

Public Health Outbreak Investigations & Colonization Screenings

Healthcare-associated Infections & Antibiotic Resistance Program,
Louisiana Office of Public Health

Antimicrobial Stewardship Summit

June 17, 2022



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The speaker does not have a financial or non-financial relationship with a commercial interest that would create a conflict of interest with this presentation. ”

Disclosure Statement

Objectives



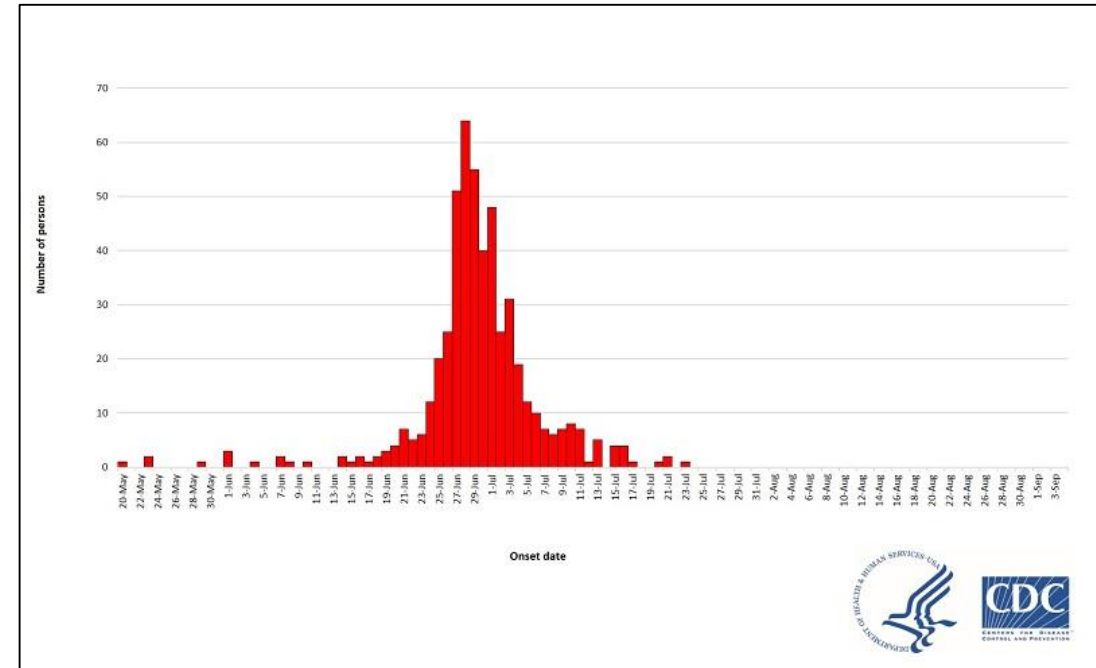
- ▶ Summarize the steps of a public health outbreak investigation
- ▶ Describe the role that colonization screenings play in an investigation
- ▶ Review case studies applying the principles of outbreak investigation
- ▶ Discuss lessons learned

Outbreak Investigations



What is an outbreak?

- ▶ Sudden rise in the number of cases of an infection or disease
- ▶ Outbreak thresholds vary by disease, population affected, and time and place of occurrence



Healthcare Facility Actions to Mitigate Outbreaks

Surveillance

Cohorting

Environmental
Cleaning &
Disinfection



Transmission-
based
Precautions

Auditing

Just-in-Time
Training

Reporting to Public Health

- ▶ Outbreaks of any infectious etiology are reportable per the Louisiana Sanitary Code
- ▶ Report by calling 1-800-256-2748 or your Regional Surveillance Epidemiologist*



Sanitary Code - State of Louisiana Part II - The Control of Disease

LAC 51:II.105: The following diseases/conditions are hereby declared reportable with reporting requirements by Class:

Class A Diseases/Conditions - Reporting Required Within 24 Hours

Diseases of major public health concern because of the severity of disease and potential for epidemic spread-report by telephone immediately upon recognition that a case, a suspected case, or a positive laboratory result is known; [in addition, all cases of rare or exotic communicable diseases, unexplained death, unusual cluster of disease and all outbreaks shall be reported.

