

BACKGROUND

- There are various therapies and treatment strategies employed to improve overall patient outcomes in COVID-19.
- Despite being a viral illness, patients hospitalized with COVID-19 often receive empiric antibiotics to treat suspected or possible bacterial coinfection, which is estimated to occur in <10% of patients.
- Unnecessary antibiotic usage can increase risk of drug adverse effects, antimicrobial resistance, and costs.
- Procalcitonin (PCT) is a polypeptide biomarker which is produced in large quantities in the body during bacterial infections.
- Serum concentrations of PCT >0.5 mcg/mL may indicate bacterial infection and warrant continuation of antibiotics.
- A prospective, single-center, cohort study found a mean reduction in antibiotic usage by 2 days in COVID-19 patients where PCT was used as an antibiotic de-escalation tool.
- Another single-center study measuring serial PCT measurements found that using PCT in combination with thorough clinical assessment is a safe, simple, and sustainable way of reducing antibiotic use in COVID-19 patients.

OBJECTIVE

- The objective of this retrospective study was to evaluate the association between PCT and the use of antimicrobials in patients with COVID-19.

METHODS

- This was an IRB-approved, single-center, retrospective, cohort study at an urban community teaching hospital.
- Inclusion criteria: patients ≥18 years old and admitted with confirmed COVID-19 infection with at least one initial PCT result (within 3 days of admission) from March 30, 2020, to March 30, 2021.
- Exclusion criteria: patients with positive COVID-19 result and/or initial PCT level >3 days after admission.
- Data collected from the electronic medical record included demographic data such as age, sex, and ethnicity, past medical history, Charlson Comorbidity Index, date of admission and discharge, duration of hospital stay, initiation of empiric antibiotics, time to initiation of empiric antibiotics, indication for empiric antibiotics, empiric antibiotic regimen, confirmation of bacterial co-infection, day from admission that antibiotics were stopped, proportion of cases where antibiotics were stopped within 48 hours of initial PCT, total days of inpatient antibiotic therapy, discharge disposition, need for mechanical ventilation, need for hemodialysis, and other baseline inflammatory markers including lactate dehydrogenase (LDH), C-reactive protein (CRP), ferritin, erythrocyte sedimentation rate (ESR), and d-dimer values.
- Primary outcomes: in-hospital mortality, days of antibiotic therapy, and length of hospital stay (LOS).
- Univariate analyses were utilized to assess for any significant differences in demographics based on predefined initial PCT groupings (< 0.25 ng/ml (group 1), 0.25-0.49 ng/ml (group 2), and ≥ 0.5 ng/ml (group 3)).
- Multivariate analyses were also performed to evaluate for any differences between initial PCT values and in-hospital mortality, LOS, and days of antibiotic therapy.

RESULTS

Table 1: Demographic and Clinical Characteristics Based on Initial PCT Grouping

Characteristic	PCT < 0.25 (Group 1)	PCT 0.25-0.49 (Group 2)	PCT ≥ 0.5 (Group 3)	p-value
Number of Patients	127 (63.5%)	31 (15.5%)	42 (21.0%)	-
Age (years) Mean (SD)	63.27 (17.46)	64.53 (17.12)	62.46 (17.84)	0.882
Male N (%)	62 (48.8%)	23 (74.2%)	28 (66.7%)	0.014
Ethnicity (Hispanic) N (%)	85 (66.9%)	23 (74.2%)	26 (61.9%)	0.706
Charlson Comorbidity Index Mean (SD)	3.12 (2.32)	3.32 (2.32)	3.52 (2.50)	0.610
Invasive Ventilation N (%)	13 (10.2%)	9 (29.0%)	8 (19.0%)	0.06
Hemodialysis N (%)	5 (3.9%)	3 (9.7%)	4 (9.5%)	0.135
True Positive Microbiology N (%)	20 (15.7%)	6 (19.4%)	7 (16.7%)	0.811
Empiric Antibiotic Therapy Initiated N (%)	126 (99.2%)	29 (93.5%)	41 (97.6%)	0.293
Antibiotics Stopped within 48hrs of Initial PCT N (%)	17 (13.6%)	1 (3.4%)	4 (9.8%)	0.330
LDH (Initial) Mean (SD)	445.04 (291.65)	507.27 (226.04)	445.32 (241.17)	0.518
CRP (Initial) Mean (SD)	82.52 (69.83)	170.15 (123.64)	112.31 (90.21)	< 0.001
Ferritin (Initial) Mean (SD)	853.18 (1126.91)	1133.70 (868.16)	1012.53 (1194.44)	0.399
ESR (Initial) Mean (SD)	70.65 (81.91)	98.80 (33.37)	56.93 (34.74)	0.018
d-dimer (Initial) Mean (SD)	1708.67 (4894.68)	2205.75 (6601.46)	734.87 (672.19)	0.397

Table 2: Clinical Outcomes Data Based on Initial PCT Grouping (Univariate Analysis)

Characteristic	PCT < 0.25 (Group 1)	PCT 0.25-0.49 (Group 2)	PCT ≥ 0.5 (Group 3)	p-value
Mortality N (%)	14 (11.0%)	8 (25.8%)	7 (16.7%)	0.191
Days of Antibiotic Therapy Mean (SD)	6.92 (5.23)	10.77 (13.65)	9.26 (15.12)	0.091
Hospital LOS (days) Mean (SD)	10.94 (9.38)	15.52 (16.20)	13.07 (18.41)	0.183

DISCUSSION

- At baseline, most patients were in group 1 suggesting absence of bacterial coinfection.
- Average age was similar and there were significant differences found in the proportion of male patients across the 3 PCT groups.
- A substantial proportion of patients were Hispanic (67%), which is an under-represented demographic that is well-represented in this study.
- All 3 PCT groups had comparable severity of illness at baseline.
- Need for hemodialysis was balanced, which is important given PCT is renally cleared and higher levels are expected in patients requiring renal replacement therapy.
- Most patients received empiric antibiotics with a much smaller proportion of patients having true positive microbiology.
- A greater proportion of patients in group 1 had antibiotics stopped within 48 hours of the initial PCT value. This result was not statistically significant (p=0.33), likely due to the absence of an institutional PCT protocol and individual prescriber variations.
- CRP and ESR were the only other inflammatory markers with significant differences found across the initial PCT groupings, although clinical impact is uncertain.
- Overall, there were no significant differences found in the outcomes of mortality, days of antibiotic therapy, and hospital LOS.
- Study limitations include small sample size, inherent selection bias due to study design, and lack of a PCT-based antibiotic stewardship protocol.
- Further studies are warranted in which a hospital PCT protocol is implemented, and patients are stratified into more specific groups at baseline to limit various confounding factors which may affect outcomes.

CONCLUSION

- The results of this retrospective study suggest that there is no significant association between initial PCT value and antimicrobial usage in patients admitted with COVID-19 at an urban community teaching hospital.

REFERENCES

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DISCLOSURES

Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.