Emerging Infections Program (EIP) Network Report
Healthcare-Associated Infections Community Interface Activity
Multi-site Gram-negative Surveillance Initiative
Carbapenem-Resistant *Acinetobacter baumannii* Complex Surveillance, 2022

Case Definition:

A carbapenem-resistant *Acinetobacter baumannii-calcoaceticus* complex (CRAB) case was included in this report if there was isolation of *Acinetobacter* that is part of the *A. baumannii-calcoaceticus* complex meeting the following criteria:

- Carbapenem-resistant (doripenem [using FDA criteria], imipenem, meropenem) using the current Clinical and Laboratory Standards Institute (CLSI) clinical breakpoints (1);
- Isolated from a normally sterile specimen (e.g., blood, cerebrospinal fluid, pleural fluid, pericardial fluid, peritoneal fluid, joint/synovial fluid, bone, internal body site, muscle) or urine, or from a lower respiratory tract or wound specimen;
- Identified in residents of the surveillance area in 2022.

Surveillance Catchment Areas:

Colorado (5 county Denver area); Connecticut (Statewide); Georgia (8 county Atlanta area); Maryland (4 county Baltimore area); Minnesota (2 county Minneapolis – St. Paul area); New Mexico (1 county Albuquerque area); New York (1 county Rochester area); Oregon (3 county Portland area); and Tennessee (8 county Nashville area).

Population:

The surveillance area represents 19,547,588 persons.
Source: U.S. Census Bureau, Population Division, Vintage 2022 Special Tabulation.

Methods:

Case finding was active, laboratory-based, and population-based. Clinical laboratories that serve residents of the surveillance area were routinely contacted for case identification through a query of minimum inhibitory concentration (MIC) values from automated testing instruments. When possible, the MIC values obtained directly from the automated testing instruments were used to determine if an isolate met the phenotypic case definition. An incident CRAB case was defined as the first CRAB isolate meeting the case definition from a patient during a 30-day period.

Standardized case report forms were completed for incident cases through review of medical records. Inpatient and outpatient medical records were reviewed for information on patient demographics, clinical syndrome, outcome of illness, and relevant healthcare exposures.

A convenience sample of CRAB isolates (N=200) was collected from EIP sites and submitted to CDC for additional testing, including species confirmatory testing, antimicrobial susceptibility testing by reference broth microdilution with a metallo-β-lactamase (MBL) screen, and real-time polymerase chain reaction (PCR) screening for carbapenemase-encoding genes, including bla_{KPC}, bla_{NDM}, $bla_{\text{OXA-48-like}}$, bla_{VIM}, bla_{IMP}, $bla_{\text{OXA-23-like}}$, $bla_{\text{OXA-24/40-like}}$, $bla_{\text{OXA-58-like}}$, and $bla_{\text{OXA-235-like}}$ genes.

Incidence rates for CRAB cases were calculated using the 2022 U.S. Census estimates of the surveillance area population as the denominator. Assessment of vital status in patients admitted to a hospital occurred at the time of discharge from the acute care hospital. For patients in a long-term care facility, long-term acute care facility, or

in an outpatient dialysis center, vital status was assessed 30 days after culture collection. For all other patients, vital status was assessed using medical records from the healthcare facility encounter associated with the culture.

CRAB surveillance data underwent regular data cleaning to ensure accuracy and completeness. Patients with data entered into the data collection system as of 5/1/2024 were included in this analysis. Because data can be updated as needed, analyses of datasets generated on a different date may yield slightly different results.

