Complication with Bacterial Pneumonia in Hospitalized Patients with Coronavirus Disease 2019 (COVID-19)

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Introduction

- Impaired function and integrity of respiratory epithelium in setting of Coronavirus Disease 2019 (COVID-19) may predispose patients to bacterial pulmonary infections
- Early reports have indicated widespread empiric antimicrobial usage in patients infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)[1]
- However, data regarding bacterial complications in patients with COVID-19 are limited and emerging

Objective

- To determine the rate of complication with bacterial pneumonia and identify demographics, comorbidities, or laboratory values associated with bacterial pneumonia

Methods

- **Design:** Retrospective cohort study
- **Inclusion Criteria:** All hospitalized patients diagnosed with COVID-19 based on detection of SARS-CoV-2 on RT-PCR from March 1, 2020 to May 10, 2020
- **Data Collection:** Retrospective data collection to identify demographics, comorbidities, or laboratory values that may help distinguish patients with bacterial pneumonia
- **Outcome:** Diagnosis of bacterial pneumonia based on sputum, tracheal aspirate, or lower respiratory tract cultures in a patient with increased secretions, ventilatory settings, or worsening opacity on chest x-ray
- **Statistical Analysis:** Fisher's exact test for categorical data; Student's t test to analyze differences between means

Results

99 hospitalized patients with COVID-19 → No pneumonia in 82 (83%)

→ Pneumonia in 17 (17%) →

Staphylococcus aureus: 8 (47%)
Enterobactericiae: 7 (41%)
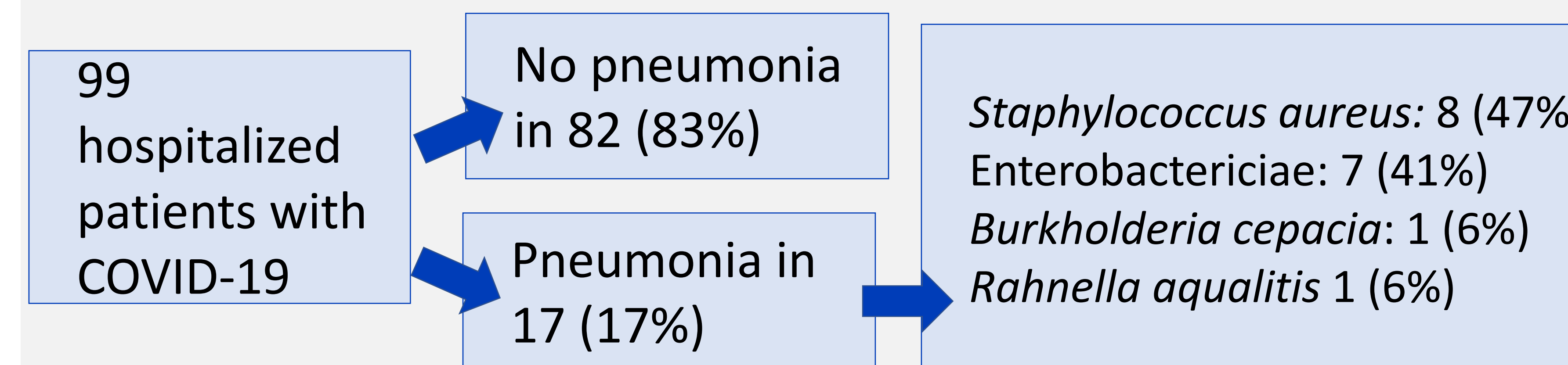*Burkholderia cepacia*: 1 (6%)
Rahnella aqualitis 1 (6%)

Figure 1. Complication with bacterial pneumonia in hospitalized patients with confirmed COVID-19

- Bacterial pneumonia diagnosed based on sputum, tracheal aspirate or lower respiratory tract cultures performed 8.9 ± 7.8 (mean ± SD) days from detection of SARS-CoV-2 on PCR

	No Bacterial Pneumonia (n=82)	Bacterial Pneumonia (n=17)	P-value
Age	58.0 ± 19.8	58.2 ± 18.6	0.97
Male	46 (56%)	9 (53%)	1.00
Smoking			0.59
Never Smoker	42 (51%)	10 (59%)	
Current Smoker	7 (9%)	0 (0%)	
Prior Smoker	13 (16%)	2 (12%)	
No Information	20 (24%)	5 (29%)	
Comorbidities			
Lung disease	9 (11%)	4 (24%)	0.23
Heart disease	12 (15%)	4 (24%)	0.47
Immunocompromised	12 (15%)	3 (18%)	0.72
Diabetes	23 (28%)	5 (29%)	1.00
ESRD	2 (2%)	0 (0%)	1.00
Hypertension	32 (39%)	10 (59%)	0.18
Intubation	20 (24%)	15 (88%)	<0.01
Vasopressor	19 (23%)	14 (82%)	<0.01
ICU Admission	30 (37%)	16 (94%)	<0.01
Laboratory (mean ± SD)			
Procalcitonin (ng/mL)	0.60 ± 0.74	2.99 ± 10.1	0.35
D-dimer (ng/mL)	675.7 ± 1174.8	1740.3 ± 2983.1	0.30
WBC (x 10^3/μL)	7.6 ± 4.0	7.6 ± 4.5	0.99
Lymphocyte count	1.0 ± 0.6	0.9 ± 0.6	0.46

Table 1. Characteristics of hospitalized patients with COVID-19 who develop complications with bacterial pneumonia

Conclusions

- Nosocomial and ventilator-associated pneumonia were commonly seen among hospitalized patients with COVID-19 requiring intubation, vasopressors, and intensive care admission
- Further work is necessary to determine if SARS-CoV-2 infection, independent of prolonged hospitalization and mechanical ventilation, increases one's risk of bacterial pneumonia
- With complications of bacterial pneumonia common among critically-ill patients infected with SARS-CoV-2, widespread antimicrobial usage may increase the selective pressure for antimicrobial resistance in this patient population

References

1. Stevens RW, Jensen K, O'Horo JC, Shah A. Antimicrobial Prescribing Practices at a Tertiary-Care Center in Patients Diagnosed with COVID-19 Across the Continuum of Care. Infect Control Hosp Epidemiol. 2020 Jul 24;1-4