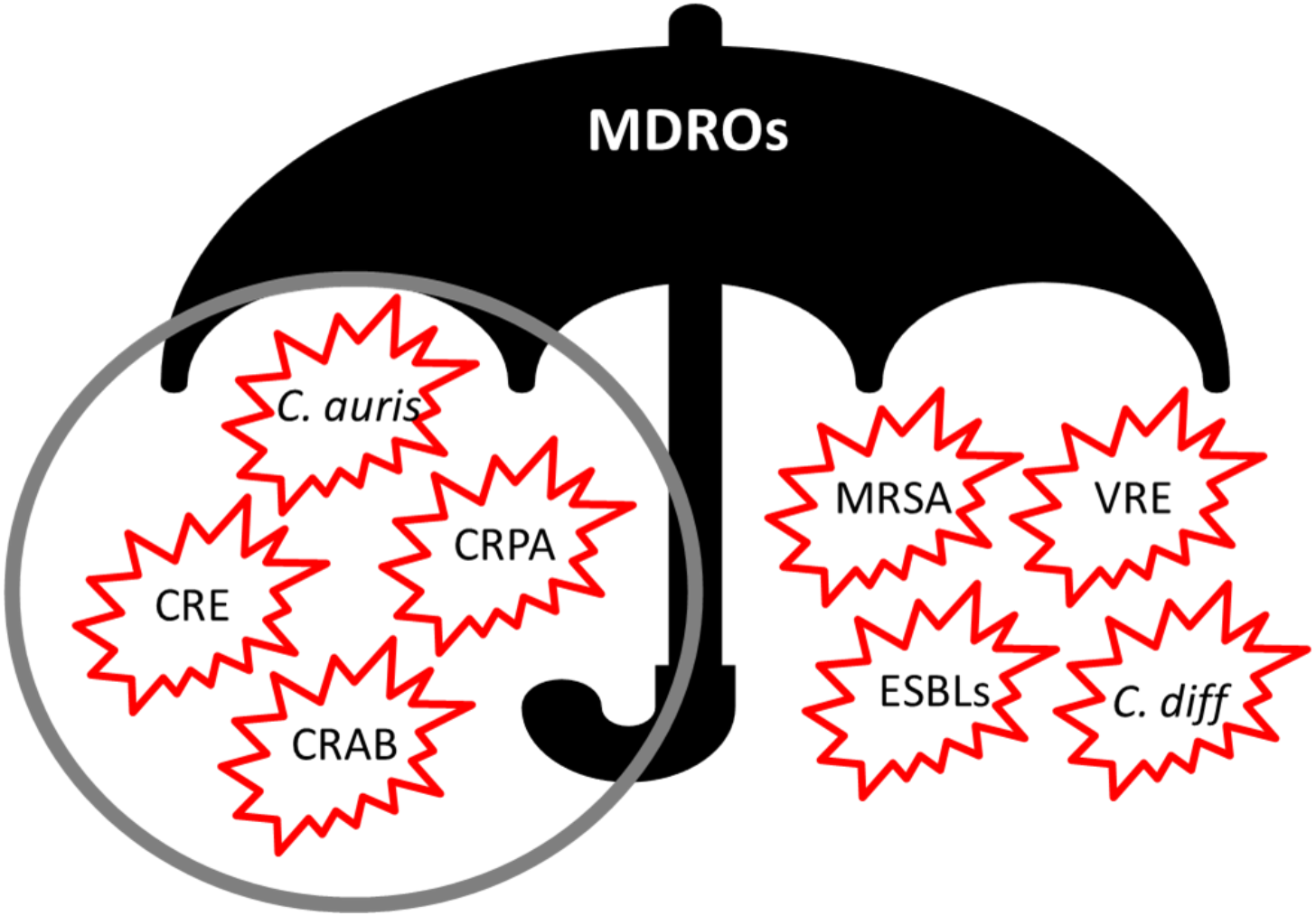
Multidrug Resistant Organisms in Michigan

Sara McNamara, MPH, MT(ASCP), CIC

Surveillance for Healthcare-Associated and Resistant Pathogens Unit

Michigan Department of Health and Human Services

Multidrug-Resistant Organisms

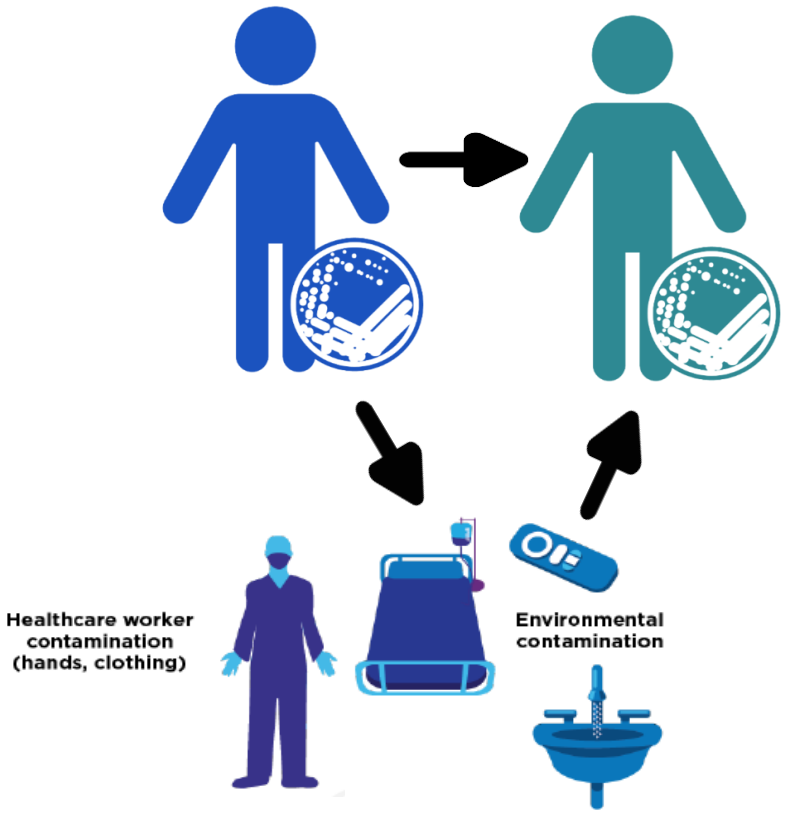


Targeted Multidrug-Resistant Organisms

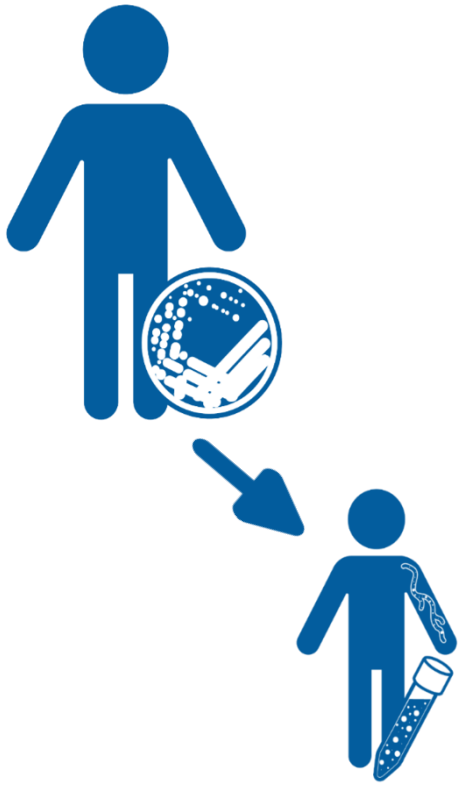
What do they have in common?

- Opportunistic pathogens that can **colonize** multiple mucosal and/or skin surfaces
- Cause a **variety of infections**, most commonly urinary tract, wound, and bloodstream infections, and pneumonia
- In **healthcare settings**, transmitted via **direct and indirect contact** with infected or colonized individuals or **contaminated healthcare environment**
- Are **emerging in prevalence** in the region

Colonization Drives Spread and Precedes Infection



Shedding of MDROs from colonized individuals leads to contamination of HCP hands and clothing and the surrounding healthcare environment

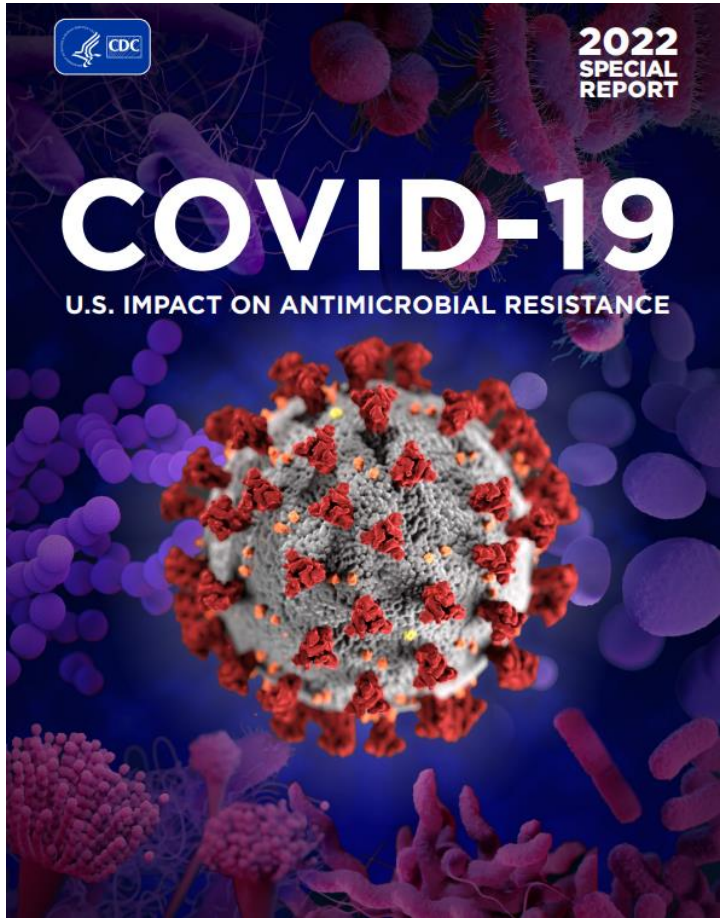


Colonization confers a 2-10 fold higher risk of infection with the colonizing organism than an individual without colonization

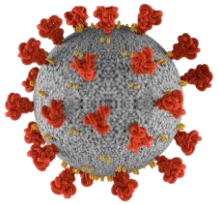
For every individual identified with an MDRO infection, there are some multiplier more who are colonized

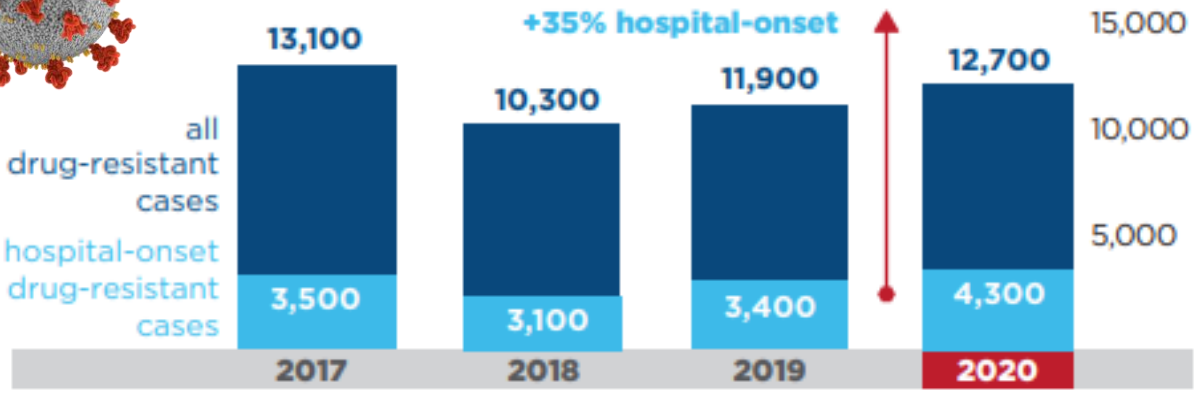
COVID-19 Impact on Antimicrobial Resistance