<i>Acinetobacter</i> spp., carbapenem-resistant	<i>C. sake</i> , <i>C. parapsilosis</i> , <i>C. catenulata</i> ,	Measles (Rubeola imported or indigenous)	Rubella (German Measles)
Acute Flaccid Paralysis including Acute Flaccid	<i>C. guilli-ermondii</i> , and <i>Rhodotorula glutinis</i>)	Melioidosis (<i>Burkholderia pseudomallei</i>)	Severe Acute Respiratory Syndrome-
Myelitis	Cholera	<i>Neisseria meningitidis</i> (invasive infection)	associated Coronavirus (SARS-CoV)
Amoeba (free living) infection (including <i>Acan-</i>	<i>Clostridium perfringens</i> (foodborne infection)	Outbreaks of Any Infectious Disease	Smallpox
<i>thamoeba</i> , <i>Naegleria</i> , <i>Balamuthia</i> & others)	Diphtheria	Pertussis	<i>Staphylococcus aureus</i> , Vancomycin
Anthrax	Enterobacteriaceae, carbapenem-resistant	Plague (<i>Yersinia pestis</i>)	Intermediate or Resistant (VISA/VRSA)

Outbreaks of Any Infectious Disease

* <https://ldh.la.gov/page/1045>

Public Health Response to Outbreaks

1. Confirm that an outbreak exists
 - Verify with the IP; request lab results and medical records
2. Establish a case definition
 - Signs and symptoms, lab criteria, location, time, etc.
 - Should be specific, but not so narrow that cases are missed
3. Perform prospective and retrospective surveillance
 - Active case finding, colonization screenings, lab lookbacks, chart reviews
4. Assemble line list and perform chart abstractions

Public Health Response to Outbreaks

5. Conduct an Infection Control Assessment and Response (ICAR)*
6. Identify risk factors
7. Implement infection control interventions
 - Environmental cleaning and disinfection, Transmission-based Precautions, cohorting, additional staff training/auditing, etc.
8. Monitor for additional cases
 - Outbreaks are usually considered to be over after two incubation periods with no new cases

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

Colonization Screenings



Multidrug-resistant Organisms (MDROs)

Colonization

- No symptoms
- No treatment indicated
- Can be prolonged or intermittent
- Can be contagious to others

Infection

- Symptoms present
- Treatment may be needed
- Can be contagious to others

MDRO Colonization

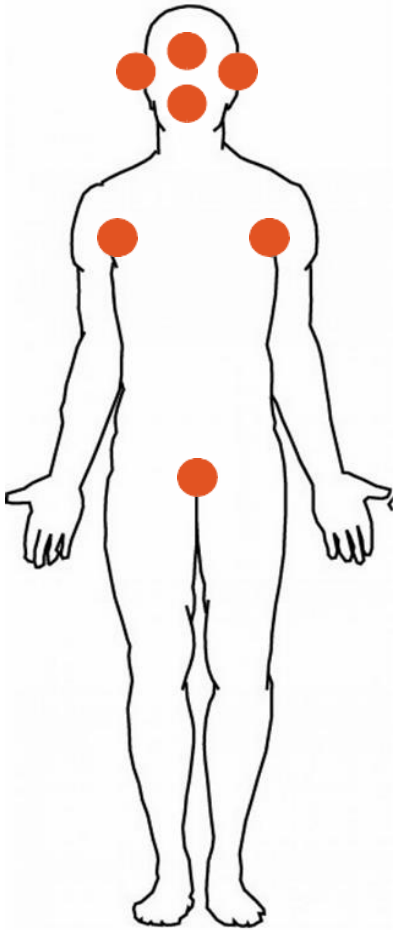
- ▶ Colonization and shedding may be persistent and/or intermittent
- ▶ Usually lasts months and may be indefinite
- ▶ Clearance testing not recommended
- ▶ No decolonization strategies
- ▶ May lead to invasive infection or transmission to others
- ▶ Those with clinical infection may remain colonized even after treatment



Colonization Screenings

- ▶ Allows for the identification patients who are asymptotically harboring a target organism
- ▶ Part of CDC's National Containment Strategy
- ▶ Indicated for MDRO outbreaks **and** when novel, resistant organisms are detected
 - Pan-resistant organisms
 - *Candida auris*
 - Bacteria that produce rare or novel carbapenemases
 - ◆ E.g., NDM, IMP, VIM, OXA-48
- ▶ Presence of colonized patients may indicate a previously unknown prevalence of the organism or ongoing transmission

Details about Screenings



- ▶ Colonization screening sites vary according to the target organism
 - CREs and CR-*Pseudomonas* – Rectum
 - *C. auris* – Axilla/groin
 - CR-*Acinetobacter* – Axilla/groin, rectum, wounds, trachs
- ▶ PCR is used to test colonization screening swabs

Limitations

- ▶ Results should not be used to inform treatment decisions
- ▶ Screenings are not used to assign attribution
- ▶ Colonization screenings require multiple rounds of testing at a set frequency (weekly or biweekly)



