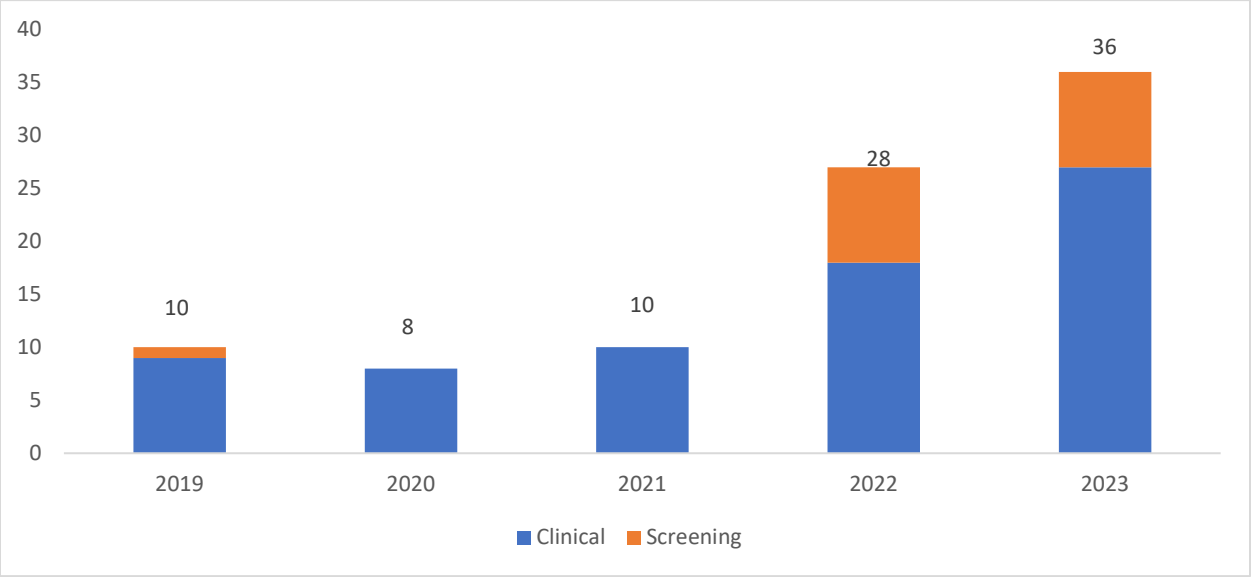
CP-CRE: **Updates for Healthcare Professionals**

Carbapenemase-producing carbapenem resistant Enterobacterales (CP-CRE) are an emerging public health threat. CP-CRE produce an enzyme that breaks down and renders ineffective carbapenem antibiotics, the last-resort for the treatment of infections caused by multidrug-resistant gram-negative bacterial infections.[1] Infections with CP-CRE are difficult to treat and are associated with high mortality rates in hospitalized patients.[2]

The first case reported in Allegheny County was in March 2019. Since then, 92 total clinical and screening cases have been reported as of December 2023 (Figure 1).

Figure 1: Number of Reported CP-CRE cases, Allegheny County, 2019-2023, (n=92)



*CP-CRE became a reportable condition in May 2022.

Patients can either be infected or colonized with CP-CRE. Infection occurs when CP-CRE enters a body site and causes signs and symptoms of disease. Colonized individuals have CP-CRE in or on the body but do not experience any symptoms of disease. Patients colonized with the organism are at risk for becoming infected. Infected and colonized individuals can spread CP-CRE to others, hence the need for CP-CRE prevention strategies for both infected and colonized patients. For purposes of reporting, clinical CP-CRE cases are those for which the specimen was collected to diagnose or treat disease and screening cases are those for which the specimen was collected to detect colonization.

Table 1: Reported CPO Counts, by Organism and Mechanism, Allegheny County, 2019-2023 (n = 92)*

Organism	Mechanism**						
	Total CP-CRE	**KPC**	**NDM**	**OXA-23/24**	**IMP**	**VIM**	**Unknown**
Klebsiella spp	54	46	7	-	1	-	-
Enterobacter spp	22	6	18	-	-	-	-
Escherichia coli	6	4	3	-	1	-	-
Other	10	6	3	-	1	1	2
Total	92	62	31	-	3	1	2

*Some bacteria have multiple mechanisms

** Carbapenemas genes: *Klebsiella pneumoniae* carbapenemase (KPC), New Delhi metallo-β-lactamase (NDM), oxacillinase-type carbapenemase (OXA-23, OXA-24/40), imipenemase metallo-β-lactamase (IMP), Verona integron-mediated metallo-β-lactamase (VIM)