- Resistant hospital-onset infections and deaths both increased at least 15% during the first year of the pandemic
- More than 29,400 people died from AR infections
  - Nearly 40% of the people got the infection while they were in the hospital
- Gaps in surveillance data and isolate submission



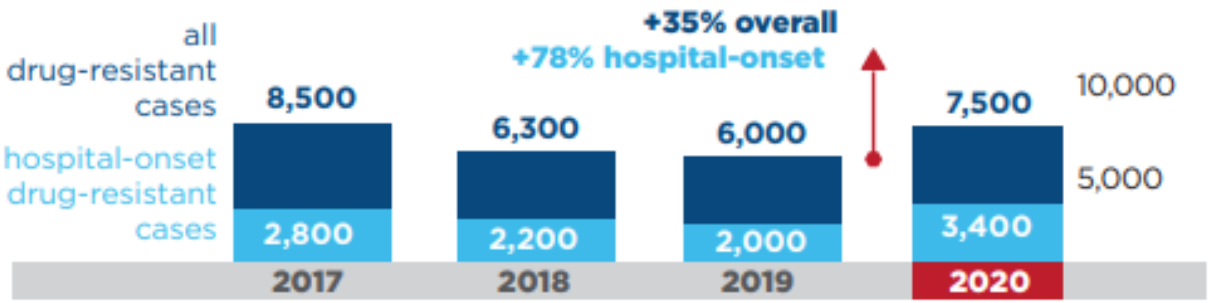
https://www.cdc.gov/drugresistance/pdf/covid19-impact-report-508.pdf





Data from 2018–2020 are preliminary.

Carbapenem-resistant Enterobacterales



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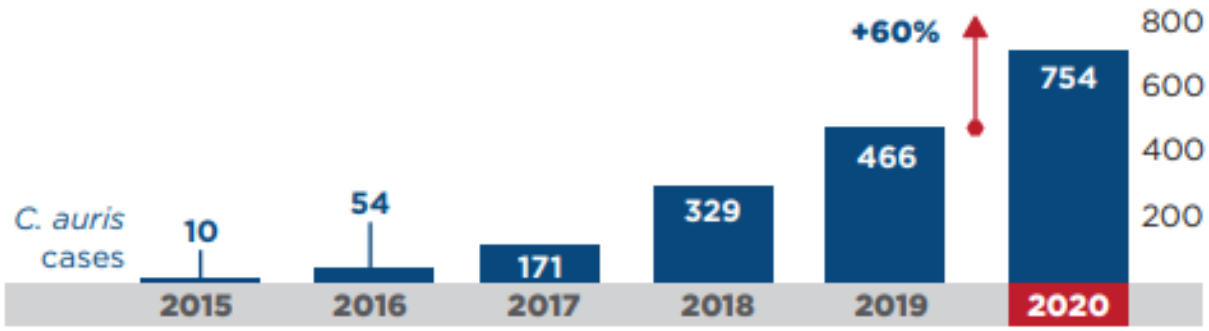
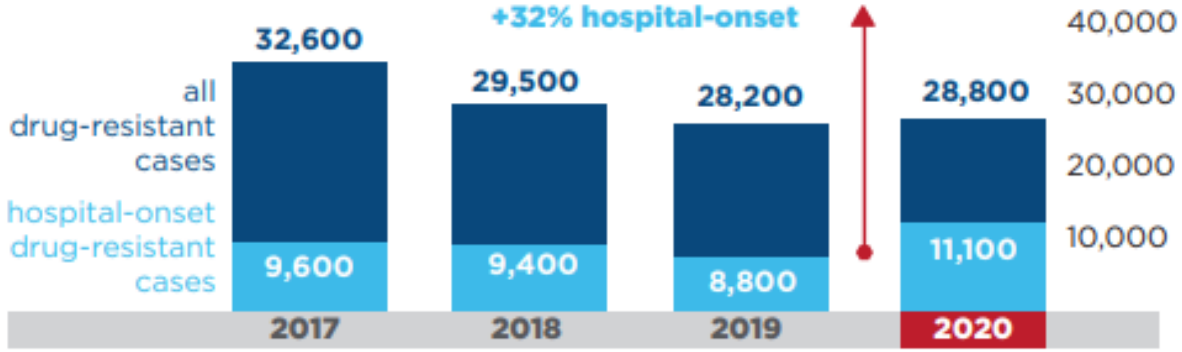
Carbapenem-resistant *Acinetobacter*



Candida auris

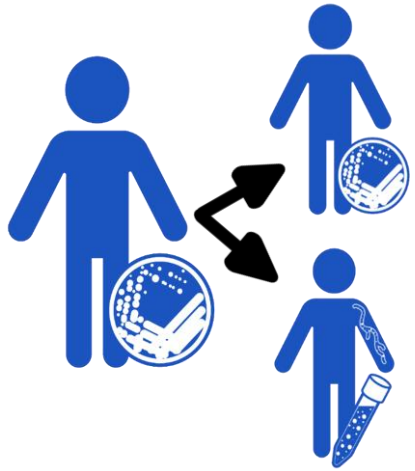


Data from 2018–2020 are preliminary.

Multidrug-resistant *Pseudomonas aeruginosa*

https://www.cdc.gov/drugresistance/pdf/covid19-impact-report-508.pdf

Candida auris is a Public Health Concern

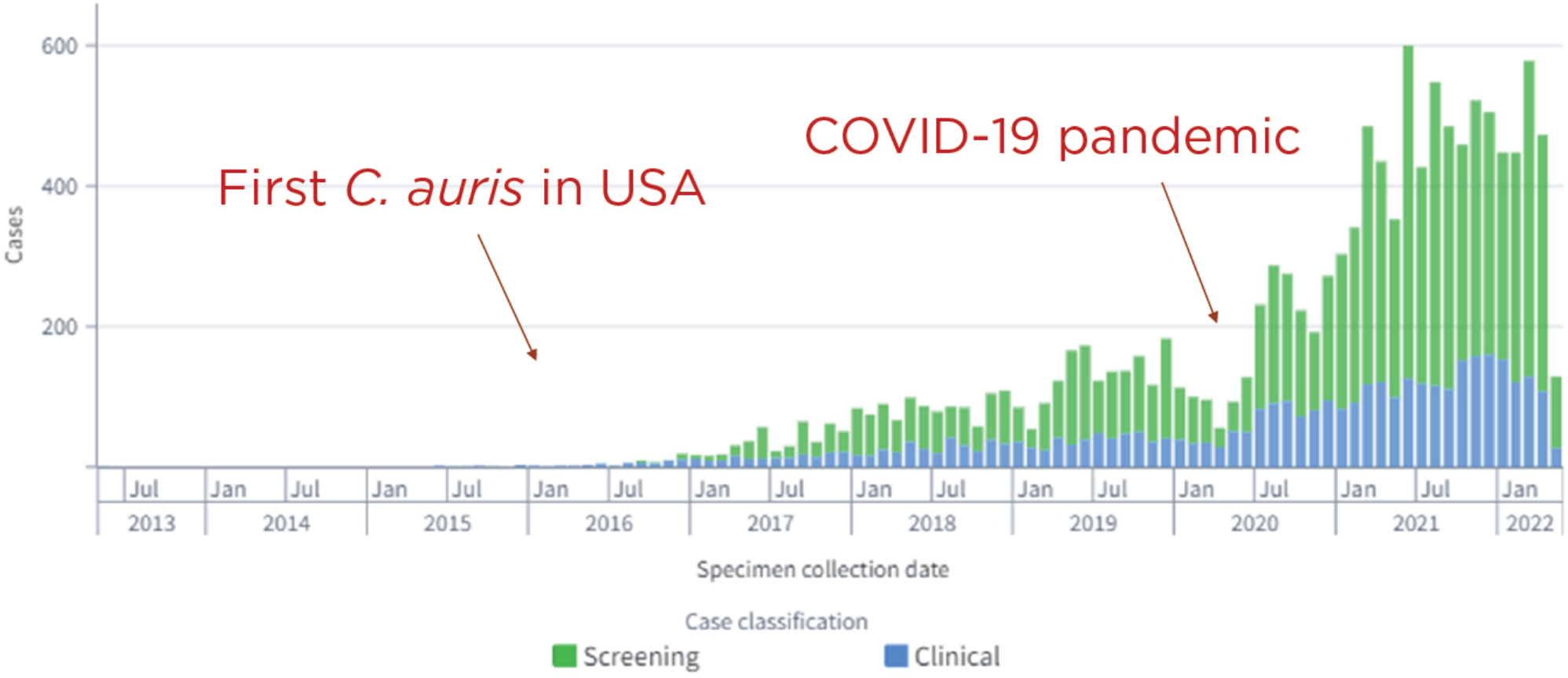


Colonization amplifies the problem
5-10% develop invasive infections
~45% mortality within 30 days of invasive infection

Spreads in healthcare settings
Some facilities can develop >70% colonization prevalence
Outbreaks can be difficult to control

Only 3 classes of antifungals
>80% resistant to 1
>25% resistant to 2
>30 isolates pan-resistant

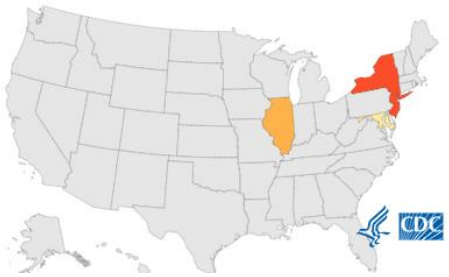
Candida auris Transmission is Increasing



60% increase in *Candida auris* infections in 2020 alone

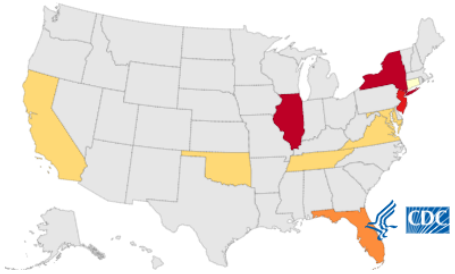
Candida auris Transmission is Increasing

Reported clinical cases of *Candida auris*, 2013-2016

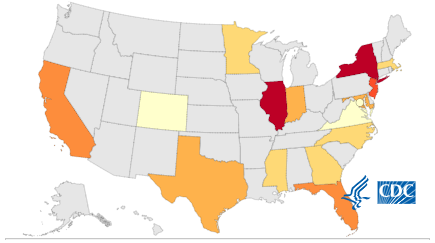


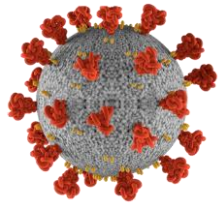
Reported clinical cases of *Candida auris*, 2017