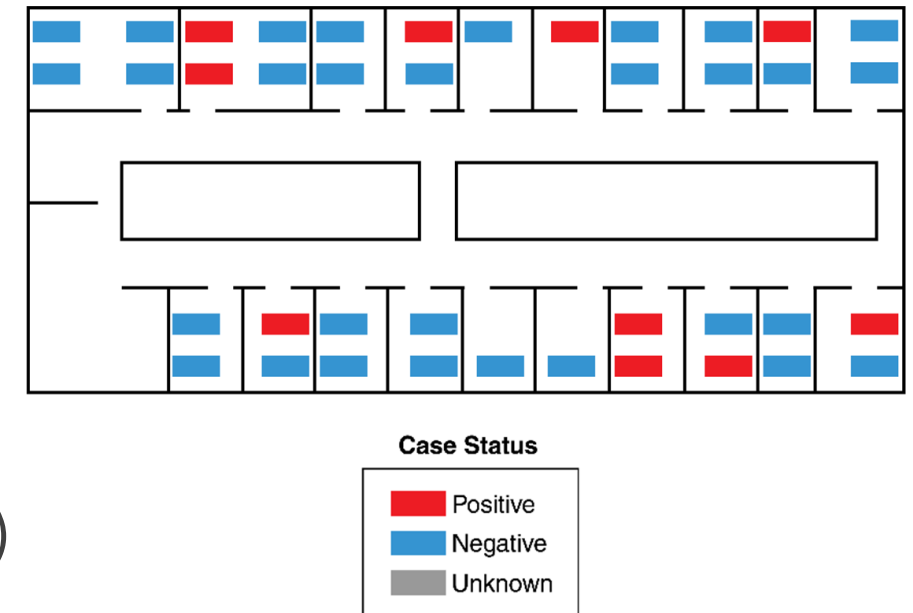
Screening Candidates

► Patients admitted in a facility or on a particular inpatient unit who are considered to be at high risk for exposure

► Risk is determined by:

- Proximity to the case
- Length of exposure
- Health status (medical devices, wounds, comorbidities)

► Not indicated for healthcare staff, family members, or contacts in outpatient settings



Screening Process

1. Identify screening candidates
2. Free testing materials will be shipped overnight to the facility by the Southeast Antibiotic Resistance Laboratory Network (ARLN)
3. The facility discusses screenings with all identified screening candidates and collects “assent”



Screening Process (cont.)

4. Swabs are collected from the screening candidates (excluding those who refuse)
5. Facility then ships swabs directly to ARLN via a paid FedEx account
6. ARLN provides a spreadsheet of the results electronically

Screening Discontinuation

- ▶ Following the first round of colonization screenings, additional screening rounds are performed for all negative persons until there are no new cases for two consecutive rounds
- ▶ If there is evidence of transmission, screenings may be expanded to additional units or facility-wide
- ▶ If the prevalence of a target organism in a facility is determined to be high, admission screenings may be recommended for other facilities who share patients

Case Studies



Case Study #1

Carbapenem-resistant *Acinetobacter*
Baumannii (CRAB)