Results:

Table 1. Specimen Sources for CRAB Cases by Organism, 2022 (N=452)

Organism	Total	Blood[a] No.	Blood %	Other sterile speci-mens No.	Other sterile speci-mens %	Urine No.	Urine %	Wound No.	Wound %	Lower respira tory tract No.	Lower respira tory tract %
Acinetobacter baumannii-calcoaceticus complex[b]	452	28	6.2	13	2.9	81	17.9	135	29.9	195	43.1

[a] Category may include cases with a positive blood culture and a positive culture from another specimen type (such as another sterile site, urine, wound, or lower respiratory tract)

[b] Unable to distinguish between species in *Acinetobacter baumannii-calcoaceticus* complex

Table 2: Incidence Rates of CRAB Cases by Sex, Race and Age, 2022 (N=452)

Sex	No. of Cases	%	Incidence Rate[a]
Female	178	39.4	1.8
Male	272	60.2	2.8
Unknown	2	0.4	-

Race	No. of Cases	%	Incidence Rate[a]
White	171	37.8	1.3
Black or African American	254	56.2	6.4
Asian	5	1.1	0.4
Unknown or another race[b]	22	4.9	-

[a] Cases per 100,000 population for EIP site surveillance areas (crude rates)

[b] Data for American Indian and Alaska Native case-patients were included in the unknown or another race category for privacy

Age groups, years	No. of Cases	%	Incidence Rate[a]
0–49	111	24.6	0.9
50–64	123	27.2	3.3
65–79	162	35.8	6.8
≥80	56	12.4	8.4
Invasive cases[b]	54	11.9	0.3
All cases	452	100.0	2.3

[a] Cases per 100,000 population for EIP site surveillance areas (crude rates)

[b] Invasive cases include cases with a sterile incident specimen source or an incident urine, wound, or lower respiratory tract specimen with a subsequent non-incident sterile specimen collected on the date of incident specimen collection or in the 29 days after

Table 3. CRAB Cases by Race and Ethnicity, 2022 (N=452)

Race/Ethnicity	No. of Cases	%
Hispanic or Latino, any race	11	2.4
Not known to be Hispanic or Latino[a] – White[b]	166	36.7
Not known to be Hispanic or Latino[a] – Black or African American[c]	244	54.0
Not known to be Hispanic or Latino[a] – Asian	5	1.1
Not known to be Hispanic or Latino – Another race or multiracial[d]	19	4.2
Not known to be Hispanic or Latino[a]– Unknown race[e]	7	1.5

[a] Records either indicated ethnicity was non-Hispanic or Latino, or ethnicity was not known

[b] 4 CRAB cases with unknown ethnicity

[c] 6 CRAB cases with unknown ethnicity

[d] American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or ≥2 races reported; 1 CRAB case with unknown ethnicity

[e] 7 CRAB cases with unknown ethnicity

Table 4. Selected Characteristics of CRAB Cases, 2022 (N=452)

Location of patient on the 3rd calendar day before incident specimen collection	No. of Cases	%
Acute-care hospital (inpatient)	194	42.9
Long-term care facility	155	34.3
Private residence	82	18.1
Long-term acute care hospital	11	2.4
Unknown or another location	10	2.2

Location of incident specimen collection	No. of Cases	%
Acute care hospital	285	63.1
Outpatient setting or emergency department	109	24.1
Long-term care facility	48	10.6
Long-term acute care hospital	7	1.5
Unknown	3	0.7

Infection types[a]	No. of Cases	%
Pneumonia	132	29.2
Bacteremia[b]	74	16.4
Decubitus/pressure ulcer	68	15.0
Urinary tract infection	50	11.1
Septic shock	48	10.6
Other	108	23.9
None[c]	94	20.8
Unknown	23	5.1

[a] Patients could have more than one type of infection reported

[b] Bacteremia includes cases with a positive blood specimen (incident or non-incident) or a documented diagnosis of sepsis, bacteremia, or blood stream infection

[c] No infection types reported

Table 5. Selected Clinical Characteristics of CRAB Cases, 2022 (N=452)

Charlson comorbidity index	No. of Cases	%
0	36	8.0
1	53	11.7
≥2	357	79.0
Unknown	6	1.3
Median (interquartile range)	3	2–4

