Poster #230

Real World Experience with Procalcitonin Use for Lower Respiratory Tract Infections

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Abstract

Background: Evidence from several randomized controlled trials has shown that procalcitonin (PCT) can be used to safely decrease antibiotic use and guide appropriate duration of antibiotic therapy for lower respiratory tract infections (LRTIs). However, many of these trials were not conducted in the United States and there is little data regarding real-world use of PCT.

Methods: In 2011, our 650-bed academic medical center implemented PCT testing with education and algorithm for interpretation. A retrospective cohort study was conducted assessing PCT algorithm compliance and outcomes for patients with compliant vs. non-compliant therapy from 7/2013 to 6/2014. Inpatients ≥ 19 years old with a diagnosis of LRTI based on ICD-9 codes and clinical criteria and ≥ 1 PCT level were included. Patients were excluded if assigned to a surgical service, received a cytokine stimulating agent, or had a past medical history of cystic fibrosis, small cell lung cancer, or thyroid cancer. Compliance with the initial PCT algorithm was assessed for all patients. Outcomes, including antibiotic utilization, hospital length of stay, in-hospital mortality, 30-day readmission, and antibiotic adverse events were compared for compliant vs. non-compliant therapy.

Results: A total of 153 patients were included. Mean age was 64 years, 51% were male, and 84% were on a medicine team. The most common diagnosis was COPD exacerbation (50%) and pneumonia (43%). Most patients (74%) only had one PCT level ordered. Initial algorithm compliance was 44% with non-compliance primarily due to initiation or continuation of antibiotics with a low PCT. For patients with a low initial PCT, algorithm compliance was associated with shorter duration of therapy (1.3 vs. 5.9 days, p=0.0001) and fewer number of antibiotics prescribed (1 vs. 2, p=0.0001). There were no significant differences in clinical outcomes or antibiotic adverse events between groups.

Conclusions: In patients with an initially low PCT, algorithm compliance was associated with a significant decrease in antibiotic use without compromising clinical outcomes.

Introduction

- PCT is a biomarker upregulated in the presence of bacterial infections
- Multiple randomized controlled trials support using PCT algorithms to guide antibiotic therapy for LRTIs but real world data for this use is lacking

Methods

Study Design

- Retrospective, observational, cohort study from July 2013 to June 2014
- Antibiotic use, PCT utilization, and clinical outcomes compared based on overall compliance to initial and follow up PCT algorithms
  - Overall compliant = followed initial and/or follow up algorithm
  - Overall non-compliant = did not follow one or both algorithms

Patient Population

- Inclusion: ≥19 years, LRTI diagnosis, ≥ 48 hrs antibiotics, ≥1 PCT level
- Exclusion: surgical/trauma service, cystic fibrosis, received cytokine stimulating agents, small cell lung cancer, medullary thyroid cancer