Reported clinical cases of *Candida auris*, 2018

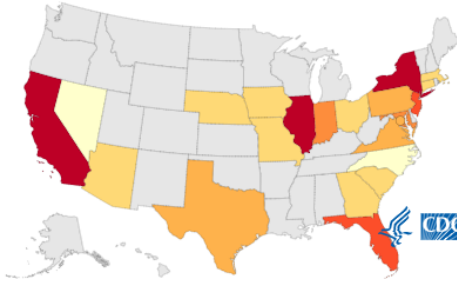


Reported clinical cases of *Candida auris*, 2019



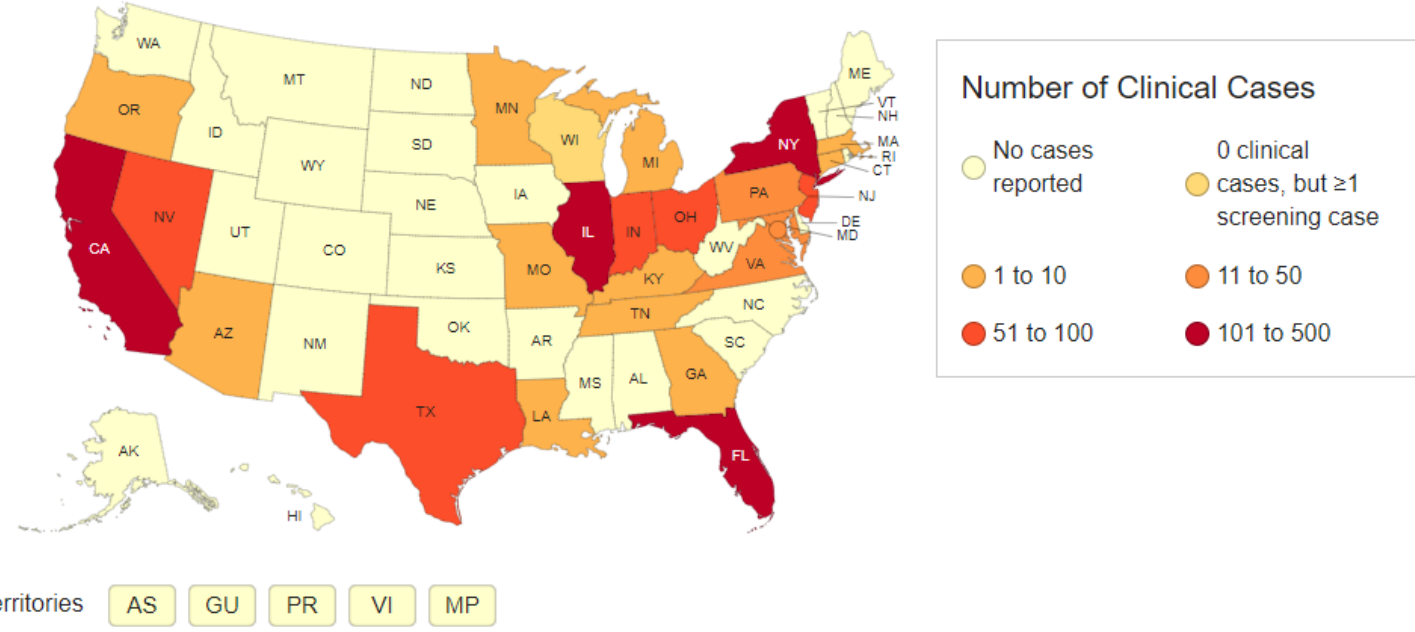


Reported clinical cases of *Candida auris*, 2020



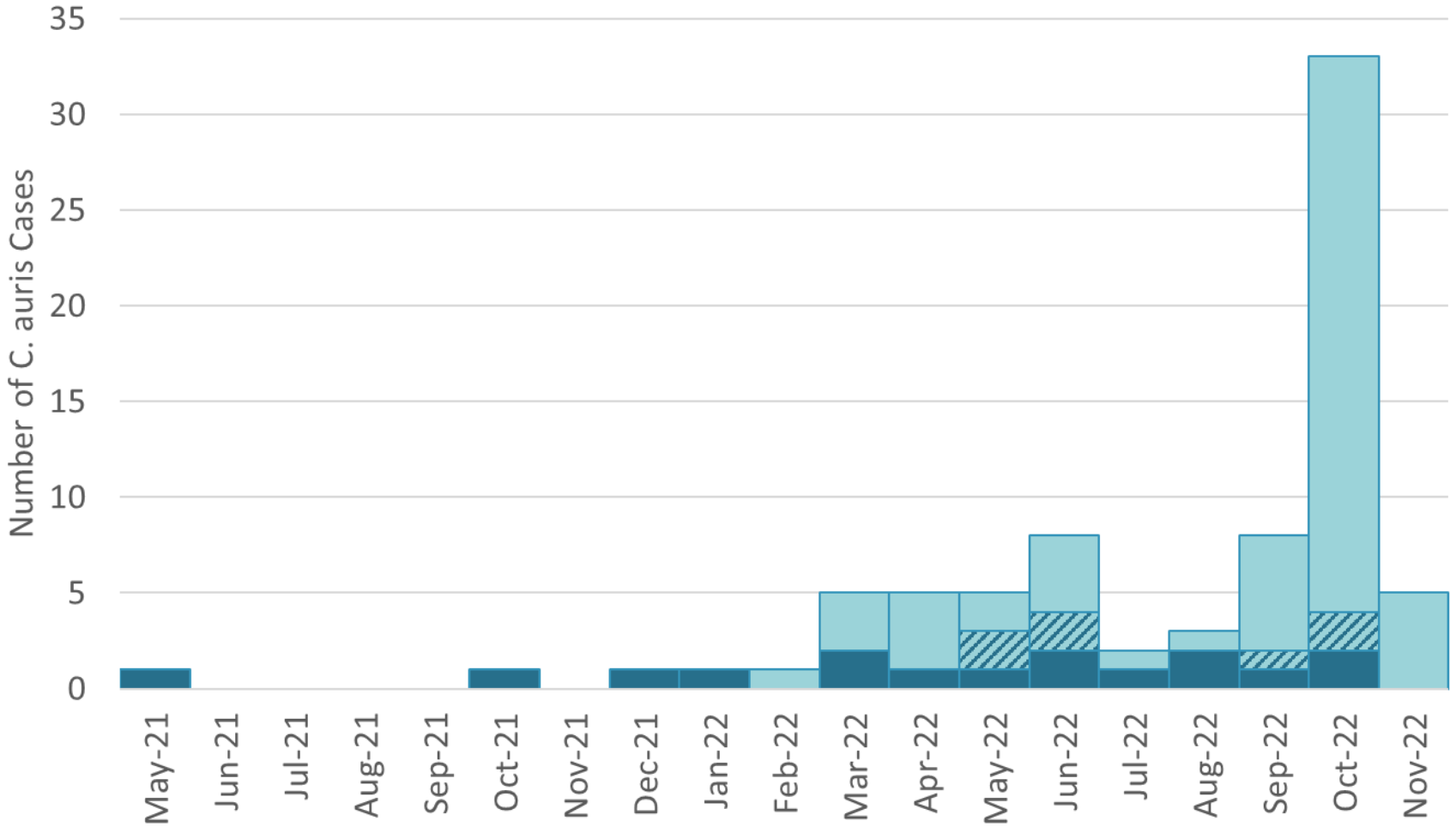
Reported clinical cases of *Candida auris*, 2021

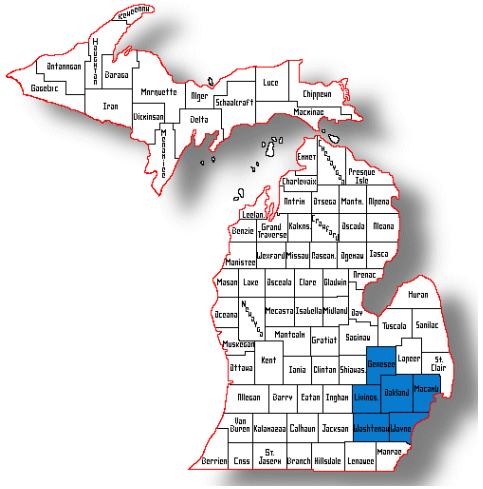
Reported clinical cases of *Candida auris*, June 1, 2021-May 31, 2022



https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html

Candida auris Cases in Michigan





79 Cases Detected in 72 Patients:

- 16 patients by clinical cultures
- 7 patients initially identified on colonization screening subsequently had positive clinical cultures
- 56 patients by colonization screening only