Underlying conditions [a]	No. of Cases	%
Skin condition	306	67.7
Neurologic condition, any	259	57.3
Diabetes mellitus	234	51.8
Urinary tract problems/abnormalities	216	47.8
Cardiovascular disease[b]	165	36.5
Chronic renal disease	129	28.5
Chronic pulmonary disease[c]	118	26.1
Gastrointestinal disease[d]	57	12.6
Malignancy (hematologic or solid organ)	36	8.0
Transplant (hematopoietic stem cell or solid organ)	7	1.5
Unknown	6	1.3

SARS-CoV-2 testing	No. of Cases	%
Positive test for SARS-CoV-2 during hospitalization and on or before the date of incident specimen collection[e]	33/353	9.3

[a] Patients could have more than one underlying condition reported

[b] Defined as myocardial infarction, congestive heart failure, congenital heart disease, stroke, transient ischemic attack, or peripheral vascular disease

[c] Defined as cystic fibrosis or any chronic respiratory condition resulting in symptomatic dyspnea

[d] Defined as diverticular disease, inflammatory bowel disease, peptic ulcer disease, short gut syndrome, or liver disease

[e] Among patients in the hospital on the date of incident specimen collection. Excludes patients who were admitted to the hospital after the date of incident specimen collection. A positive SARS-CoV-2 test was defined as any positive viral test for SARS-CoV-2, including antigen and nucleic acid amplification tests. Serologic tests were excluded

Table 6. Selected Healthcare Exposures or Risk Factors of CRAB Cases, 2022[a] (N=452)

Healthcare facility stay in the year before the date of incident specimen collection	No. of Cases	%
Any healthcare facility stay	391	86.5
Acute care hospitalization	362	80.1
Long-term care facility residence	278	61.5
Long-term acute care hospitalization	36	8.0

Exposure	No. of Cases	%
Surgery in the year before the date of incident specimen collection	190	42.0
Specimen collected ≥3 days after hospital admission	184	40.7
Chronic dialysis	54	11.9

Selected medical device(s) in place in the 2 calendar days before the date of incident specimen collection	No. of Cases	%
Urinary catheter	282	62.4
Central venous catheter	160	35.4
Tracheostomy	155	34.3
Endotracheal or nasotracheal tube	60	13.3
Other[b]	249	55.1

[a] Patients could have more than one prior healthcare exposure or risk factor reported

[b] Other medical devices include gastrostomy tube, nephrostomy tube, nasogastric tube, or other device

Table 7. Outcomes of Incident CRAB Cases, 2022 (N=452)

Outcomes	No. of Cases	%
Outcome – hospitalized on the day of or in the 29 days after the date of incident specimen collection[a,b]	387	85.6
Outcome – ICU admission in the 6 days after the date of incident specimen collection[a]	66	14.6
Hospitalized patient discharged to – long-term care facility	202/387	52.2
Hospitalized patient discharged to – private residence or other/unknown discharge location	94/387	24.3
Hospitalized patient discharged to – died during hospitalization	73/387	18.9
Hospitalized patient discharged to – long-term acute care hospital	18/387	4.7
Died within 30 days of incident specimen collection date	57	12.6
Cases with an incident sterile site specimen	8/41	19.5
Cases with an incident urine specimen[c]	3/81	3.7
Cases with an incident wound specimen[d]	10/135	7.4
Cases with an incident lower respiratory tract specimen[e]	36/195	18.5

[a] Patients could have more than one outcome

[b] Data include 194 cases considered to be hospital-onset

[c] No incident CRAB cases had a subsequent non-incident blood specimen collected on the date of incident specimen collection or in the 29 days after

[d] No incident CRAB cases had a subsequent non-incident blood specimen collected on the date of incident specimen collection or in the 29 days after

[e] No incident CRAB cases had a subsequent non-incident blood specimen collected on the date of incident specimen collection or in the 29 days after

Laboratory Characterization:

Table 8.a. Antimicrobial Susceptibility and Molecular Characteristics of CRAB Isolates Based on Testing Performed at CDC, 2022 (N=200)

