Diminishing Returns, Increasing Risks: Impact of Antibiotic Duration of Therapy on Bacterial Respiratory Isolates in Hospitalized Patients during COVID-19

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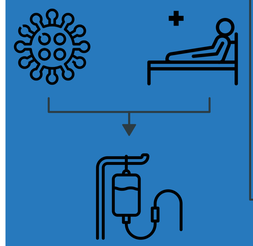
Does antimicrobial prescribing correlate with bacterial coinfection in hospitalized COVID-19 patients?

Hospitalized COVID-19 patients often received empiric antibiotics for presumed bacterial respiratory coinfections



Outcomes of Interest

1. **Antimicrobial use**
   - Days of therapy (DOT) during COVID-19 surge (March-May 2020) vs. 2018 & 2019
2. **Respiratory bacterial coinfection**
   - Multidrug resistant (MDR)
   - Community acquired (≤3 days)
   - Hospital acquired (>3 days)
3.

Methods

Hospital admission between March 1st to May 31st 2020

Overall
- ICD-10 COVID-19
- OR
- Positive SARS-CoV-2 nasopharyngeal PCR

Cultures
- Respiratory
- Infection onset per CDC NHSN surveillance definition
  - Community: ≤ 3 days
  - Hospital: > 3 days

-Microbiologic and antimicrobial information taken from data repository
-Multidrug-resistant Gram-negative rods (MDR GNR) per CDC NHSN definition

Outcomes of Interest

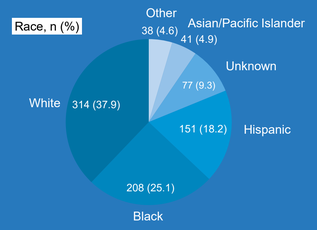
Descriptive
- Demographics
- Antimicrobial days of therapy (DOT) compared to previous years
- Organism(s) isolated

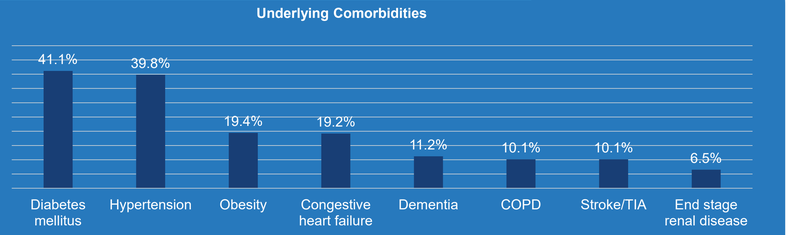
Sub-Analysis
- Case-control
- MDR GNR vs. other respiratory pathogens
- Antimicrobial exposure, odds ratio

Results

Demographics n=829

- Sex, male n (%): **410 (49.5)**
- Age, years, mean (SD): **64.9 (±17.9)**
- Hospital admission in the last 90 days, n (%): **112 (13.5)**



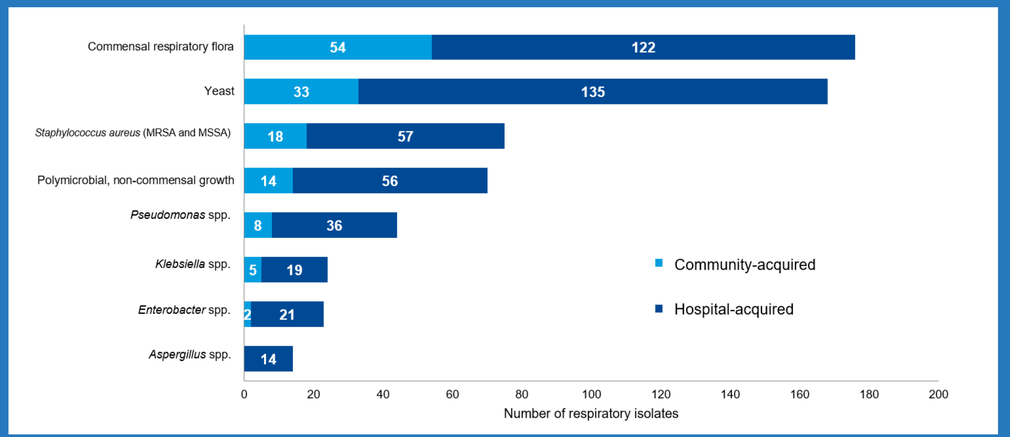


Clinical Outcomes

- Median length of stay, days (IQR): **6 (2-13)**
- Inpatient mortality/discharge to hospice, n (%): **171 (20.6)**
- *C. difficile* PCR positive during hospitalization, n (%): **29 (3.5)**

Microorganisms isolated from respiratory samples

- Patients with positive respiratory cultures: 196 (23.6%)



Results (continued)

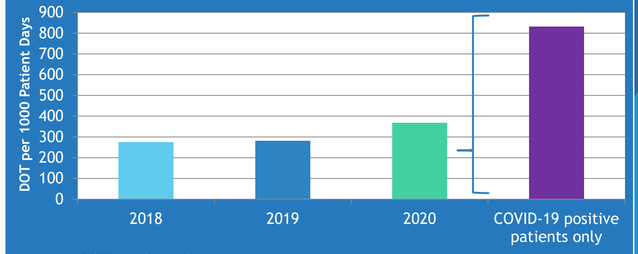
Antimicrobial Exposure During Hospitalization n=829