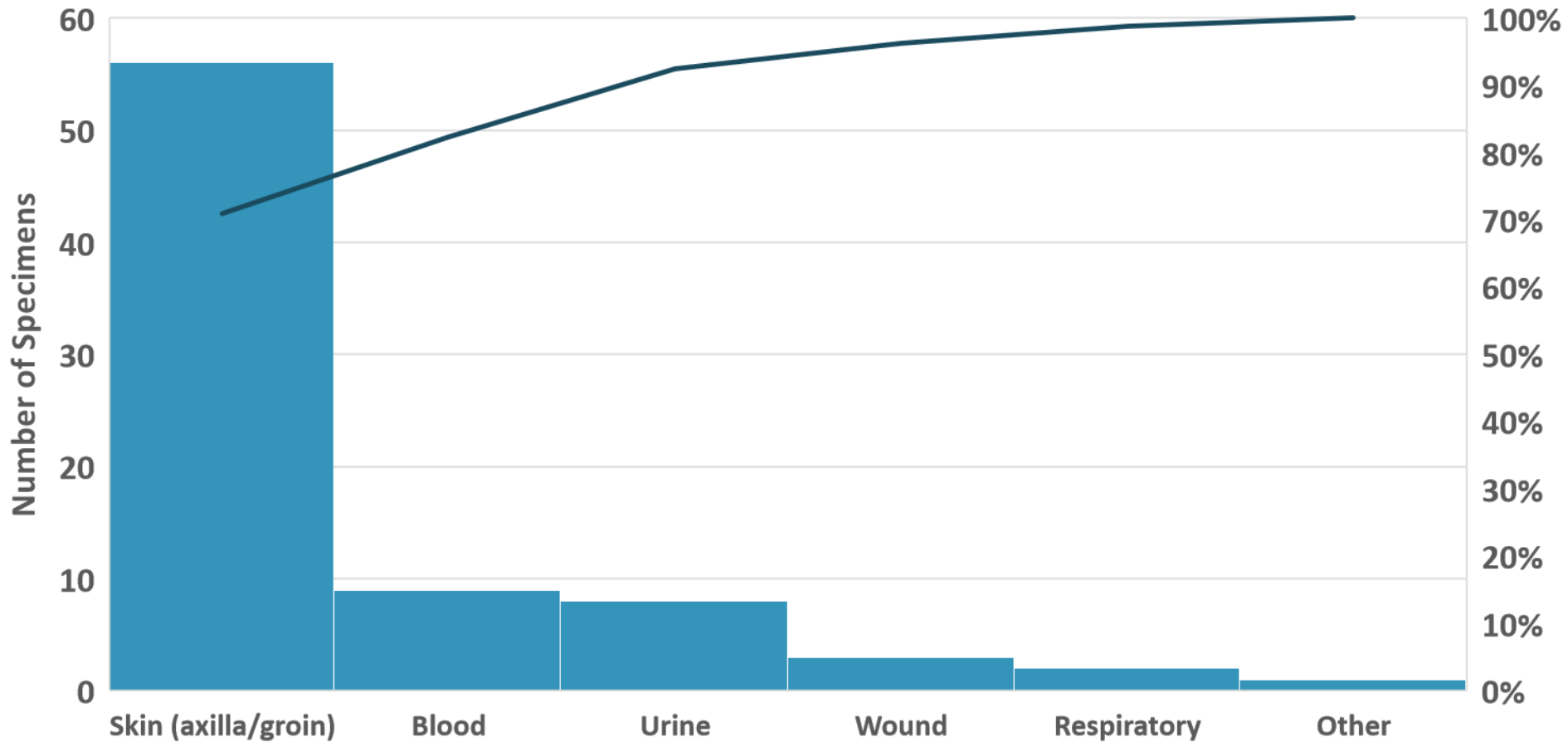
Screening

Screening to Clinical

Clinical

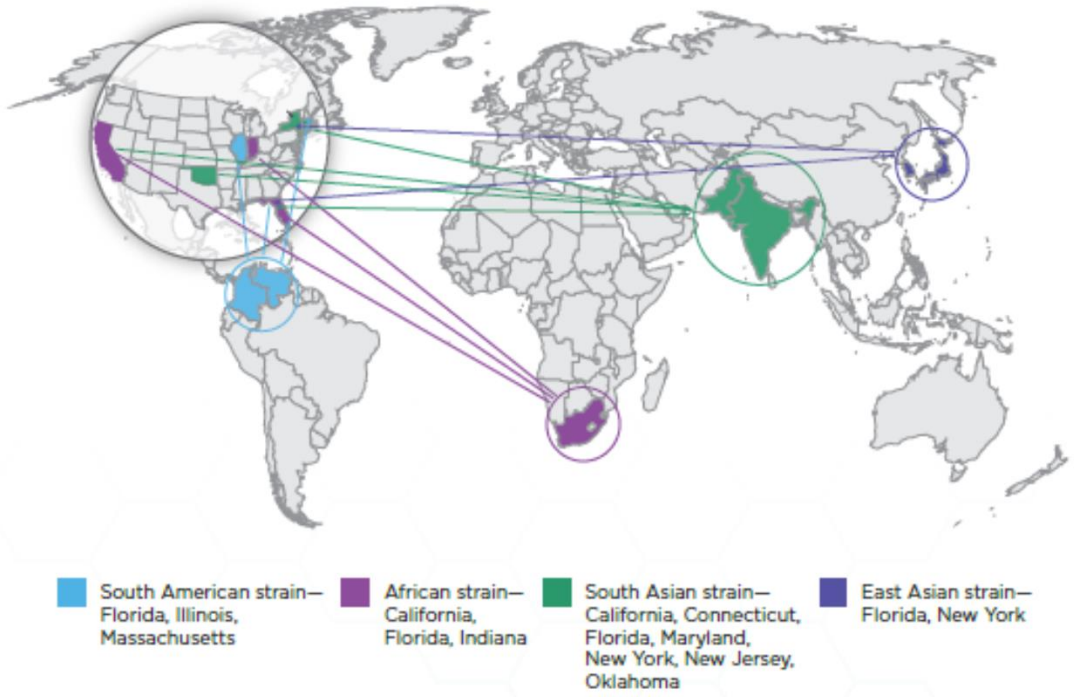
Preliminary data available 11-15-22

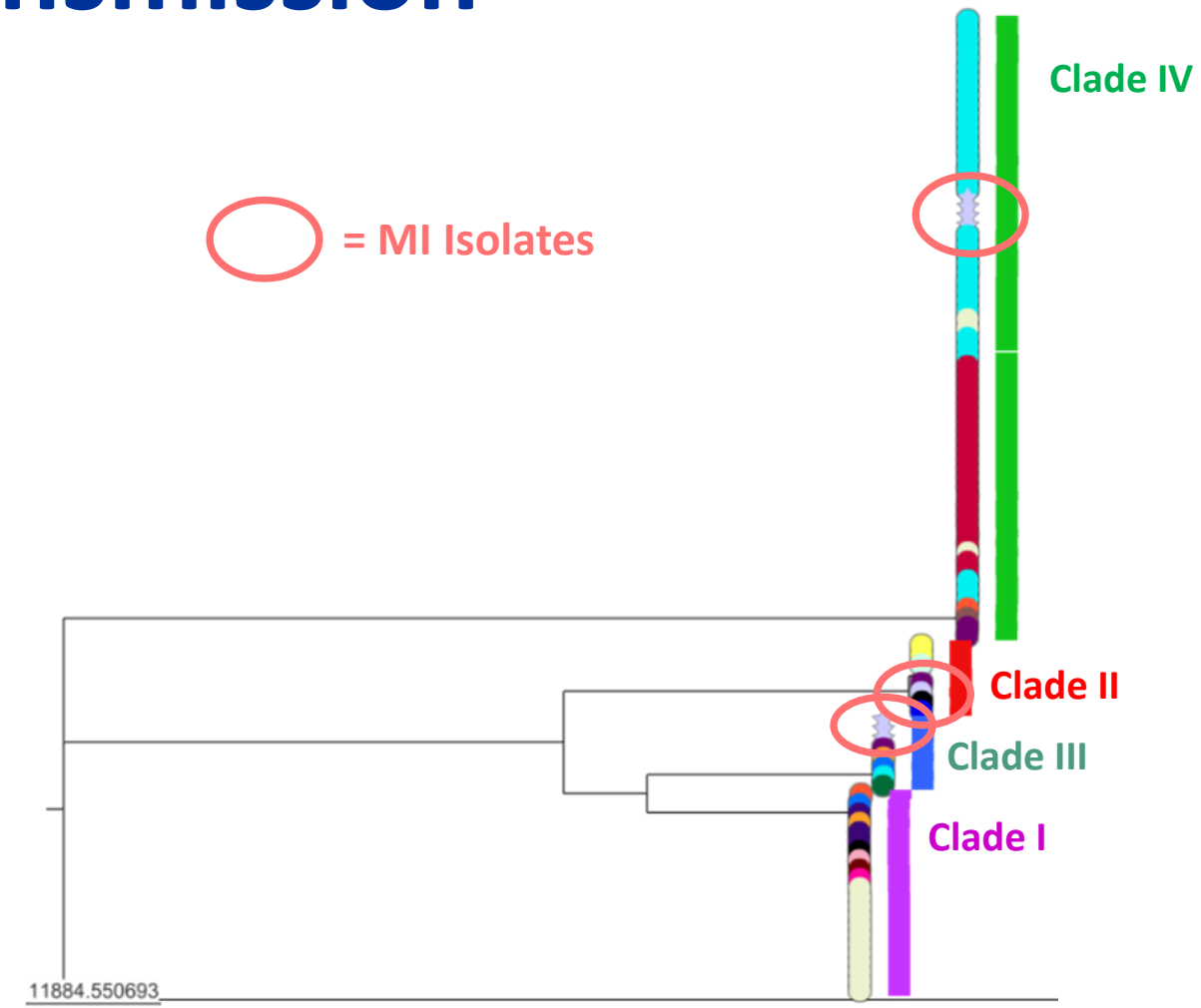
Specimen Source of MI *Candida auris* Isolates



Preliminary data available 11-15-22

Multiple Introductions of *C. auris* Followed by Local Transmission





https://www.cdc.gov/drugresistance/pdf/threats-report/candida-auris-508.pdf

Risk Factors for *Candida auris* in MI Cases

Older age

Median 59 yrs (range 18->89)

Indwelling devices

Recent Mechanical Ventilation (73%)

Tracheostomy (64%)

PEG tube (64%)

CVC/PICC (44%)

Urinary Cath (41%)

Wounds

Chronic non-healing or surgical (67%)

Antifungals and antibiotics

Hx MDROs (48%)

Comorbid conditions

Chronic Lung Disease

Diabetes

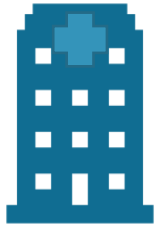
Renal Disease

Cardiovascular Disease

Cancer

Preliminary data available 11-15-22

Multiple Healthcare Exposures are Common



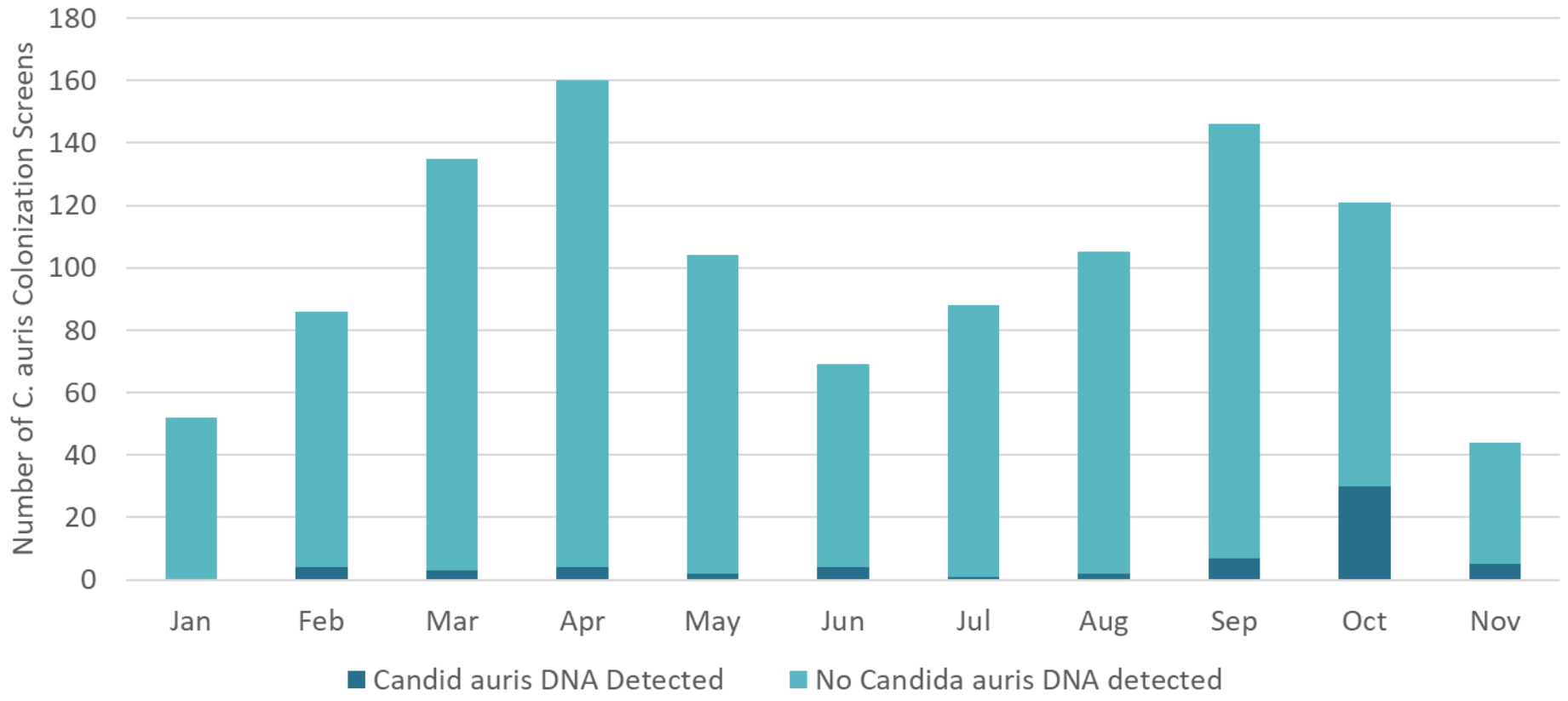

Healthcare Setting	Acute Care Hospital	Long-term Acute Care Hospital	Skilled Nursing Facility w/Ventilator Care	Skilled Nursing Facility
At Time of Detection	38%	58%	3%	-
Exposures in Last 90 Days	99%	66%	20%	20%