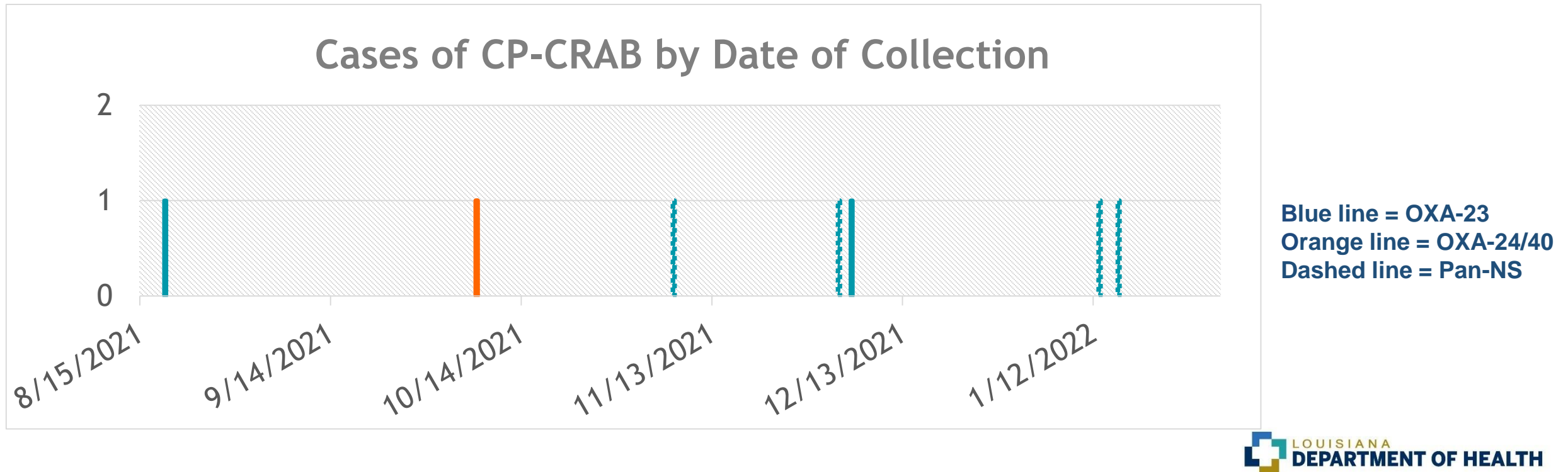
Initial Report

- ▶ In February of 2022, two alert values were received from ARLN for patients that had been hospitalized in the same acute care hospital (ACH)
 - Both were CRAB isolates that were pan-NS and OXA-23-producing
 - Both patients also had recent admissions in an onsite long-term acute care hospital (LTACH)



Case Definition and Lab Lookback

- ▶ Case = CRAB isolate collected in the ACH or LTACH that was pan-NS/pan-R and/or was positive for carbapenemase production
- ▶ A lab lookback revealed five other similar CRAB cases dating back six months



Actions Taken

- ▶ IPs at the ACH and the LTACH were notified of the alert values and the possible outbreak and preliminary infection control recommendations were shared
- ▶ Medical records were requested and basic information was collected
 - Travel history
 - Risk factors (e.g., medical device use, wounds, healthcare exposures, etc.)
 - Dates on Contact Precautions
 - Other healthcare exposure
- ▶ 100% of cases had recent admissions in the ACH and the LTACH

Actions Taken (cont.)

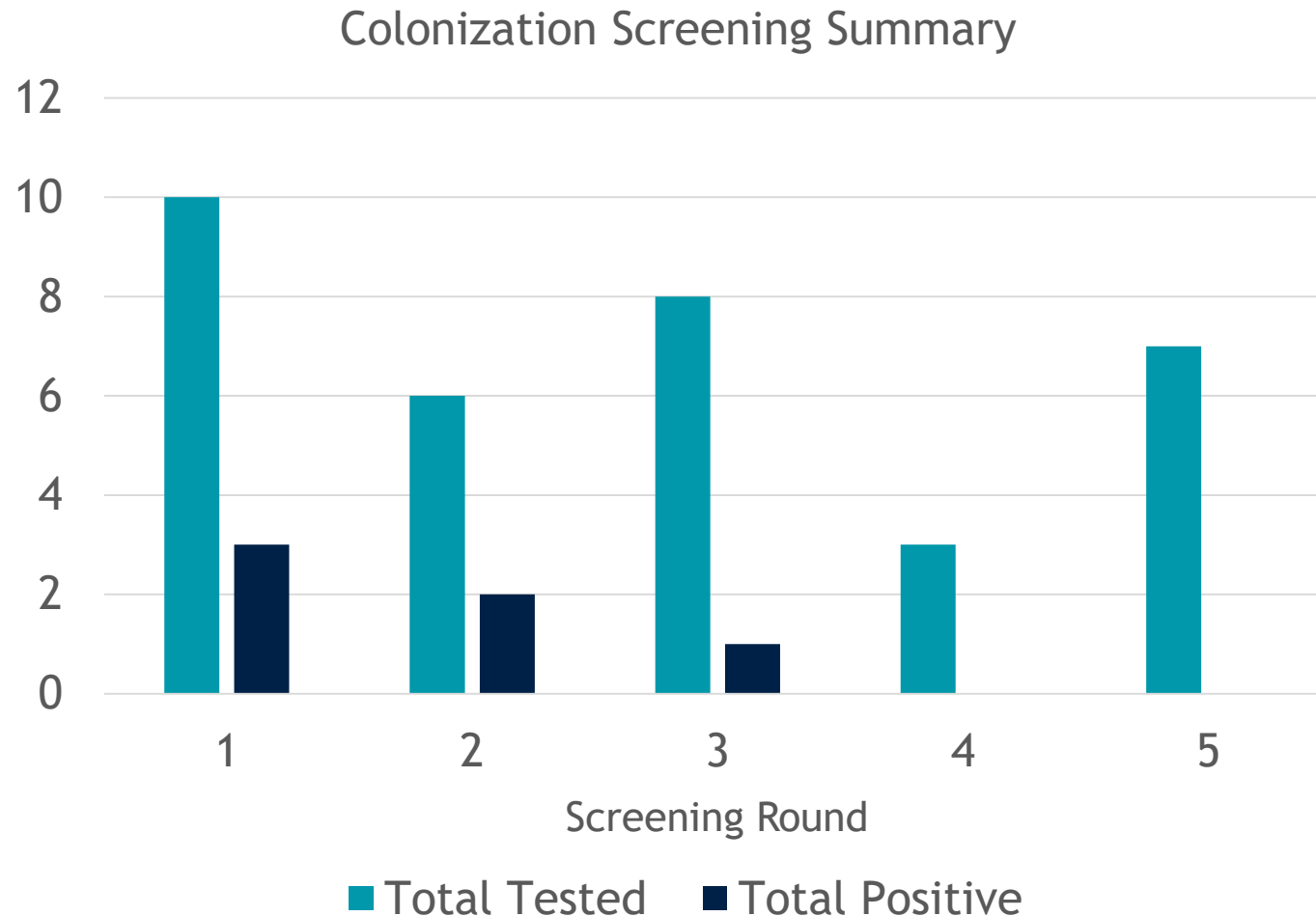
- ▶ Site visits were scheduled with both facilities to perform ICARs, discuss colonization screenings, and perform onsite rounding
- ▶ IPs looked for additional cases
 - One additional case was found for eight total cases
- ▶ An Excel spreadsheet was created to track cases and summarize patient characteristics
 - Wounds (5)
 - Recent abdominal surgeries (4)
 - Medical device use (4)



