

Bacterial and viral infections among hospitalized adults with COVID-19, COVID-NET, 14 states, March 2020–April 2022

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BACKGROUND

- Bacterial and viral coinfections occur with viral respiratory tract infections and can be associated with increased morbidity/mortality
- Compared to previous influenza pandemics, a low proportion of COVID-19 patients have been reported to have bacterial coinfections
- Prevalence, risk factors, and associated clinical outcomes in patients with bacterial/viral coinfections with SARS-CoV-2 are not fully understood.

Objectives:

- To describe the prevalence of bacterial and viral coinfections in hospitalized adults with COVID-19 using a population-based surveillance system
- To examine the association of bacterial coinfection with mortality among hospitalized adults with COVID-19

METHODS

- Coronavirus Disease 2019-Associated Hospitalization Surveillance Network (COVID-NET), a population-based surveillance system, used to investigate the occurrence of bacterial and viral infections among hospitalized adults with laboratory-confirmed SARS-CoV-2 infection between March 2020 and April 2022
- Clinician-driven testing for bacterial pathogens from sputum, deep respiratory, and sterile sites included
- Prevalence of viral pathogens including respiratory syncytial virus, rhinovirus/enterovirus, influenza, adenovirus, human metapneumovirus, parainfluenza viruses, and non-SARS-CoV-2 endemic coronaviruses described
- Multivariable logistic regression with generalized estimating equations (GEE) and controlling for underlying medical condition, age, sex, and race/ethnicity used to examine the association of bacterial coinfection and severe outcomes

RESULTS

- Among 36,490 hospitalized adults with COVID-19, 53.3% had bacterial cultures taken within 7 days of admission; 6.0% of those tested had a clinically relevant bacterial infection (Table 1)
- Staphylococcus aureus* and Gram-negative rods were most frequently isolated (Figure 1)
- Bacterial infections in COVID-19 patients within 7 days of admission associated with an adjusted relative risk of death 2.3 times that of patients with negative bacterial testing (Table 2)
- Among hospitalized adults with COVID-19, 2,766 (7.6%) tested for all 7 virus groups; a non-SARS-CoV-2 virus was identified in 0.9%

Bacterial coinfections within 7 days of admission were identified in 6% of hospitalized adults with COVID-19 and were associated with increased mortality.

TABLE 1:

Baseline characteristics of hospitalized adults with COVID-19 and bacterial testing performed within 7 days of admission, COVID-NET March 2020–April 2022, stratified by presence of bacterial infections

| | Clinically relevant bacterial infection within ± 7 days of admission Weighted column % with 95% CI n=1,140 | No clinically relevant bacterial infection within the first 7 days of admission among those with any bacterial culture performed Weighted column % with 95% CI n=17,236 |
|---------------------------------|--|---|
| Sex | | |
| Male | 58.2 (53.2-63.1) | 53.7 (52.3-55.0) |
| Female | 41.8 (36.9-46.8) | 46.3 (45.0-47.7) |
| Age category | | |
| 18-34 years | 6.0 (4.1-8.6) | 7.4 (6.8-8.1) |
| 35-54 years | 22.9 (19.2-27.0) | 23.4 (22.3-24.4) |
| 55-74 years | 44.0 (39.1-49.0) | 42.0 (40.7-43.3) |
| 75+ years | 27.0 (22.6-31.8) | 27.2 (25.9-28.6) |
| Race/ethnicity | | |
| Non-Hispanic White | 49.2 (44.1-54.3) | 49.0 (47.6-50.4) |
| Non-Hispanic Black | 29.3 (24.6-34.4) | 26.6 (25.3-27.8) |
| Non-Hispanic AI/AN | 2.1 (1.1-3.5) | 1.6 (1.3-1.9) |
| Asian/Pacific Islander | 4.0 (2.4-6.2) | 5.9 (5.2-6.8) |
| Hispanic | 15.4 (12.1-19.1) | 16.9 (16.0-17.9) |
| Any Underlying Condition | 96.3 (94.6-97.5) | 91.8 (91.1-92.5) |
| Outcomes | | |
| Intensive Care Required | 60.0 (54.9-64.9) | 28.5 (27.3-29.7) |
| Mechanical Ventilation | 47.6 (42.6-52.6) | 15.6 (14.7-16.6) |
| Death | 31.7 (27.2-36.5) | 13.2 (12.3-14.1) |

AI/AN = American Indian/Alaska Native

TABLE 2:

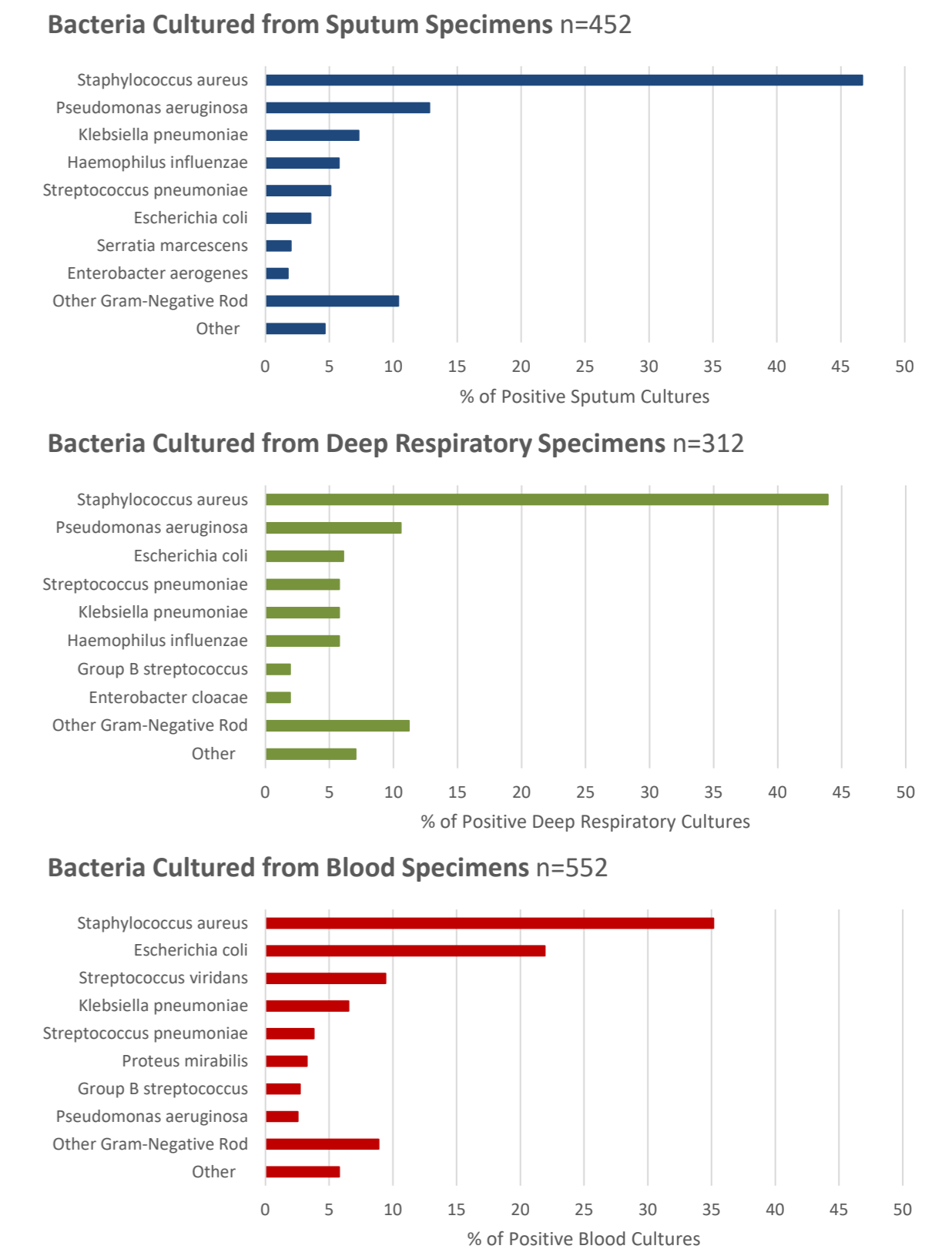
Adjusted relative risk for death among hospitalized adults with COVID-19 who had bacterial testing performed within 7 days of admission, COVID-NET March 2020–April 2022

| | Adjusted Relative Risk for Death (95% CI) n=16,383 | p-value |
|---|---|---------|
| Bacterial infection in a respiratory or sterile site within 7 days of hospital admission | 2.28 (1.86, 2.80) | <0.01 |
| Sex | | |
| Male | 1.19 (0.99, 1.43) | 0.06 |
| Female | Ref | Ref |
| Age Category | | |
| 18-34 years | Ref | Ref |
| 35-54 years | 1.68 (1.14, 2.49) | 0.01 |
| 55-74 years | 3.95 (2.40, 6.52) | <0.01 |
| 75 years or more | 5.54 (3.31, 9.28) | <0.01 |
| Race/Ethnicity | | |
| Non-Hispanic White | Ref | Ref |
| Non-Hispanic Black | 0.98 (0.86, 1.12) | 0.80 |
| Non-Hispanic AI/AN | 1.19 (0.91, 1.54) | 0.21 |
| Asian/Pacific Islander | 1.21 (1.05, 1.41) | 0.01 |
| Hispanic | 1.38 (1.12, 1.69) | <0.01 |
| Chronic Lung Disease | 0.95 (0.80, 1.12) | 0.55 |
| Diabetes | 1.06 (0.93, 1.19) | 0.39 |
| Cardiovascular Disease | 1.24 (1.05, 1.47) | 0.01 |
| Obesity | 1.12 (0.96, 1.31) | 0.15 |
| Gastrointestinal/Liver Disease | 0.83 (0.64, 1.08) | 0.17 |
| Renal Disease | 1.26 (1.14, 1.39) | <0.01 |

AI/AN = American Indian/Alaska Native

FIGURE 1:

Bacterial pathogens recovered within 7 days of admission from sputum, deep respiratory, and blood specimens among hospitalized adults with COVID-19 from March 2020 to April 2022. Figure includes 1,408 bacterial cultures from 1,066 individuals. Deep respiratory sites include endotracheal aspirate, bronchoalveolar lavage fluid, pleural fluid, and lung tissue. Unweighted counts and percentages are reported.



CONCLUSIONS

- Among patients with clinician-driven testing, 6.0% of hospitalized adults with COVID-19 were identified to have bacterial coinfections and 0.9% were identified to have viral coinfections.
- Identification of a bacterial coinfection within 7 days of admission was associated with increased mortality.

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