Preliminary data available 11-15-22

Antifungal Resistance is Common in *C. auris*

Antifungal Class	US Isolates	MI Isolates N=21
 Azoles	88%	95%
 Polyenes	34%	0%
 Echinocandins (First Line)	3%	19%
Resistant to 2	>25%	19%
Pan-resistant	>30 isolates	0 isolates

Colonization Screening Conducted as Part of Public Health Follow-up



Candida auris Outbreaks Detected

Acute Care Hospitals

Medical ICU

3 patients

Med/Surg ICUs

4 patients

2 patients

Medical ICU

3 patients*

2 patients

Long-term Acute Care Hospitals

LTAC

12 patients

LTAC

33 patients

Skilled Nursing Facility w/Ventilator Care

Ventilator Unit

2 patients

New Admit/COVID-19 PUI Unit

2 patients

Skilled Nursing Facility

New Admit/COVID-19 PUI Unit

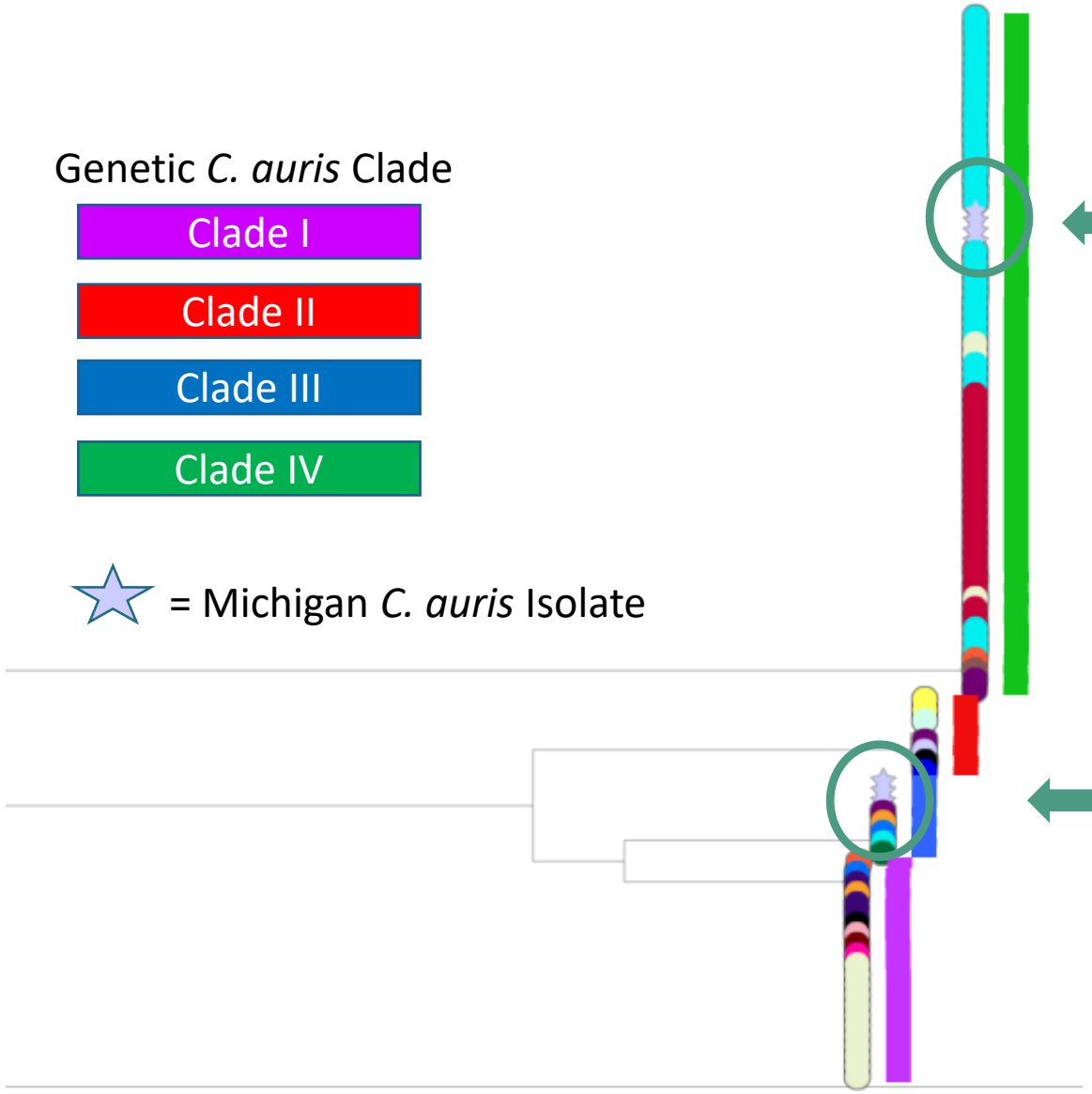
2 patients

Whole Genome Sequencing Detected At Least 2 Separate *C. auris* Introductions into HCF A

Genetic *C. auris* Clade

- Clade I
- Clade II
- Clade III
- Clade IV

= Michigan *C. auris* Isolate



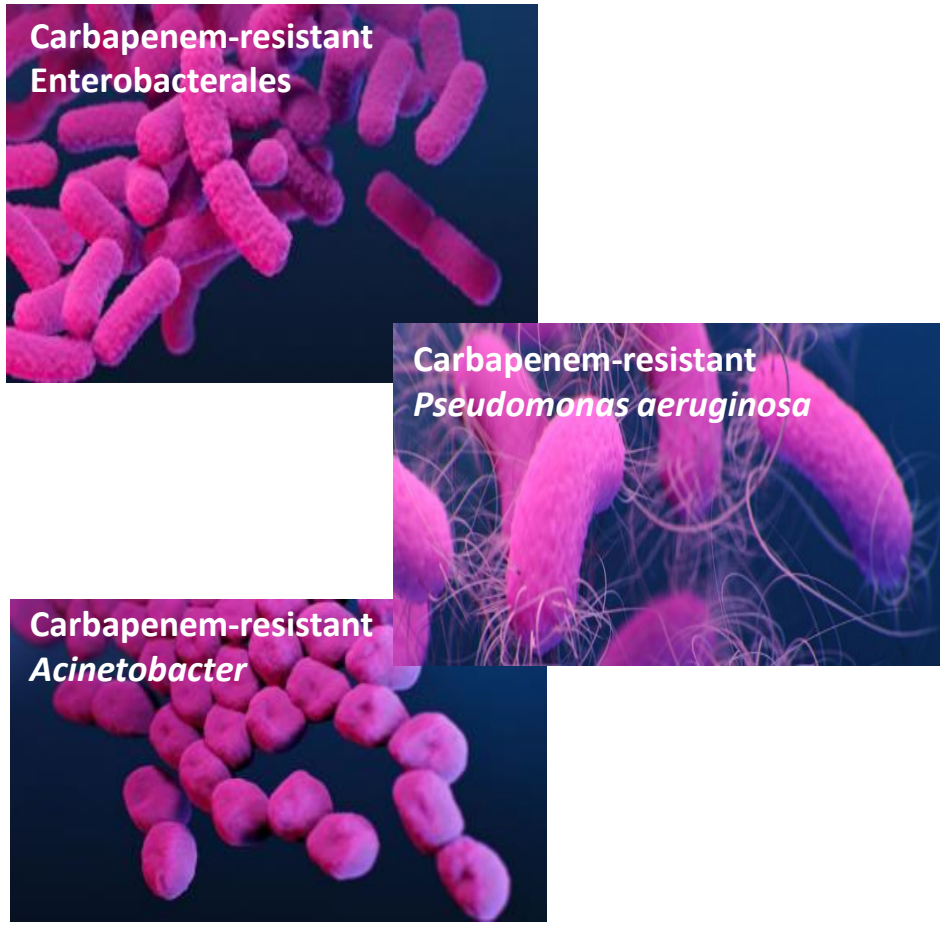
First isolate detected at HCF A in urine culture

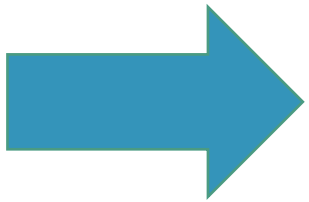
Azole-R, Echinocandin-S

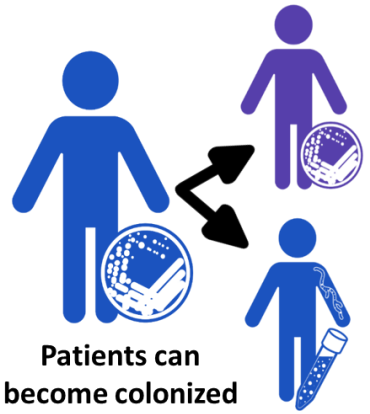
3 isolates detected at HCF A on 1st PPS 3 weeks later in axilla/groin swabs