Infection Control Interventions

- ▶ Increased cleaning and disinfection of patient care areas and all high touch surfaces
- ▶ Increased auditing
 - Cleaning and disinfection
 - Wound care
- ▶ Held just-in-time staff trainings for hand hygiene, PPE use, cleaning and disinfection
- ▶ Flagged patient charts to ensure Contact Precautions remained in place

Colonization Screenings



- ▶ Screenings were recommended for the LTACH
 - Cases were too scattered across the ACH to perform systematic screening
- ▶ Five rounds of screenings were completed
 - Six colonized patients were identified

Final Impressions

► Screening challenges

- Decreased patient census during screening period
- Patients began refusing testing after initial round

► Outbreak vs underlying prevalence

- No “smoking gun” was identified
- Several colonized and infected patients tested positive on or very shortly after admit
- Per IPs, CRAB cases were not especially elevated
- True baseline rate of CRAB in Louisiana is unknown



Case Study #2

NDM-producing CRE

New Delhi Metallo-Beta Lactamase (NDM)

- ▶ NDM is a type of carbapenemase that was first detected in India in 2008¹
- ▶ Endemic in Southeast Asia
- ▶ Louisiana's first case was detected in 2018
 - A total of 7 cases have been identified to-date
 - ◆ 4 were identified in the last year
 - ◆ 3 were admitted in inpatient locations at the time of detection



¹ Zarfel G, Hoenigl M, Leitner E, et al. Emergence of New Delhi Metallo- β -Lactamase, Austria. *Emerging Infectious Diseases*. 2011;17(1):129-130. doi:10.3201/eid1701.101331.

Case #1 (2018 – *E. coli*)

- ▶ An NDM result was detected and reported by ARLN
- ▶ Conference call with the facility (Hospital A) was held the same day
- ▶ A site visit was scheduled soon after, during which:
 - An ICAR was performed
 - Colonization screenings were discussed and screening candidates were identified
 - ◆ A CDC subject matter expert shared enhanced information about screenings via phone at the facility's request

Recommendations

► Colonization screenings

- Screening candidates included 24 patients who were housed on the same unit
 - ◆ Only a handful were still admitted
 - ◆ Recommendation was made to 1) screen those who were still admitted, and 2) flag discharged patient's charts and screen if readmitted



Conclusion

- ▶ Facility ultimately elected not to perform colonization screenings
 - Cited concerns with performing additional testing on a very vulnerable patient population
- ▶ Facility agreed to closely monitor for CRE or any other NDM-producing organisms on the affected unit as well as facility-wide
- ▶ No additional cases were identified
- ▶ Organism was likely acquired through travel or close contact with colonized family member



Case #2 (2022 – *E. coli*)

- ▶ Result was detected in urine by the Louisiana Office of Public Health Lab (LA-OPHL)
- ▶ No history of travel and no real risk factors
- ▶ Patient presented to Hospital B due to altered mental status and had a lengthy and complicated hospitalization
 - Required intubation and placement on a ventilator
 - PEG tube and trach had to be placed
 - Patient developed a pressure wound

Case #3 (2022 – *K. variicola*)

► Like Case #2:

- Result was detected in urine by LA-OPHL
- No travel history and lengthy hospitalization

► The patient presented to Hospital C with encephalopathy and later developed a UTI and sepsis

- PICC line and Foley catheter were placed during admission

Recommendations for Cases #2 and 3

- ▶ A site visit was conducted at Hospital B and C and ICARs were performed
- ▶ The following recommendations were made for both cases:
 - Flag the patient's chart so that Contact Precautions may be applied if the patient returns
 - Conduct colonization screenings in the unit where the patient was housed most recently
 - Ensure that staff adhere to usual infection control practices (hand hygiene, PPE use, cleaning and disinfection, etc.)

