

Table 2: Readmission Diagnosis

Readmission Diagnosis – COVID-19 Related	Early n	Late n
Worsening COVID-19 pneumonia	8	0
COVID-19 pneumonia resolving	2	2
Secondary bacterial infections	1	0
Pulmonary embolism	1	0
Arterial thrombosis	0	1

Readmission Diagnosis – COVID-19 Unrelated	Early n	Late n
Infections	4	3
Gout	1	0
Atrial arrhythmia	0	2
Congestive Heart Failure	1	2
Ascites	0	1
Failure to thrive	1	1
Acute Kidney Injury	2	2

Table 3: Univariate and Multivariate Analysis of Readmissions

Univariate Analysis: Odds of Early Readmission				
Variable	OR	Lower CI	Upper CI	P Value
Methylprednisolone Given First Admission	1	0.075	13.367	1
Hours to First Methylprednisolone Dose	0.959	0.892	1.03	0.2508
Methylprednisolone Duration First Admission	0.901	0.633	1.284	0.5656
Age - 1 Year Increase	1.007	0.953	1.064	0.8062
Male Sex	0.533	0.076	3.756	0.528
Length of Stay Previously (Days)	1.07	0.841	1.361	0.583
CRP at First Discharge - 1 Point Increase	1.117	0.825	1.512	0.4751
Multivariate Analysis: Odds of Readmission For Worsening COVID-19 Pneumonia				
Variables	OR	Lower CI	Upper CI	P Value
CRP at Discharge - 1 Point Increase	1.226	0.678	2.215	0.5007
Methylprednisolone Duration - 1 Day Increase	1.361	0.595	3.115	0.4657
Age - 1 Year Increase	1.033	0.953	1.119	0.4318
Male Sex	0.138	0.004	4.695	0.2714
Length of Stay First Admission - 1 Day Increase	0.303	0.098	0.936	0.0381

**Conclusion:** Early MP in COVID-19 pneumonia was not associated with increased risk of early secondary bacterial infections in the readmitted patients. Optimal duration of MP in patients with COVID-19 pneumonia needs to be defined.

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**404. The occurrence of stroke in COVID-19**

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**Session:** P-12. COVID-19 Complications, Co-infections, and Clinical Outcomes

**Background:** Patient with COVID-19 may exhibit a wide array of neurologic manifestations, including stroke; in some cases, stroke is the presenting or predominant manifestation. The frequency of stroke in COVID-19 has varied greatly in previous reports, probably reflecting the intensity with which neurologic abnormalities have been sought. The great majority of stroke have been thought to be ischemic.

**Methods:** Review of data, case reports, and case series

**Results:** See table 1 for a summary of reported data on neurologic manifestations of COVID-19. When MRI has been done, the great majority of strokes have been shown to be ischemic. COVID-19 causes a generalized hypercoagulable state, and arterial thromboses have been recognized in other organs, as well, involving pulmonary, mesenteric and coronary arteries. Coronavirus infection causes an intense release of cytokines with widespread activation of the coagulation cascade. In addition, SARS-CoV-2 attaches to ACE 2 receptors on endothelial surfaces via the S (spike) protein and invades causing a localized inflammatory response, with a resulting increase in local thrombotic activity. Antiphospholipid antibodies are sometimes present. New data suggest possible role of alpha-defensin level in creation and prevention of disintegration of blood clots. To date, reports of neurologic disease are based on case series, so there is no way, at present, to calculate the frequency of neurologic complications of COVID-19. A systematic, prospective study focusing on neurologic examination supplemented by MRI in hospitalized patients would answer the question of the incidence of this complication, but logistical problems including patients' need for ICU care and concern for contagion resulting from sending patients out of the ICU for procedures mitigate against the likelihood of such a study being done.

**Conclusion:** We hypothesize that: (1) stroke occurs in COVID-19 more frequently than is recognized; (2) a hypercoagulable state with inflammation at the site of local invasion of vascular endothelial cells by SARS-CoV-2, perhaps with a role for

antiphospholipid antibodies all contribute to the pathogenesis of stroke; and (3) more liberal use of anticoagulation in COVID-19 cases should be considered.

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**405. Trend in blood culture results in Washington DC during and prior to Pandemic COVID-19**

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**Session:** P-12. COVID-19 Complications, Co-infections, and Clinical Outcomes

**Background:** The rate of bacterial and/or fungal infections among COVID-19 cases is reportedly low. Antimicrobial Stewardship Programs (ASPs) provide continuous surveillance of blood cultures to secure appropriate choice and duration of therapy. Comparing to historic data, we characterize our ASP experience in bacteremic surveillance during the COVID-19 pandemic.