Azole-R, Echinocandin-R

Carbapenemase-Producing Organisms are a Public Health Concern







Patients can become colonized and develop invasive infections

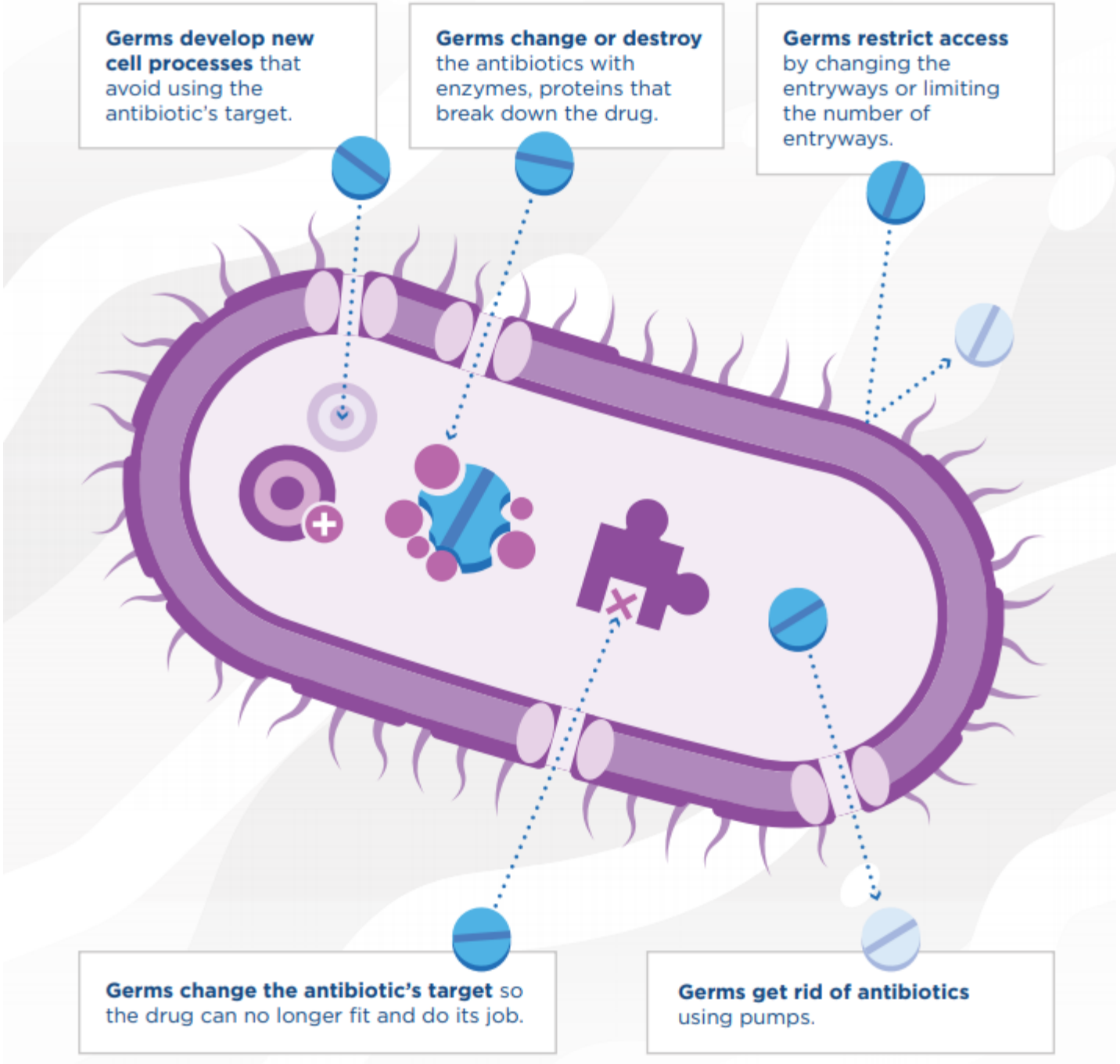
Spreads in healthcare settings

Highly drug-resistant

Mechanisms of Carbapenem Resistance

- Altered targets
- Avoidance of targets
- Porin loss
- Efflux pumps
- Enzymes

→ **Carbapenemases**



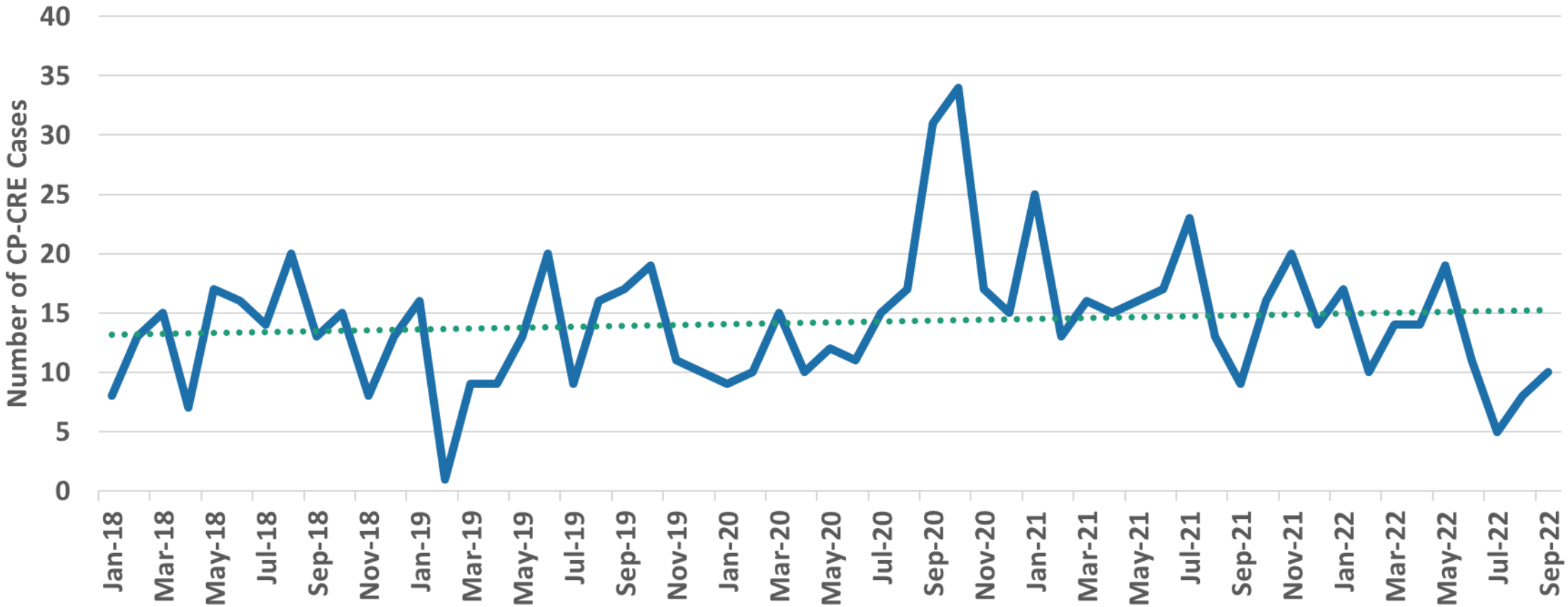
Carbapenemases Vary by Organism

25-30% are CP	<5% are CP	>90% are CP

KPC, NDM, OXA-48-like, IMP, VIM

OXA-23, -24/40, 58, -235-like

Confirmed CP-CRE Cases Reported to MDSS
2018 - 2022Q3*



Preliminary – Data Subject to Change

Confirmed CP-CRE Cases Reported to MDSS
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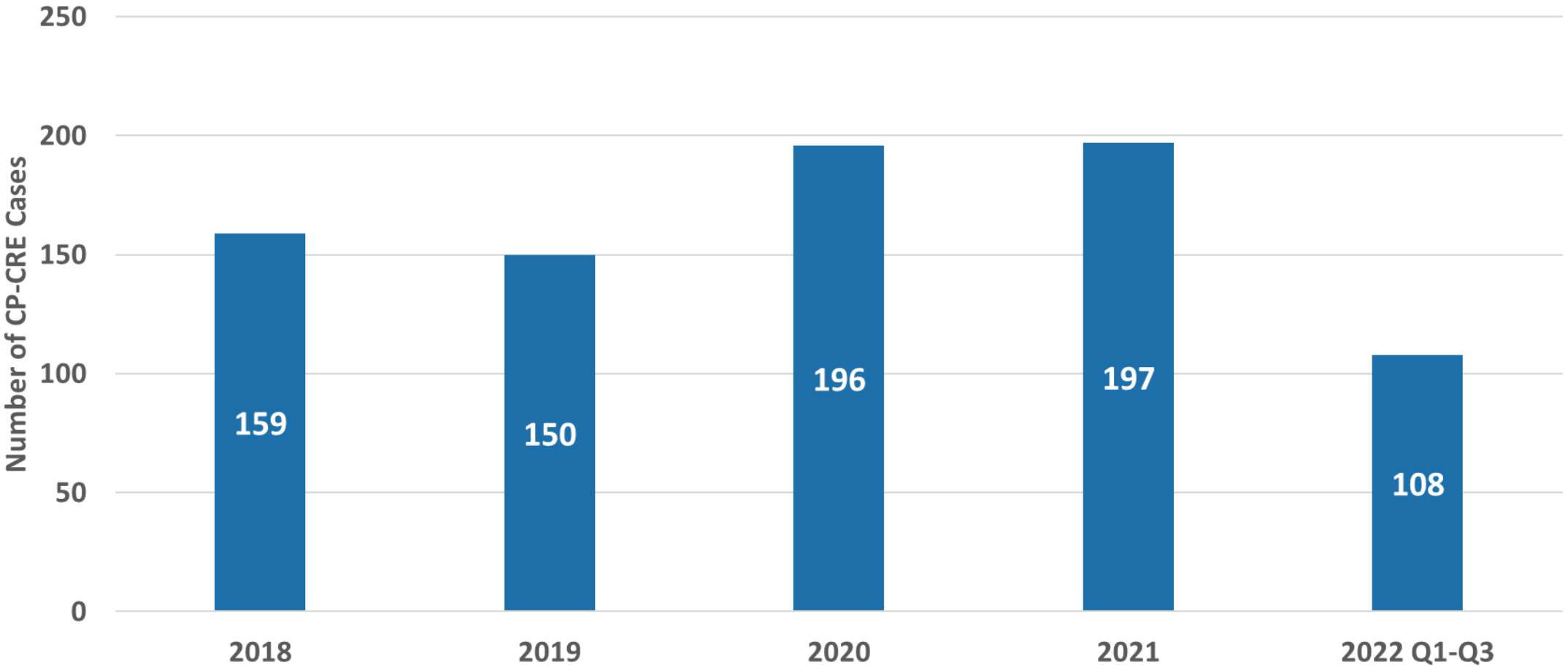