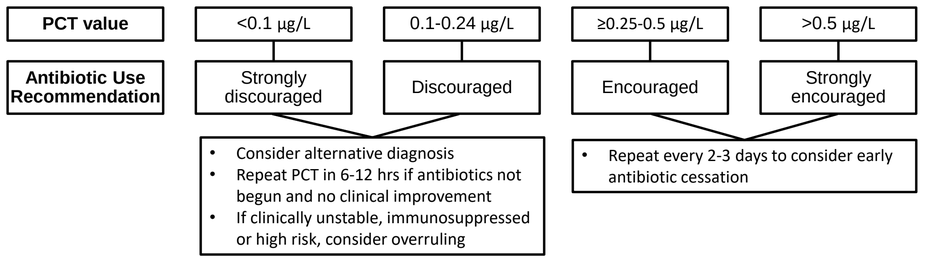
Patient Population

Demographics	Overall (n=316)	Compliant (n=129)	Non-Compliant (n=187)	P-value
Mean age, years (range)	64 (20-98)	61 (20-98)	65 (22-96)	0.028
Male, n (%)	151 (48)	68 (53)	83 (44)	0.169
Clinical diagnosis, n (%)				
• Pneumonia	150 (48)	69 (54)	81 (43)	0.086
• COPD	151 (48)	53 (41)	98 (52)	0.052
• Acute bronchitis	15 (5)	7 (5)	8 (4)	0.789
Primary service, n (%)				
• Medicine	277 (88)	108 (84)	169 (90)	0.084
• Oncology	18 (6)	10 (8)	8 (4)	0.221
ID consulted, n (%)	39 (12)	17 (13)	22 (12)	0.730
Co-morbidities	**Overall** (n=316)	**Compliant** (n=129)	**Non-Compliant** (n=187)	**P-value**
ESRD, n (%)	14 (4)	12 (9)	2 (1)	0.001
COPD, n (%)	195 (62)	66 (49)	129 (71)	<0.001
Asthma, n (%)	92 (29)	39 (29)	53 (29)	1.000
Charlson, mean (range)	2.1 (0-10)	2.2 (0-10)	1.9 (0-9)	0.104
CURB-65, mean (range)	1.0 (0-3)	1.0 (0-3)	1.0 (0-3)	0.966
ICU admission, n (%)	37 (12)	17 (13)	20 (11)	0.594

Procalcitonin Algorithm

Algorithm Compliance	n (%)
Overall compliant	129 (41)
1 PCT level, compliant with initial algorithm	100 (78)
≥2 PCT levels, compliant with initial *and* follow up algorithms	29 (23)
Overall non-compliant	187 (59)
1 PCT level, non-compliant with initial algorithm	146 (78)
≥2 PCT levels, non-compliant with initial *or* follow-up algorithms	15 (8)
≥2 PCT levels, non-compliant with *both* algorithms	26 (14)

LRTI Initial Antibiotic Use Algorithm



Results

PCT Utilization

No significant difference in PCT utilization (1.4 vs. 1.3 levels, P=0.583)

Overall Antibiotic Utilization

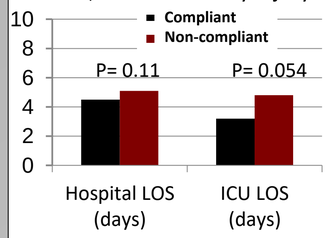
Outcome	Comp. (n=129)	Non-Comp. (n=187)	P-value
Total DOT, mean (range)	4.5 (0-26)	5.7 (0-22)	0.018
IV DOT, mean (range)	3.3 (0-24)	3.6 (0-20)	0.576
PO DOT, mean (range)	1.2 (0-10)	2.1 (0-12)	<0.001
# Abx, mean (range)	1.8 (0-6)	2.0 (0-5)	0.071

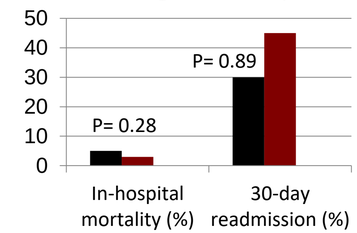
Antibiotic Utilization Based on Initial Low PCT Value

Outcome	Comp. (n=56)	Non-Comp. (n=177)	P-value
Total DOT, mean (range)	1.2 (0-10)	5.8 (1-22)	<0.001
IV DOT, mean (range)	1.1 (0-10)	3.6 (0-20)	<0.001
PO DOT, mean (range)	0.2 (0-3)	2.2 (0-12)	<0.001
# Abx, mean (range)	0.8 (0-3)	2.1 (1-5)	<0.001

Clinical Outcomes

No significant differences in *C. difficile* infection, antibiotic adverse events, or acute kidney injury based on overall algorithm compliance





Conclusion

- Overall compliance to initial PCT algorithm was <50%
- Adherence to PCT guidance for low values reduced exposure to antimicrobial agents without compromising clinical outcomes

References

1. Markanday A. Acute Phase Reactants in Infections: Evidence-Based Review and a Guide for Clinicians. *Open Forum Infect Dis*. 2015;2(3):ofv098.
2. Schuetz P, et al. Procalcitonin for diagnosis of infection and guide to antibiotic decisions: past, present and future. *BMC Medicine*. 2011;9:107.
3. Hayashi Y, Paterson DL. Strategies for reduction in duration of antibiotic use in hospitalized patients. *Clin Infect Dis*. 2011;52:1232-40.
4. Schuetz P, et al. Effect of procalcitonin-based guidelines vs standard guidelines on antibiotic use in lower respiratory tract infections. *JAMA*. 2009;302:1059-66.