

**Emerging Infections Program (EIP) Network Report  
Healthcare-Associated Infections Community Interface Activity  
Multi-site Gram-negative Surveillance Initiative  
Carbapenem-Resistant *Acinetobacter baumannii* Complex Surveillance,  
2021**

**Note:** In 2021, wound and lower respiratory tract specimens were added to the case definition. For this reason, case counts are higher than in previous years, and characteristics of cases may also differ.

**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 2021.

**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 19,485,846 persons.

Source: Starting with the 2021 surveillance year, population estimates were obtained from the U.S. Census Bureau, Population Division, Vintage 2021 Special Tabulation. This file includes population estimates for the five single-race categories and a multiple-race category specified in the 1997 Office of Management and Budget (OMB) standards for racial categories. The population estimates for previous reports were obtained from the National Center for Health Statistics, which bridged the multiple-race group population counts to the four single-race categories specified in the 1977 OMB standards.

**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.

Isolates were collected as part of this activity for 2021; the laboratory characterization data are not presented in this report.

Incidence rates for CRAB cases were calculated using the 2021 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 7/7/2023 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, 2021 (N=368)**

Organism	Total	Blood <sup>a</sup> No.	Blood %	Other sterile speci- mens No.	Other sterile speci- mens %	Urine No.	Urine %	Wound No.	Wound %	Lower respiratory tract No.	Lower respiratory tract %
<i>Acinetobacter baumannii-calcoaceticus</i> complex <sup>b</sup>	368	18	4.9	8	2.2	54	14.7	127	34.5	161	43.8

<sup>a</sup> 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)

<sup>b</sup> Unable to distinguish between species in *Acinetobacter baumannii-calcoaceticus* complex

**Table 2: Incidence Rates of CRAB Cases by Sex, Race and Age, 2021 (N=368)**

Sex	No. of Cases	%	Incidence Rate <sup>a</sup>
Female	137	37.2	1.4
Male	231	62.8	2.4

Race	No. of Cases	%	Incidence Rate <sup>a</sup>
White	130	35.3	1.0
Black or African American	220	59.8	5.6
Other <sup>b</sup>	6	1.6	0.3
Unknown	12	3.3	-

Age groups, years	No. of Cases	%	Incidence Rate <sup>a</sup>
0–49	89	24.2	0.7
50–64	121	32.9	3.2
65–79	123	33.4	5.3
≥80	35	9.5	5.6
Invasive cases <sup>c</sup>	33	8.4	0.2
All cases	368	100.0	1.9

<sup>a</sup> Cases per 100,000 population for EIP sites (crude rates)

<sup>b</sup> Other race includes Asian, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or ≥2 races reported

<sup>c</sup> 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, 2021 (N=368)**

Race/Ethnicity	No. of Cases	%
Hispanic, any race	13	3.5
Not known to be Hispanic <sup>a</sup> – White <sup>b</sup>	122	33.2
Not known to be Hispanic <sup>a</sup> – Black or African American <sup>c</sup>	214	58.2
Not known to be Hispanic <sup>a</sup> – Asian	3	0.8
Not known to be Hispanic – Other or multiple races	7	1.9
Not known to be Hispanic <sup>a</sup> – Unknown race <sup>d</sup>	9	2.4

<sup>a</sup> Records either indicated ethnicity was non-Hispanic, or ethnicity was not known

<sup>b</sup> 4 CRAB cases with unknown ethnicity

<sup>c</sup> 25 CRAB cases with unknown ethnicity

<sup>d</sup> Of cases with unknown race, 4 CRAB cases with unknown ethnicity

**Table 4. Selected Characteristics of CRAB Cases, 2021 (N=368)**

<b>Location of patient on the 3<sup>rd</sup> calendar day before incident specimen collection</b>	<b>No. of Cases</b>	<b>%</b>
Acute-care hospital (inpatient)	152	41.3
Long-term care facility	117	31.8
Private residence	80	21.7
Long-term acute care hospital	18	4.9
Unknown	1	0.3

<b>Location of incident specimen collection</b>	<b>No. of Cases</b>	<b>%</b>
Acute care hospital	236	64.1
Outpatient setting or emergency department	71	19.3
Long-term care facility	45	12.2
Long-term acute care hospital	16	4.3

<b>Infection types<sup>a</sup></b>	<b>No. of Cases</b>	<b>%</b>
Pneumonia	110	29.9
Decubitus/pressure ulcer	76	20.6
Bacteremia <sup>b</sup>	50	13.6
Urinary tract infection	43	11.7
Septic shock	34	9.2
Other	88	23.9
None <sup>c</sup>	55	14.9
Unknown	14	3.8

<sup>a</sup> Patients could have more than one type of infection reported

<sup>b</sup> Bacteremia includes cases with a positive blood specimen (incident or non-incident) or a documented diagnosis of sepsis, septicemia, bacteremia, or blood stream infection

<sup>c</sup> No infection types reported

**Table 5. Selected Clinical Characteristics of CRAB Cases, 2021 (N=368)**

<b>Charlson comorbidity index</b>	<b>No. of Cases</b>	<b>%</b>
0	28	7.6
1	44	12.0
≥2	292	79.3
Unknown	4	1.1
Median (IQR)	3	2–4