Investigation Outcomes

- ▶ Two rounds of colonization screenings were completed by both hospitals
 - No additional cases were identified in either facility



Case Study #3

Candida auris

Candida auris: Clinical Case #1



- ▶ Louisiana's first case was detected in January 2022 in a hospitalized patient in Hospital A
 - Isolated from blood
- ▶ The patient was immunocompromised and had been admitted for treatment of several opportunistic respiratory infections
- ▶ There was no history of travel to any affected areas
 - Indicated that this was likely just the first **detected** case
- ▶ Hospital A elected to expand species-level identification for *Candida spp.* from all body sites

Clinical Case #2

- ▶ A second case was detected in a patient housed in an LTACH about a week later
- ▶ No recent travel was noted
- ▶ Case #2 had chronic wounds with a history of diabetes
 - Also found to be non-compliant with outpatient antibiotic therapy
- ▶ The patient had a previous overlapping stay with the first case in Hospital A
- ▶ Specimen was sourced from urine and was tested by Hospital A
 - Case was only detected because of the recent change in lab procedures

Clinical Case #3

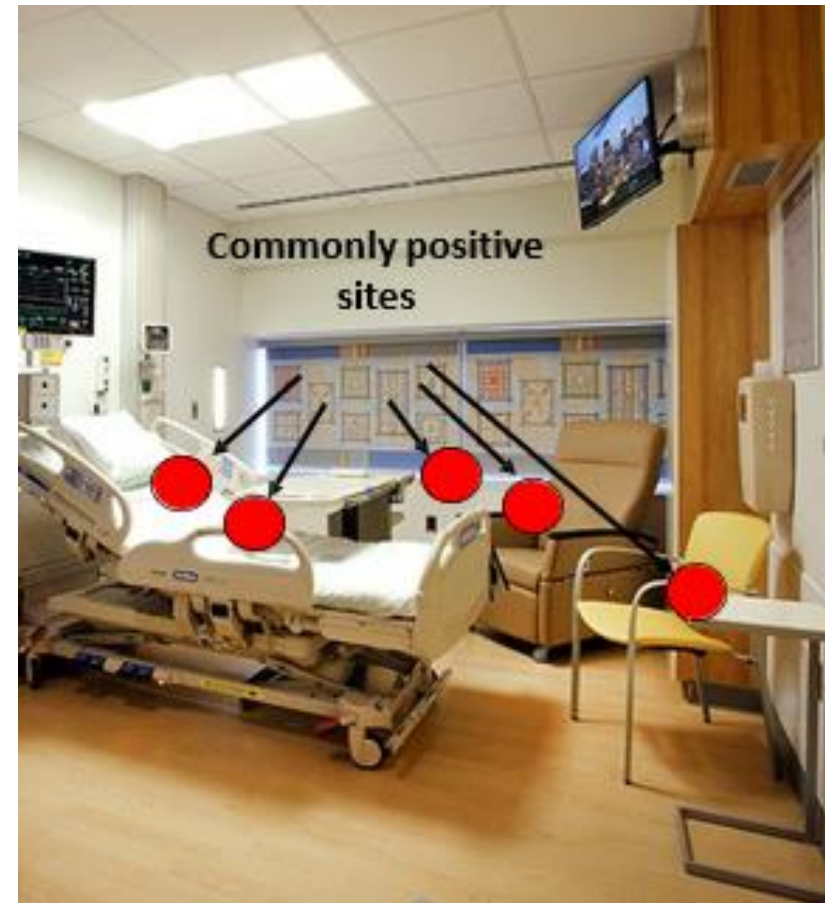
- ▶ Identified in a patient admitted in Hospital B a month after Cases 1 and 2 were detected
- ▶ The specimen source was blood
- ▶ The patient had several severe, non-healing pressure ulcers
- ▶ Medical devices used included a trach and PEG tube
- ▶ No history of travel
- ▶ The patient was a usual resident at a ventilator skilled nursing facility (vSNF) and had multiple admissions to Hospitals A and B