CP-CRE spreads rapidly in healthcare settings, and it can be transmitted from person to person through contact with wounds or stool of an infected or colonized case.[1] Transmission can occur through the hands of healthcare workers, medical equipment, or devices that have not been thoroughly disinfected. Patients with exposure to acute care and long-term care facilities and those with compromised immune systems are most at risk for CP-CRE. In addition, exposure to antibiotics can alter the bacteria in a person's microbiome, making a person more susceptible to becoming infected or colonized with CP-CRE.[2] Most cases in Allegheny County had indwelling devices (72%) and most had wounds (63%).

Table 2: Risk Factors for CP-CRE cases, Allegheny County, 2019-2023 (n=92)

Risk Factor	Yes n (%)	No n (%)	Unknown n (%)
Hospitalized*	76 (83%)	11 (12%)	5 (5%)
LTCF resident *	31 (34%)	60 (65%)	1 (1%)
Travel outside US**	3 (3%)	34 (37%)	55 (60%)
Indwelling device***	66 (72%)	25 (27%)	1 (1%)
Wound***	58 (63%)	32 (35%)	2 (2%)

*Hospitalization and long-term care facility (LTCF) history refer to the 30 days prior to culture date

**Travel history refers to the 6 months prior to culture date

***Indwelling device and wound history refer to the day of the culture

Other bacteria aside from Enterobacterales can develop resistance to carbapenems, such as *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. There have been five carbapenemase producing-carbapenem resistant *Pseudomonas aeruginosa* (CP-CRPA) cases and three carbapenemase producing-carbapenem resistant *Acinetobacter baumannii* (CP-CRAB) cases reported in Allegheny County from September 2019 through December 2023 (Table 3). These organisms are not included on Allegheny County's notifiable disease list.

Table 3: Other Carbapenemase Producing Organisms Reported to Allegheny County Health Department, 2019-2023 (n=8)

Organism	Mechanism*						
	Total CPO	KPC	NDM	OXA-23/24	IMP	VIM	Unknown
CP-CRPA	5	3	-	-	-	1	1
CP-CRAB	3	-	-	3	-	-	-

*

*Carbapenemas genes: *Klebsiella pneumoniae* carbapenemase (KPC), New Delhi metallo-β-lactamase (NDM), oxacillinase-type carbapenemase (OXA-23, OXA-24/40), imipenemase metallo-β-lactamase (IMP), Verona integron-mediated metallo-β-lactamase (VIM)

Recommended Prevention Activities (see CDC's Facility Guidance for Control of Carbapenem-Resistant Enterobacteriaceae for more information):

- **Hand hygiene**: Alcohol-based hand rub (ABHR) is effective. Use soap and water if hands are visibly soiled.
- **Precautions**: Use contact precautions or Enhanced Barrier Precautions (EBP) if applicable for clinical and colonized persons.
- **Cleaning and disinfection**: Use EPA List K Products and educate staff on contact time for proper disinfection.
- **Communication**:
  - Laboratory Results – Ensure the laboratory notifies the public health department within 24 hours when CP-CRE cases are identified. This is important to ensure prevention and containment strategies are implemented.
  - Transfers - Ensure other involved facilities, especially acute care and long-term care facilities, are made aware of CP-CRE cases.
- **Colonization screening**:
  - If you identify cases of CP-CRE at your facility, contact the Allegheny County Health Department (412-687-2243) for information on screening protocols. Prepare to screen the case's roommates, people residing on the same floor as the case, or in some instances, the entire affected facility.
  - Peri-rectal swabs are used.

Resources:

- CDC's Facility Guidance for Control of Carbapenem-Resistant Enteracteriaceae
- Pennsylvania Department of Health's Toolkit for Response to Antimicrobial-Resistant Organisms in Healthcare Facilities
- Pennsylvania Department of Health's HAI Website
- EPA List K Products
- Pennsylvania Department of Health's 5-year CPO Report_2018-2022.pdf (pa.gov)

References:

1. CDC. Carbapenem-resistant Enterobacterales (CRE): An urgent public health threat. July 2021. Carbapenem-resistant Enterobacterales (CRE): An urgent public health threat | A.R. & Patient Safety Portal (cdc.gov)
2. CDC. About carbapenem-resistant Enterobacterales. April 2024. About Carbapenem-resistant Enterobacterales | CRE | CDC