**Methods:** Consecutive blood cultures at the Washington DC VA Medical Center were captured in an ASP-driven decision support software system (TheraDoc, Premier/DSS Inc) between Jan 1<sup>st</sup> 2018-May 31<sup>st</sup> 2020. In the setting of an established ASP, the organism positive cultures were reviewed over the first five months (Jan-May) of each of the three years collected. Results of cultures were characterized as either pathogenic gram positive (MSSA/MRSA/Enterococci/PSSP/PRSP/Strep sp.), pathogenic aerobic and anaerobic gram negative organisms and a skin contaminant-category (GPRs/skin flora/CNS).

**Results:** Over 3 yrs, 528 patients had 1464 positive cultures from among 8727 admissions, 83638 inpatient-days. The proportion of pathogenic GP bacteria and pathogenic GN bacteria were not statistically significantly different 38% (2018) vs 37% (2019) vs 39% (2020) and 33%, 31%, 27% respectively. There was slight trend in the increase of pathogenic GP 9.6 vs 9.5 vs 11.7 per 1,000 inpatient days and skin contaminant-category with 12.0 vs 11.0 vs 14.1 per 1,000 patient days from 2019 to 2020. We noted a dramatic shift in culture surveillance report during the peak COVID-infection rates (March-April), notable for several weeks of few to no culture positive results. When broken down by month, variability was noted (data not shown). COVID-19 infected patients represented 9.0% (7/78) of positive blood culture results in 2020 Jan-May, only 5.1% (4/78) were treated as non-contaminants and were related to indwelling catheters or urosepsis.

**Conclusion:** Overall and adjusted rates of the blood cultures sent during the pandemic months in 2020 were comparable to the comparative years. Surveillance revealed short term changes in patterns which may have reflected the pandemic induced changes to admissions. COVID-19 infected patients rarely experienced line and hospital acquired bacteremia/fungemia, most during the recovery period.

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**406. Utility of Tracheal Aspirates in Guiding Antibiotic Use in Mechanically Ventilated Patients with COVID-19**

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**Session:** P-12. COVID-19 Complications, Co-infections, and Clinical Outcomes

**Background:** In critically ill patients with COVID-19 it is difficult to determine the presence of bacterial co-infection. Many patients receive antibiotics until a bacterial infection can be ruled out. To minimize aerosolization of SARS-CoV-2, non-invasive sampling, such as endotracheal aspiration (ETA), is preferred over invasive techniques. The purpose of this study is to determine the diagnostic yield of ETA and effect of ETA on antibiotic management in patients with COVID-19.

**Methods:** This retrospective analysis included patients admitted to the intensive care unit (ICU) from March 1 to May 31, 2020 who tested positive for SARS-CoV-2. Patients who did not receive mechanical ventilation were excluded. Data were extracted from electronic medical records. When ETA was performed, records were manually reviewed to determine diagnostic yield and effect on antibiotic management. Diagnostic yield was defined as ETA result with a plausible respiratory pathogen in a quantity of moderate or many. Plausible respiratory pathogens exclude normal flora, yeast, coagulase-negative *Staphylococcus sp* and *Enterococcus sp*. The primary outcome is the frequency of initiation, change, no change, or discontinuation of antibiotics based on ETA results.

**Results:** 124 patients with COVID-19 were admitted to the ICU; 76 met inclusion criteria. The average age was 58 years and 75% were male. Hispanic or Latino ethnicity made up the majority of the patient population (63%). Antibiotics were administered to 97% of patients for a median of 11 days of therapy (IQR 7, 21). There were 100 ETAs performed on 55 patients for a diagnostic yield of 21%. ETA led to a change in antibiotic management 47% of the time it was performed. Antibiotic changes include de-escalation (29), discontinuation (7), escalation (6), and initiation (5).