73% were prescribed antibiotics against respiratory pathogens

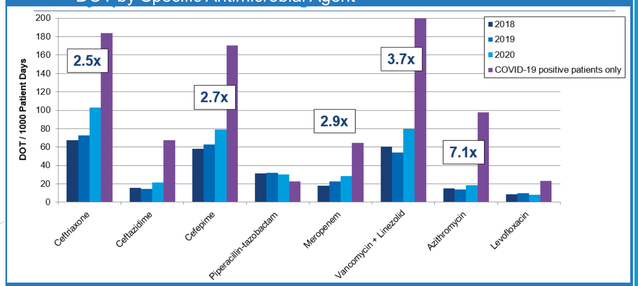
- 33% prescribed **ceftriaxone**
- 22% prescribed **antipseudomonal beta-lactams**
- 21% prescribed **vancomycin or linezolid**
- 21% prescribed **azithromycin**

Antimicrobial Utilization

March-May: 2018 vs 2019 vs 2020



DOT by Specific Antimicrobial Agent



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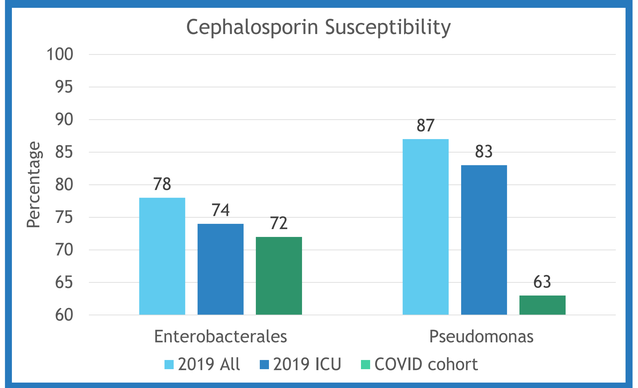
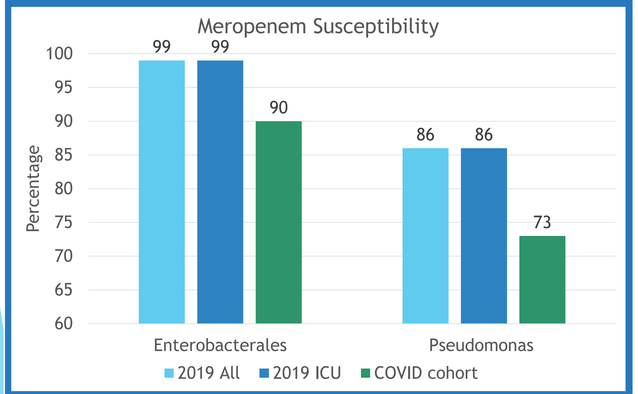
Resistance in Pseudomonas spp. (n=30) and Enterobacterales (n=50)





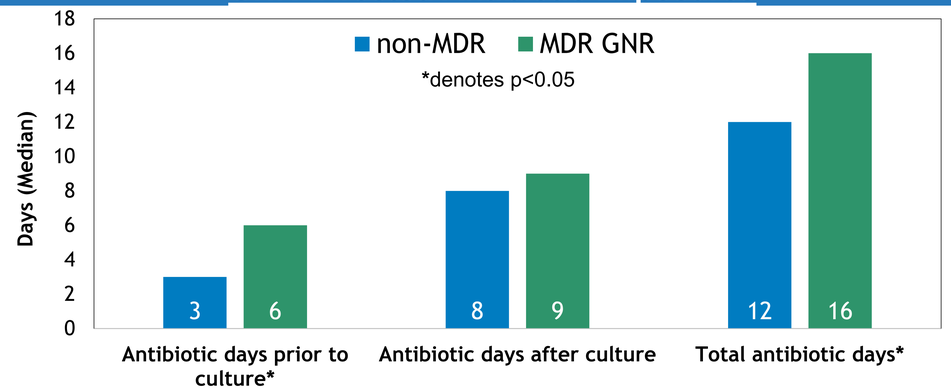
Case-Control Sub-Analysis

Population: hospitalized patients with organisms isolated in respiratory samples

Cases (n=30)
- COVID-19 positive
- MDR GNR in respiratory samples

Controls (n=96)
- COVID-19 positive and negative
- Other respiratory pathogens

GNR-Directed Antibiotic Exposures



(OR 1.065 [1.003-1.131])

Discussion

- Bacterial coinfection is uncommon upon presentation
- Antibiotic usage and DOT was substantially increased compared to prior years during the study period
- Each day of antibiotic use was associated with a 6.5% increased risk of MDR GNR isolation

Strengths and Limitations

- Large sample size
- Longitudinal DOT assessment
- Case-control sub-analysis

- Infection versus colonization
- Confounding by indication
- Survival bias

Future Direction

- Investigate the utility of rapid diagnostics for decision support
- Develop targeted interventions to limit antibiotic usage
- Compare MDR GNR isolation with other institutions

Questions? Contact Ryan Chapin rchapin@bidmc.harvard.edu