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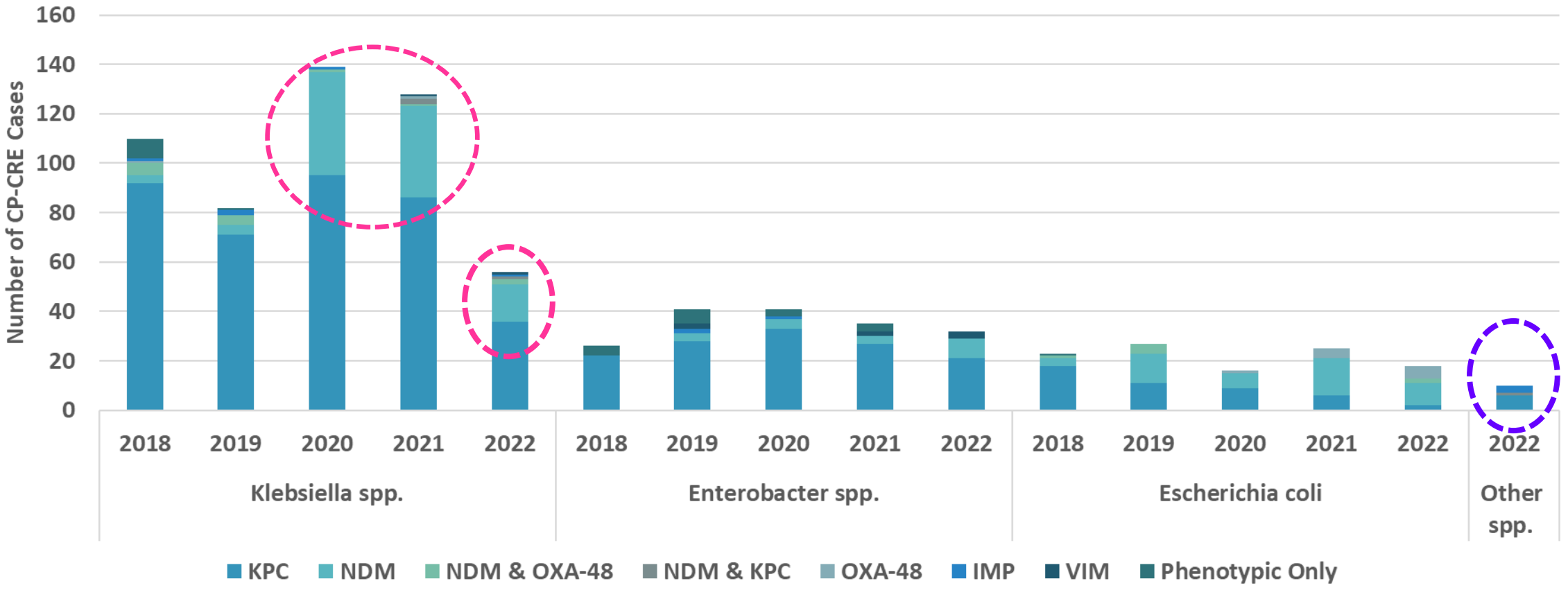
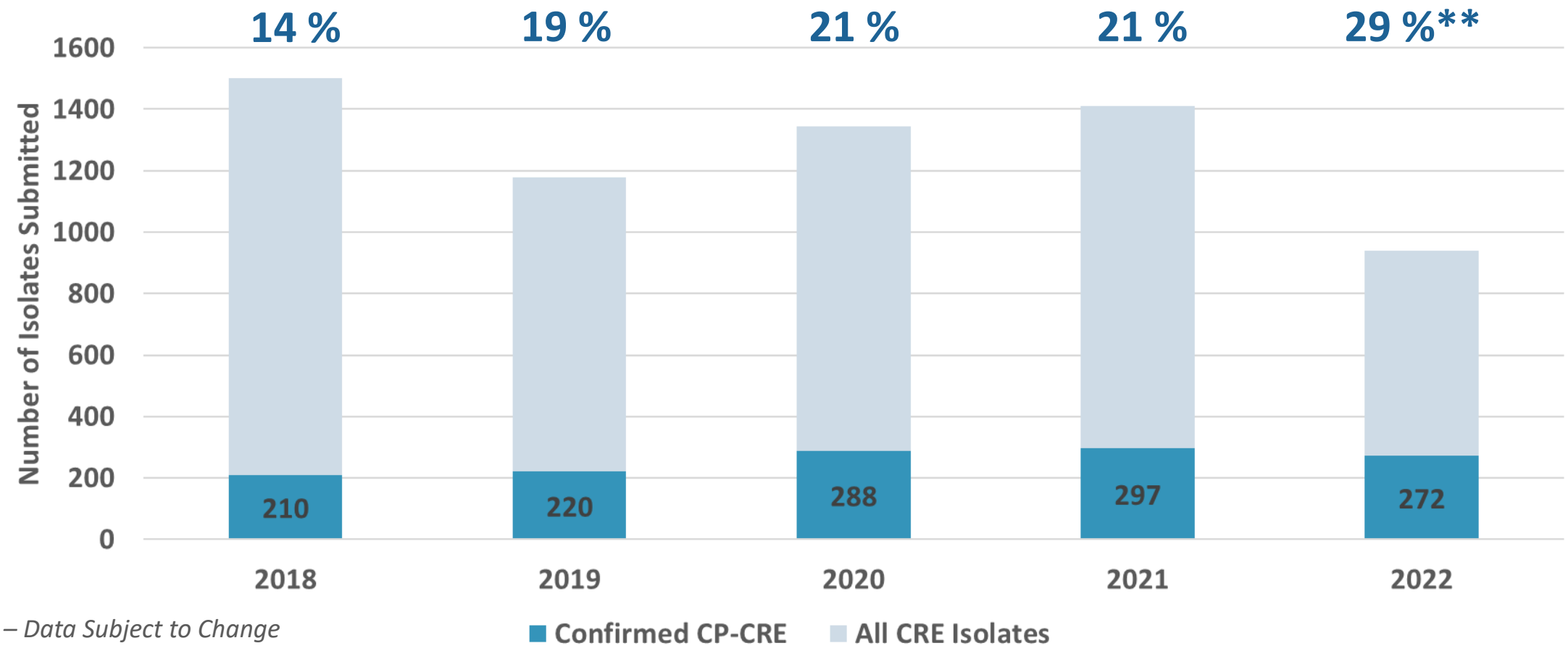


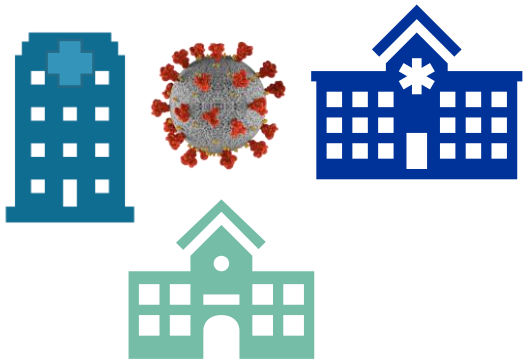
Preliminary – Data Subject to Change

CRE Isolates Submitted to BOL
2018 – 2022Q3*

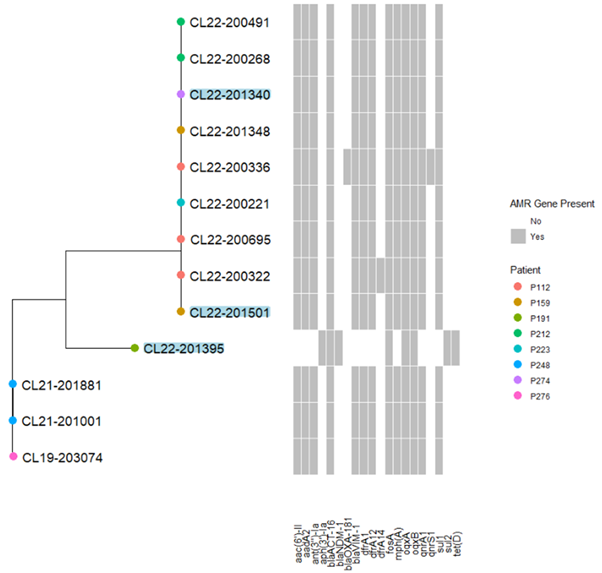


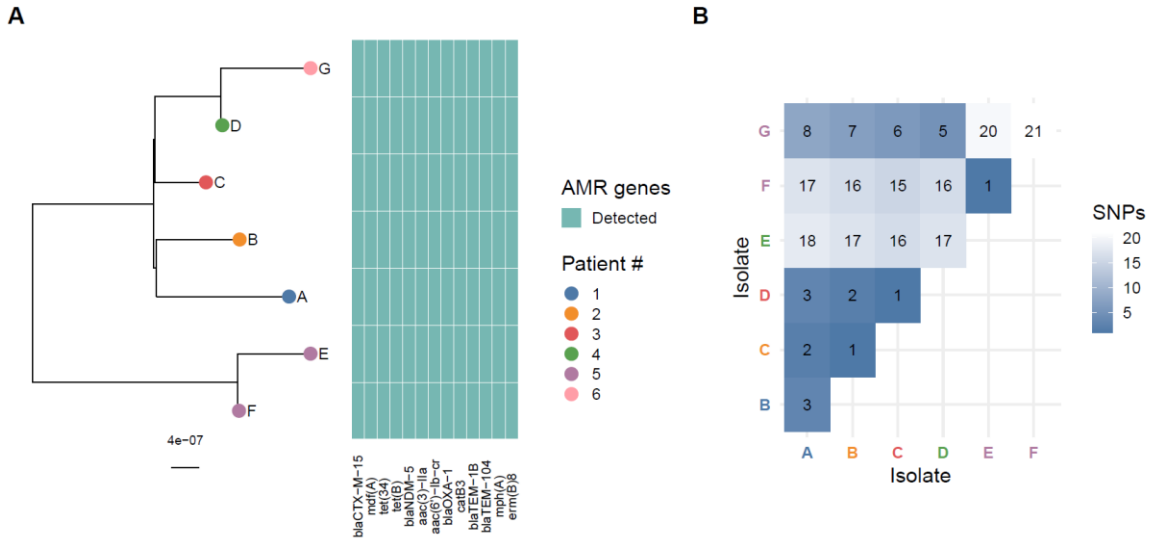
Preliminary – Data Subject to Change
CRE = Carbapenem-resistant Enterobacterales
Carbapenemase genes include KPC, NDM, OXA-48, IMP, VIM
**CP-CRE isolate submission required in 2022

More Recent CP-CRE Outbreaks Detected



E. Cloacae ST 114



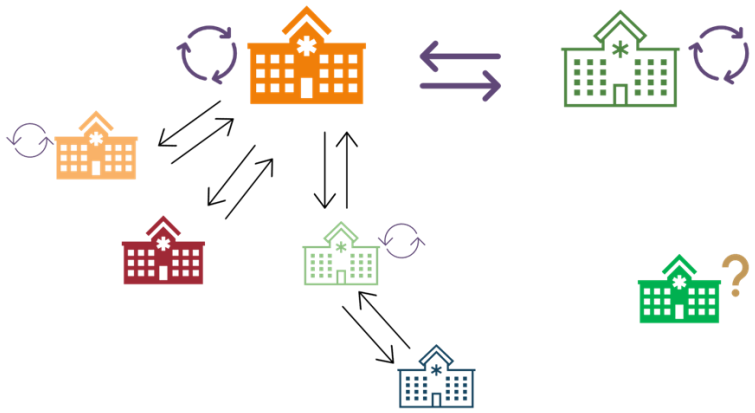


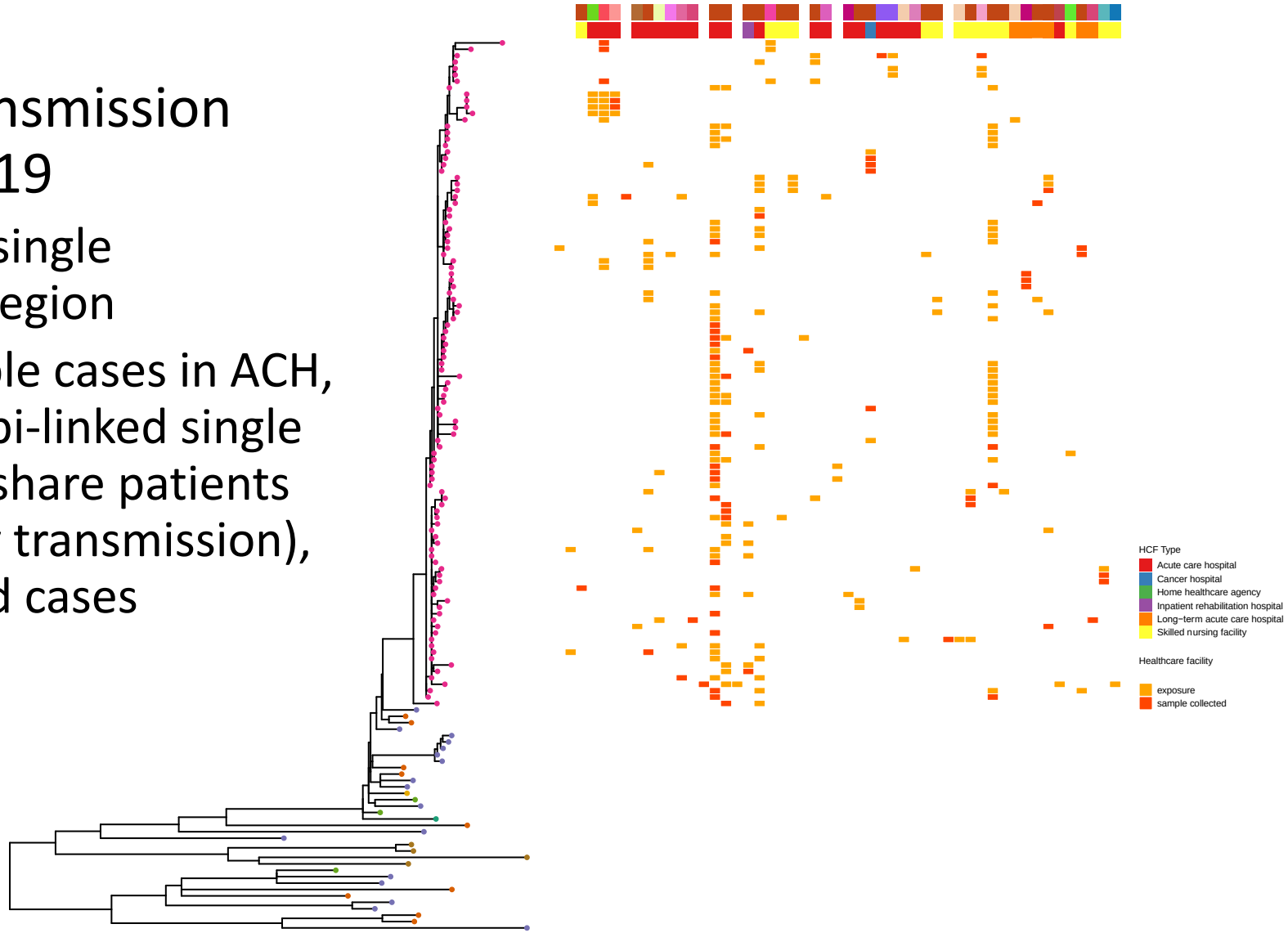
- Multiple outbreaks across settings
- Particularly in COVID-19 unit or during times of COVID-19 surges
- NDM *Klebsiella pneumoniae* ST 219 - >100 cases regionally (R2N, 2S)
- VIM *Enterobacter cloacae* ST 114 – 7 cases (R3)