Table 1. Demographics and Clinical Characteristics

	N=76
Age – yr, average ± SD	58 ± 15
Male – no. (%)	57 (75)
Race or ethnic group – no. (%)	
Hispanic or Latino	48 (63)
White	12 (16)
Black	11 (14)
Other	5 (7)
Body mass index, median (IQR)	30.6 (26.5, 37.3)
History of smoking – no. (%)	34 (45)
No. of coexisting conditions – no. (%)	
None	10 (13)
1	9 (12)
2 or more	57 (75)
Coexisting conditions – no. (%)	
Hypertension	44 (58)
Obesity	43 (57)
Diabetes	36 (47)
Chronic respiratory disease	25 (33)
Cardiovascular disease	12 (16)
Chronic kidney disease	6 (8)
Immunocompromised	5 (7)
Temperature (max), average ± SD	101.5 ± 1.8
White blood cell count (max), average ± SD	11.6 ± 5.8
Procalcitonin (max), median (IQR), n=64	0.77 (0.3, 1.8)
Length of hospitalization – d, median (IQR)	18 (14, 25)
Receipt of vasopressors – no. (%)	45 (59)
ARDS – no. (%)	55 (72)
Receipt of antibiotics – no. (%)	74 (97)
Days of therapy, median (IQR)	11 (7, 21)
In-hospital mortality – no. (%)	25 (33)

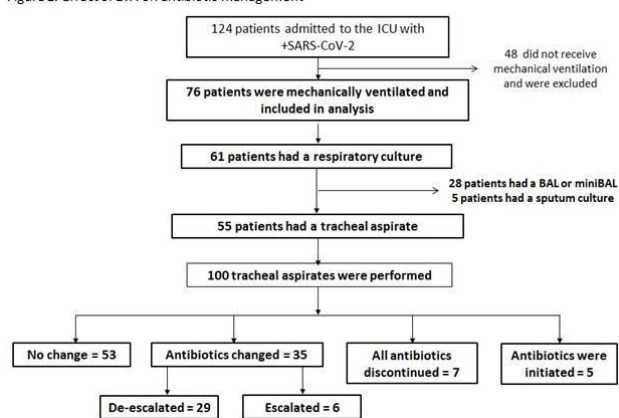
SD – standard deviation, IQR – interquartile range, ARDS – acute respiratory distress syndrome  
 Temperature (max), white blood cell count (max), procalcitonin (max) – maximum values within 24 hours of antibiotic initiation or ICU admission if no antibiotics were administered

Table 2. Tracheal Aspirate Results

	N=76
Tracheal aspirate diagnostic yield (n=100)	21
Tracheal aspirate led to a change in antibiotic management (n=100)	47
Respiratory culture – no. (%)	61 (80)
Tracheal aspirate	55 (72)
1 tracheal aspirate	27 (36)
2 tracheal aspirates	11 (14)
3 or more tracheal aspirates	17 (22)
BAL or mini BAL	28 (37)
Sputum	5 (7)
Pathogens <sup>1</sup>	
<i>Staphylococcus aureus</i> <sup>2</sup>	8
Methicillin-susceptible	6
Methicillin-resistant	1
<i>Klebsiella pneumoniae</i>	5
<i>Klebsiella oxytoca</i>	4
<i>Proteus sp</i>	4
<i>Klebsiella aerogenes</i>	3
<i>Pseudomonas aeruginosa</i>	3
<i>Streptococcus pneumoniae</i>	3
<i>Haemophilus influenzae</i>	2
Normal flora	31
Other <sup>3</sup>	6

<sup>1</sup>Not mutually exclusive and includes growth of any quantity  
<sup>2</sup>1 *Staphylococcus aureus* did not have susceptibilities performed due to low colony counts  
<sup>3</sup>Other includes 1 *Enterococcus sp*, 1 *Enterobacter cloacae*, 1 *E. coli*, 1 *Stenotrophomonas maltophilia*, 2 not otherwise specified lactose fermenting Gram-negative bacilli

Figure 1. Effect of ETA on antibiotic management



**Conclusion:** The diagnostic yield of ETA in mechanically ventilated patients with COVID-19 was low. Furthermore, ETA results led to a change in antibiotics less than half of the time. The use of ETA to diagnose bacterial co-infection and guide antibiotic therapy in patients with COVID-19 should be weighed against the risk of using a more invasive sampling technique vs the benefit of potential for increased diagnostic yield. Another conclusion may be to forgo ETA if the result is unlikely to change management.