Public Health Response

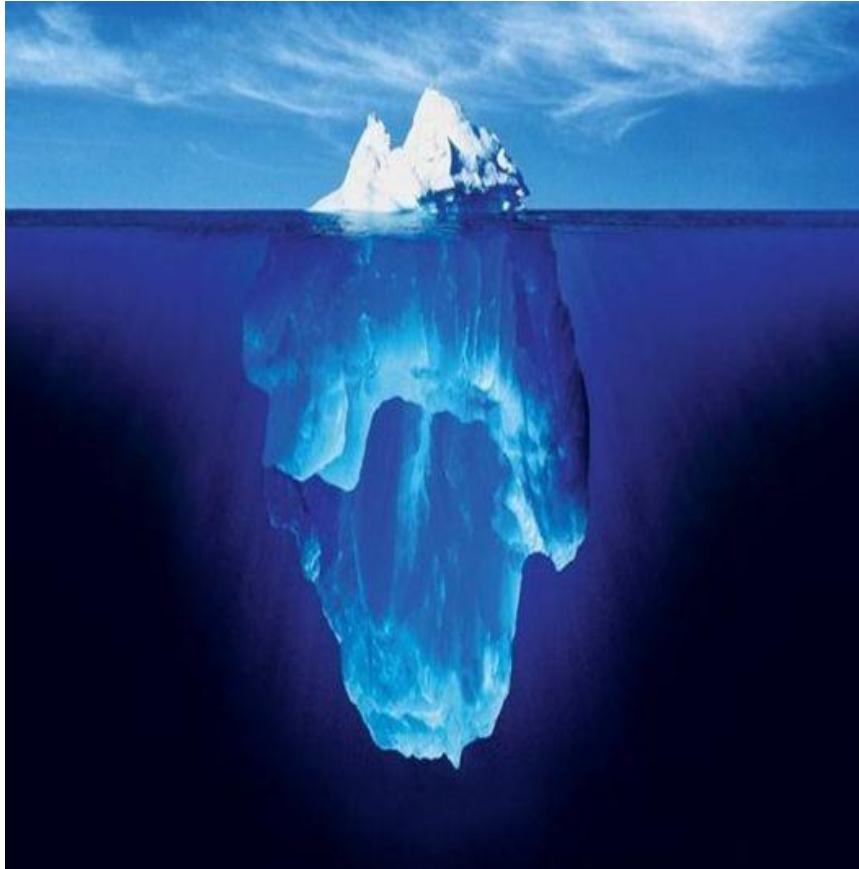
- ▶ Infection control personnel at each facility were immediately notified of positive results
- ▶ Medical records and lab results for each of the cases were requested and reviewed
- ▶ Site visits and ICARs were performed with Hospital A, Hospital B, the LTACH, and the vSNF
 - Infection control recommendations were provided
- ▶ Colonization screenings were recommended for each facility

Facility Response

- ▶ All facilities ramped up cleaning and disinfection practices
- ▶ In-services were provided to staff
- ▶ Contact Precautions for each clinical case were strictly applied
 - Dedicated medical equipment
 - Limited number of staff allowed in patients' rooms
- ▶ Increased auditing of hand hygiene, PPE, and cleaning and disinfection
- ▶ Each facility performed colonization screenings



