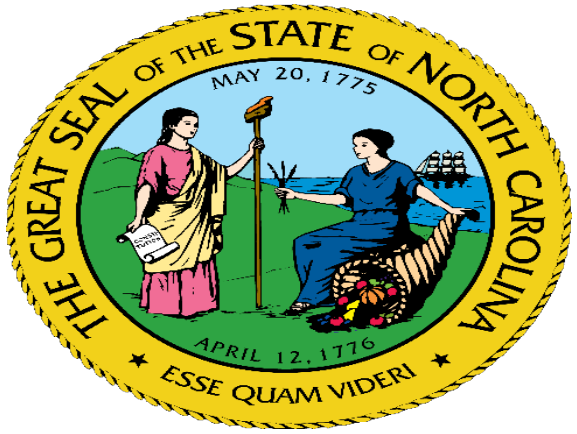
March 11, 2018

Screening identifies one colonized case of VIM

PART FIVE: CONCLUSION

- The response continues for 4 months
- Screening is expanded to include other high risk patients and continues until there are two consecutive screens with no new positives
- Education and rounding continue to ensure appropriate IP practices
- Your facility participates in a public health regional training session to educate other hospitals, long-term care facilities, transport services and LTACHS in your area to ensure a coordinated approach to MDRO control

Questions?



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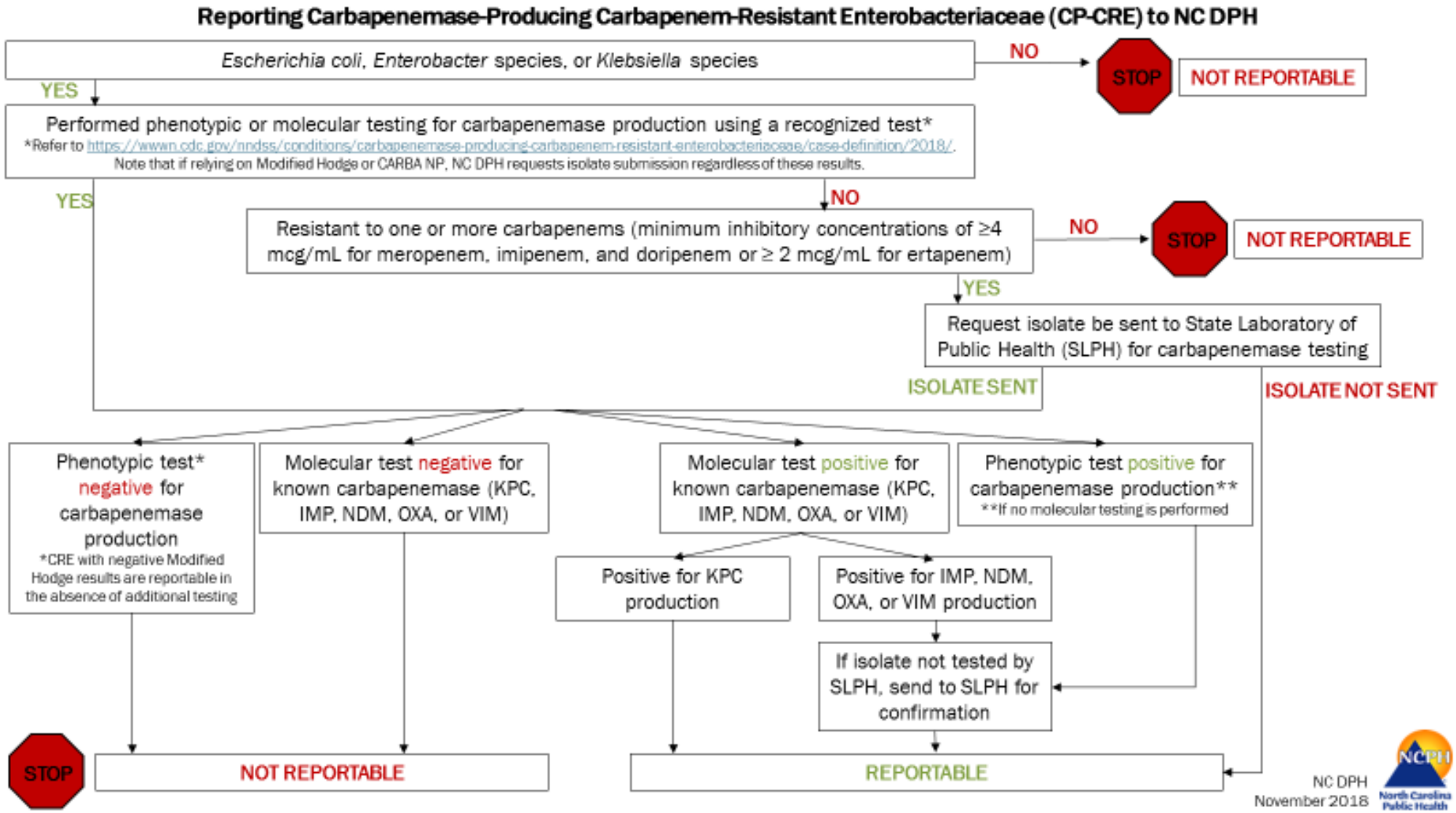
Epi-On-Call: 919-733-3419

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_toc.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

I understand the process for CRE reporting and surveillance

I can identify resources and key stakeholders related to CRE response

I can describe containment strategies for CRE

I am comfortable assessing infection prevention measures to prevent CRE transmission

I understand the process for initiating CRE colonization screening