<b>Underlying conditions<sup>a</sup></b>	<b>No. of Cases</b>	<b>%</b>
Skin condition	252	68.5
Neurologic condition, any	184	50.0
Diabetes mellitus	172	46.7
Cardiovascular disease <sup>b</sup>	167	45.4
Urinary tract problems/abnormalities	127	34.5
Chronic renal disease	96	26.1
Chronic pulmonary disease <sup>c</sup>	95	25.8
Gastrointestinal disease <sup>d</sup>	49	13.3
Malignancy (hematologic or solid organ)	30	8.2
Transplant (hematopoietic stem cell or solid organ)	6	1.6
Unknown	4	1.1

<b>SARS-CoV-2 testing</b>	<b>No. of Cases</b>	<b>%</b>
Positive test for SARS-CoV-2 during hospitalization and on or before date of incident specimen collection <sup>e</sup>	86/272	31.6

<sup>a</sup> Patients could have more than one underlying condition reported

<sup>b</sup> Defined as myocardial infarction, congestive heart failure, congenital heart disease, stroke, transient ischemic attack, or peripheral vascular disease

<sup>c</sup> Defined as cystic fibrosis or any chronic respiratory condition resulting in symptomatic dyspnea

<sup>d</sup> Defined as diverticular disease, inflammatory bowel disease, peptic ulcer disease, short gut syndrome, or liver disease

<sup>e</sup> 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, 2021<sup>a</sup> (N=368)**

Healthcare facility stay in the year before the date of incident specimen collection	No. of Cases	%
Any healthcare facility stay	321	87.2
Acute care hospitalization	299	81.3
Long-term care facility residence	219	59.5
Long-term acute care hospitalization	43	11.7

Exposure	No. of Cases	%
Surgery in the year before the date of incident specimen collection	151	41.0
Specimen collected $\geq 3$ days after hospital admission	143	38.9
Chronic dialysis	55	14.9

Selected medical device(s) in place in the 2 calendar days before the date of incident specimen collection	No. of Cases	%
Urinary catheter	231	62.8
Central venous catheter	155	42.1
Tracheostomy	130	35.3
Endotracheal or nasotracheal tube	54	14.7
Other <sup>b</sup>	196	53.3

<sup>a</sup> Patients could have more than one prior healthcare exposure or risk factor reported

<sup>b</sup> Other medical devices include gastrostomy tube, nephrostomy tube, nasogastric tube, or other device

**Table 7. Outcomes of Incident CRAB Cases, 2021 (N=368)**

Outcomes	No. of cases	%
Outcomes – hospitalized on the day of or in the 29 days after the date of incident specimen collection <sup>a,b</sup>	293	79.6
Outcomes – ICU admission in the 6 days after the date of incident specimen collection <sup>a</sup>	49	13.3
Discharge location among hospitalized patients – long-term care facility	128/293	43.7
Discharge location among hospitalized patients – private residence or other discharge location	82/293	28.0
Discharge location among hospitalized patients – died during hospitalization	73/293	24.9
Discharge location among hospitalized patients – long-term acute care hospital	10/293	3.4
Died within 30 days of incident specimen collection date	63	17.1
Cases with an incident sterile site specimen	7/26	26.9
Cases with an incident urine specimen <sup>c</sup>	6/54	11.1
Cases with an incident wound specimen <sup>d</sup>	10/127	7.9
Cases with an incident lower respiratory tract specimen <sup>e</sup>	40/161	24.9

<sup>a</sup> Patients could have more than one outcome

<sup>b</sup> Data include 152 cases considered to be hospital-onset

<sup>c</sup> 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

<sup>d</sup> 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

<sup>e</sup> 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

## Summary:

Surveillance data from 2021 represent the tenth full year of population-based surveillance for CRAB through the Emerging Infections Program. The case definition changed in 2021 to include additional specimens (wound and lower respiratory tract), resulting in a higher incidence rate and different case characteristics compared to previous years. The overall crude incidence rate of CRAB in 2021 was 1.9 cases per 100,000 persons, with higher incidence in men than in women, and higher incidence 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  $\geq 80$  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  $\geq 2$ . Most cases were hospitalized with 13.3% requiring ICU admission. Overall, crude mortality was 17.1 %, 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 in the prior year. Almost one-third of patients in the hospital on the date of incident specimen collection (31.6%) had a positive viral test for SARS-CoV-2 during their hospitalization and on or before date of incident CRAB specimen collection.

## References:

1. CLSI. *Performance Standards for Antimicrobial Susceptibility Testing*. 31st ed. CLSI supplement M100. Wayne, PA: Clinical and Laboratory Standards Institute; 2021.

## Citation:

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## For more information, visit our web sites:

- Multi-site Gram-negative Surveillance Initiative (MuGSI) (<https://www.cdc.gov/hai/eip/mugsi.html>)
- Healthcare-Associated Infections - Community Interface Data Visualization (HAICViz) (<https://www.cdc.gov/hai/eip/haicviz.html>)