- Contaminated Duodenoscopes
- NDM *Escherichia coli* ST648

NDM *Klebsiella pneumoniae* ST 219

- Sustained regional transmission detected since late 2019
  - Clonal outbreak from single introduction into the region
  - Outbreaks with multiple cases in ACH, vSNF, SNF as well as epi-linked single cases in facilities that share patients (intra and inter-facility transmission), and few non epi-linked cases





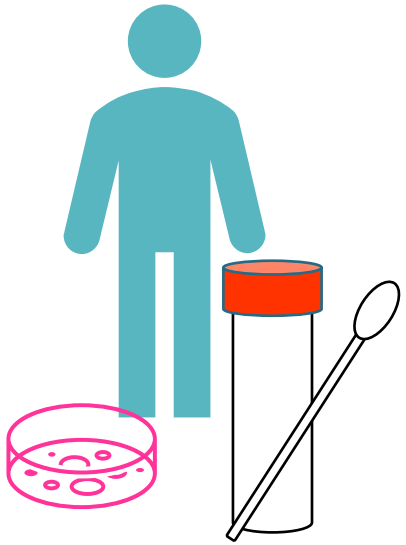
Summary of Targeted MDRO Trends

- Emergence of localized transmission of *Candida auris* in SE MI in 2022
  - Most cases are colonized, unrecognized status driving transmission
  - Outbreaks detected across healthcare settings, largest occurring in LTACHs
  - Multiple clades, some echinocandin-R strains detected

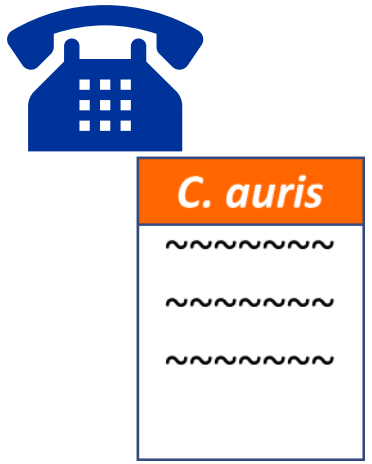
- Early analysis may indicate slightly lower rates of CP-CRE in 2022 vs 2020-2021
  - *very preliminary: data cleaning/case closeout in progress, isolate submissions(?)*
  - Continued detection and spread of NDM carbapenemases
  - Detection of targeted carbapenemases in non-Big 3 organisms
    - *Serratia & Citrobacter* spp. (KPC), *Proteus & Providencia* spp. (IMP)

What Can Healthcare Facilities Do?

Infection Prevention Practices



Identify Colonized and Infected Individuals



Communicate MDRO Status

Antibiotic & Antifungal Stewardship

Public Health
What Can ~~Healthcare Facilities~~ Do?

ICAR

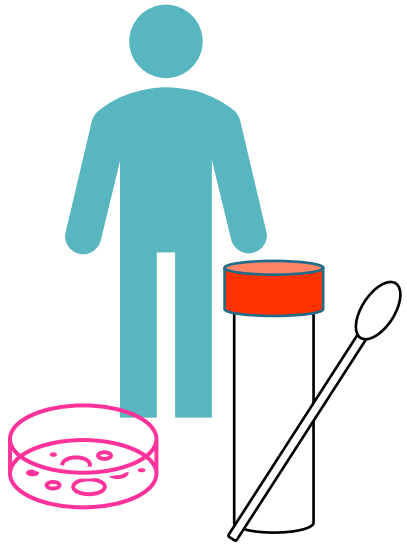
PROJECT FIRSTLINE

Infection Prevention Practices

Facilitate Screening & Isolate Submission

MDHHS Bureau of Laboratories

ARLABnetwork

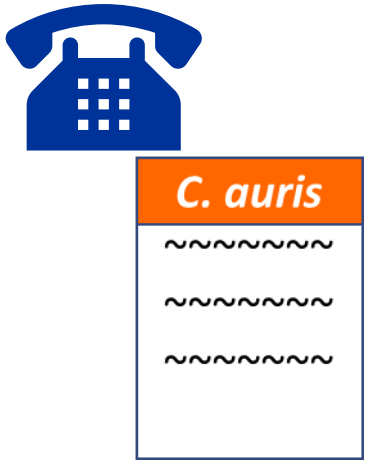


Identify Colonized and Infected Individuals

Assist w/Notifications

Promote Transfer Forms

MDSS



Communicate MDRO Status

NHSN NATIONAL HEALTHCARE SAFETY NETWORK

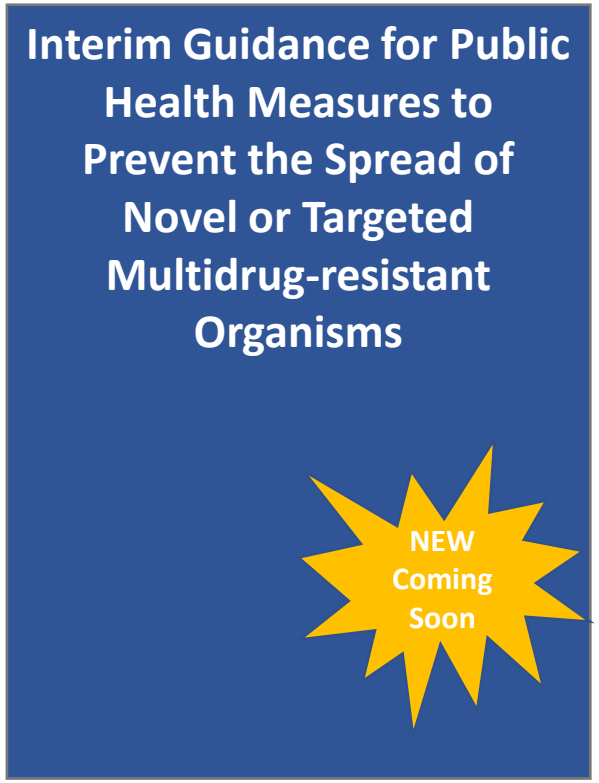
CHARM Project

BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

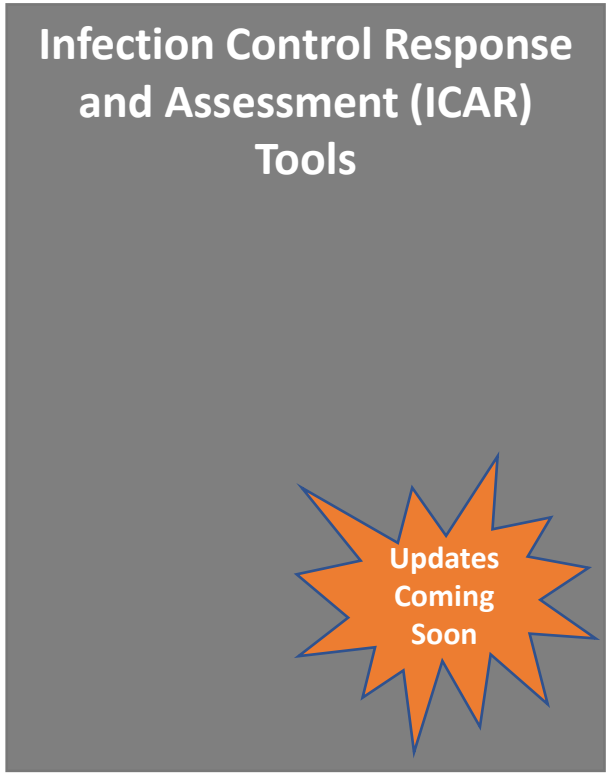
Antibiotic & Antifungal Stewardship

New & Updated CDC Guidance & Tools for 2022

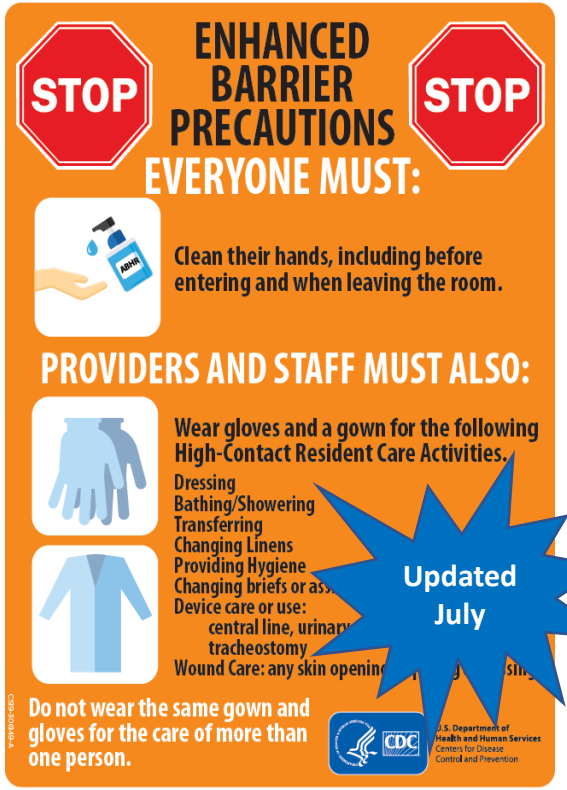
Response Guidance
"Containment"



Proactive Guidance
"Prevention"



ICAR Tools For All
Healthcare Settings



Enhanced Barrier
Precautions Guidance
Nursing Homes

Thank You

Surveillance for Healthcare Associated and Resistant Pathogens (SHARP) Unit
Michigan Department of Health and Human Services (MDHHS)

MDHHS-SHARP@michigan.gov
(517) 335-8165