Colonization Screening



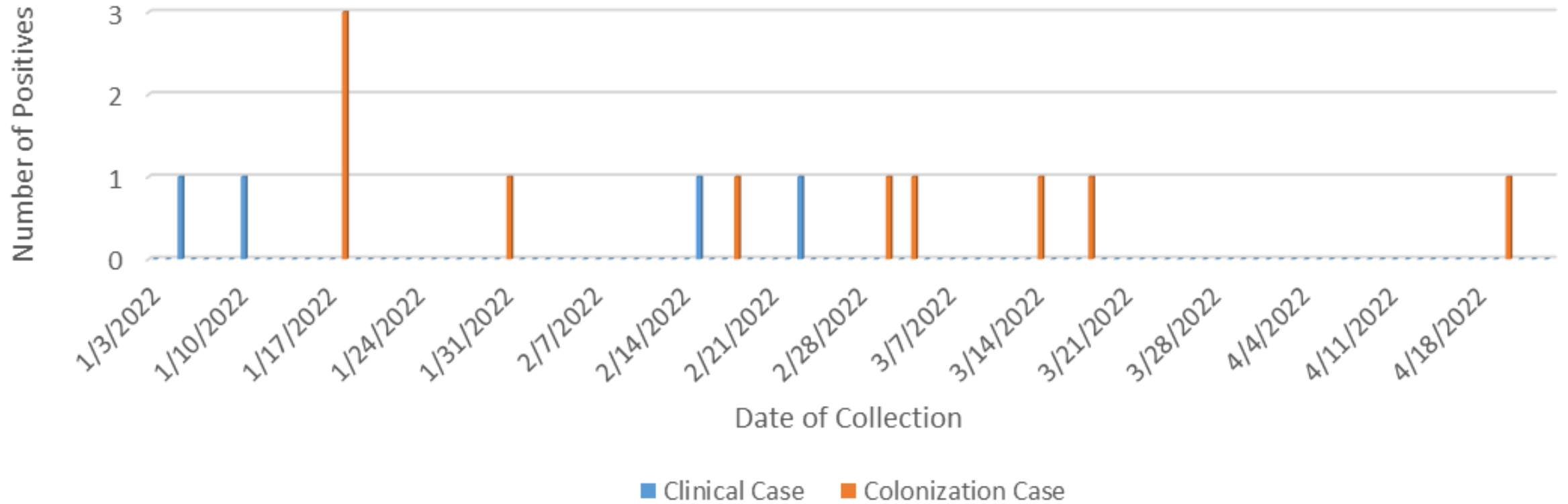
- ▶ All four facilities have completed colonization screenings
- ▶ 10 colonization cases were detected across multiple facilities
- ▶ Facilities with more than one case cohorted positive patients

Clinical Case #4

- ▶ A previously colonized patient in Hospital A subsequently developed an infection
- ▶ *C. auris* was detected in a wound



C. auris Case Timeline



Lessons Learned



Lessons Learned

- ▶ Rapid identification of outbreaks and quick coordination with Public Health
 - Important for limiting transmission
- ▶ Transparency with patients
 - When indicated, patient notifications often increase the public's trust in a healthcare facility
- ▶ Cleaning and disinfection
 - Thorough attention to cleaning and disinfection is needed to interrupt transmission of organisms that are spread through contact



Lessons Learned

- ▶ Clear communication around colonization screenings
 - Purpose of screenings
 - How to use the information

- ▶ Training for screening staff
 - High refusal rates during colonization screenings may be due to staff's approach

Lessons Learned

► Inter-facility communication

- Open and regular communication between facilities who share patients will prevent unnecessary exposure

► Assess travel history on admit

- Needed when rare MDROs are detected to understand where exposure likely occurred



Lessons Learned



► Auditing

- Our observations indicate that compliance to hand hygiene and proper PPE donning procedures is poorer when staff are in groups
- Staff have better adherence when they know they are being watched
 - ◆ Secret shoppers should be considered

Summary

- ▶ Effective outbreak response requires a coordinated, multidisciplinary approach
- ▶ Public Health will work with facilities to provide outbreak control recommendations based on:
 - Best practices
 - Experience and lessons learned from previous outbreaks
 - CDC guidance
- ▶ Colonization screenings are used to guide infection control interventions and inform local epidemiology

References

- ▶ Louisiana reportable disease requirements
<https://ldh.la.gov/page/1013>
- ▶ Contact information for Regional Surveillance Epidemiologists
<https://ldh.la.gov/page/1045>
- ▶ Antimicrobial Products Registered with EPA for Claims Against Common Pathogens
<https://www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants#pathogens>
- ▶ Lesson 6: Investigating an Outbreak. Principles of Epidemiology in Public Health Practice, Third Edition
An Introduction to Applied Epidemiology and Biostatistics
<https://www.cdc.gov/csels/dsepd/ss1978/lesson6/section2.html>
- ▶ Infection Control Assessment and Response
<https://www.cdc.gov/hai/prevent/infection-control-assessment-tools.html>
- ▶ Interim Guidance for a Public Health Response to Contain Novel or Targeted MDROs
<https://www.cdc.gov/hai/containment/index.html>
- ▶ AR Laboratory Network
<https://www.cdc.gov/drugresistance/ar-lab-networks/domestic.html>
- ▶ Zarfel G, Hoenigl M, Leitner E, et al. Emergence of New Delhi Metallo- β -Lactamase, Austria. *Emerging Infectious Diseases*. 2011;17(1):129-130. doi:10.3201/eid1701.101331.
https://wwwnc.cdc.gov/eid/article/17/1/10-1331_article
- ▶ Transmission-Based Precautions
<https://www.cdc.gov/infectioncontrol/basics/transmission-based-precautions.html>
- ▶ 2019 Antibiotic Resistant Threats Report
<https://www.cdc.gov/drugresistance/biggest-threats.html>

Thank you

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