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**407. Utilization of Blood Cultures, Risk factors and Outcomes of Bloodstream Infections in Patients Hospitalized with COVID-19**

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**Session:** P-12. COVID-19 Complications, Co-infections, and Clinical Outcomes

**Background:** During the coronavirus disease 2019 (COVID-19) surge, there was a sharp increase of blood cultures (BC) performed at Henry Ford Health System (HFHS). However, the epidemiology and outcomes of bloodstream infections (BSI) in COVID-19 patients (pts) remains undefined. We report the utilization of blood cultures, risk factors and mortality associated with BSI in a large cohort of COVID-19 pts.

**Methods:** A retrospective analysis was performed of all COVID-19 pts that had BC performed during hospitalization at HFHS, a 5-hospital system in southeast Michigan. BSI was defined using NHSN criteria. Demographics, comorbidities, severity of illness, and outcome of pts with and without BSI were compared.

**Results:** From 3/10/2020 to 4/28/2020, 2541 pts were hospitalized with lab-confirmed COVID-19. 1393 (55%) of these pts had BC performed and 80 (5.74%) met criteria for BSI. Of the 84 pathogens identified, *Staphylococcus aureus* was most common (Figure 1). As compared to 1313 COVID-19 pts without BSI, those with BSI were older (70.1 vs 64.5 years, P = 0.0024). Other factors significantly associated with BSI included chronic kidney disease, higher mSOFA score, ICU stay and mechanical ventilation (all P < 0.0001) (Table 1). Multivariate analysis revealed age (OR, 1.07 CI [1.06–1.08]), ICU stay (OR, 7.91 [CI: 5.75–10.87]) and mSOFA score (OR, 1.29 [CI: 1.13–1.47]) were independent risk factors associated with mortality. BSI was not associated with increased mortality (Table 3).

Table 1. Characteristics of COVID-19 Patients with BSI Compared to COVID-19 Patients without BSI

	COVID-19 pts with BSI (N=80)	COVID-19 pts without BSI (N=1313)	P value
Age – Mean (SD) 95% CI of Mean	70.1 (13.8) (67.1-73.2)	64.5 (15.9) (63.7-65.4)	0.0024
Male gender - N (%)	36 (45.0)	717 (54.6)	0.0941
Race/ethnicity - N (%)			0.3556
Black	51 (63.8)	726 (55.3)	
White	25 (31.3)	457 (34.8)	
Asian/Pacific Islander	1 (1.3)	21 (1.6)	
Other/Decline	3 (3.8)	109 (8.3)	
Body mass index (BMI) (N=271)	31 (9.8)	31.8 (8.4)	0.0935
Continuous – Mean (SD)			0.0841
BMI Categorical – Mean (SD)			
<18.5	3 (3.85)	20 (1.59)	
18.5-24.9	18 (23.1)	233 (18.5)	
25-29.9	26 (33.3)	337 (26.8)	
≥30	31 (39.7)	668 (53.1)	
Max mSOFA score (N=232) - Median (IQR)	(N=64) 6.5 (3-8.5)	(N=954) 4 (2-6)	<0.0001
Length of stay - Median (IQR)	12 (5.5-20)	8 (5-13)	0.0013
ICU admission - Median (IQR)	47 (58.8)	453 (34.5)	<0.0001
ICU length of stay - Median (IQR)	12 (5-20)	8 (4-13)	0.0558
Mechanical ventilation - Median (IQR)	43 (53.75)	351 (26.73)	<0.0001
Total ventilation days - Median (IQR)	10 (4-16)	8 (4-13)	0.3544
Receipt of steroids N (%)	50 (62.5)	932 (71)	0.1063
O2 saturation at presentation			0.2523
≥95	18 (22.5)	210 (16)	
90-94	32 (40)	664 (50.6)	
86-89	14 (17.5)	216 (16.5)	
≤ 85	16 (20)	223 (17)	
Co-morbidities – Mean (SD)			
Immunodeficiency	1 (1.25)	24 (1.8)	1.0000
Pulmonary disease	56 (70)	875 (66.7)	0.5356
Cardiac disease	8 (10)	130 (9.9)	0.9770
Chronic kidney disease	56 (70)	619 (47.1)	<0.0001
Chronic obstructive lung disease	15 (18.8)	198 (15.1)	0.3759
Hypertension	60 (75)	888 (67.6)	0.1700
Asthma	9 (11.3)	120 (9.4)	0.5272
Cancer	20 (25)	222 (16.9)	0.0636
Diabetes mellitus	44 (55)	513 (39.1)	0.0047
Central line Placement (N=52)	18 (22.5)	147 (11.2)	0.0024
Mortality	39 (48.8)	325 (24.8)	<0.0001