Organism	Isolates Submitted to CDC	Carbapenemase-producing, [a,b,] - N	%
Acinetobacter baumannii-calcoaceticus complex	200	175	87.5

Table 8.b. Molecular Characteristics of CRAB Isolates Based on Testing Performed at CDC, by Carbapenemase Gene, 2022 (N=200)

Carbapenemase gene	No. of Isolates	%
$bla_{\text{OXA-23-like}}$	134	67.0
$bla_{\text{OXA-24/40-like}}$	35	17.5
$bla_{\text{OXA-58-like}}$	1	0.5
$bla_{\text{OXA-235-like}}$	5	2.5
bla_{KPC}	0	0
bla_{NDM}	0	0
bla_{VIM}	0	0
bla_{IMP}	0	0

Table 8.c. Confirmatory Antimicrobial Susceptibility Results of CRAB Isolates Submitted to CDC, 2022 (N=200)

Organism	Carbapenem-resistant - N	Carbapenem-resistant - %
Acinetobacter baumannii-calcoaceticus complex	197	98.5

[a] Testing was performed by PCR

[b] Carbapenemase-producing isolates were collected from lower respiratory tract specimens (66/175; 37.7%), wound specimens (58/175; 33.1%), urine (n=35/175; 20.0%), blood (n=12/175; 6.9%), and other normally sterile specimens (n=4/175; 2.3%)

Summary:

Surveillance data from 2022 represent the eleventh full year of population-based surveillance for CRAB through the Emerging Infections Program. The overall crude incidence rate of CRAB in 2022 was 2.3 cases per 100,000 persons. This is a 21.1% increase in the crude CRAB incidence rate reported in 2021 (2). The incidence rate was higher in males than in females, and higher in persons of Black or African American race compared to other races. The incidence rate of CRAB was highest among persons aged 65–79 years and ≥ 80 years.

Pneumonia was the most common infection type reported. Isolates were most commonly collected while a patient was in an acute care hospital, and more than two-thirds of patients were in an acute care hospital or long-term care facility prior to their incident specimen collection. Underlying conditions were commonly reported, with most CRAB cases having a Charlson comorbidity index of ≥2. Most cases were hospitalized with 14.6% requiring ICU admission. Overall, crude mortality was 12.6%, and higher in patients who had CRAB isolated from a sterile site specimen or lower respiratory tract specimen compared to those with CRAB isolated from urine or wound.

The most common prior healthcare exposures reported were an admission to a healthcare setting in the prior year and presence of an indwelling medical device. Nine percent of patients in the hospital on the date of incident specimen collection had a positive viral test for SARS-CoV-2 during their hospitalization and on or before the date of incident CRAB specimen collection.

Among the 200 CRAB isolates submitted to CDC, 87.5% were carbapenemase-producing. OXA-23-like was detected in 67.0% of the isolates, OXA-24/40-like in 17.5% of the isolates, OXA-58-like in 0.5% of the isolates, and OXA-235-like in 2.5% of the isolates.

References:

1. CLSI. *Performance Standards for Antimicrobial Susceptibility Testing.* 32nd ed. CLSI supplement M100. Wayne, PA: Clinical and Laboratory Standards Institute; 2022.

2. Centers for Disease Control and Prevention. 2023. Emerging Infections Program, Healthcare-Associated Infections – Community Interface Surveillance Report, Multi-site Gram-negative Surveillance Initiative (MuGSI), Carbapenem-Resistant Acinetobacter baumannii Complex Surveillance, 2021. Available at: https://www.cdc.gov/healthcare-associated-infections/media/pdfs/2022-CRE-Report-508.pdf

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For more information, visit our web sites:

- Multi-site Gram-negative Surveillance Initiative (MuGSI) (https://www.cdc.gov/healthcare-associated-infections/php/haic-eip/mugsi.html)
- Healthcare-Associated Infections - Community Interface Data Visualization (HAICViz) (https://www.cdc.gov/healthcare-associated-infections/php/haic-eip/haicviz.html)