Impact of Procalcitonin on Antibiotic Duration for Community Acquired Pneumonia at Burnaby Hospital

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Background

- Pneumonia is the 4th leading cause of inpatient hospitalizations in Canada
- Challenges in diagnosis of bacterial pneumonia lead to inappropriate use of antibiotics in 40 to 60 percent of lower respiratory tract infections (LRTI)
  - Overuse of antibiotics contributes to increase drug resistance, unnecessary adverse effects and increase cost
- Existing biomarkers, such as C-reactive protein (CRP), demonstrate poor sensitivity or specificity in guiding antibiotic therapy for community acquired pneumonia (CAP)
  - Procalcitonin (PCT) is the prohormone of calcitonin that is elevated in bacterial infections and suppressed in viral infections
  - Data from randomized controlled trials supports the use of PCT as diagnostic aid to discontinue antibiotic therapy in CAP
  - PCT, an relatively expensive test compared to CRP, has been available at Burnaby Hospital (BH) since October 2016

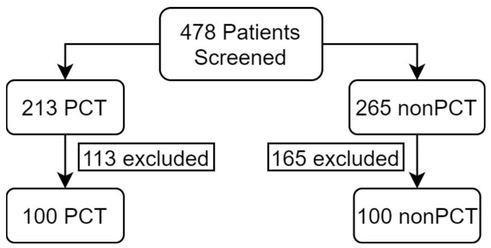
Objectives

To assess the impact of PCT on antibiotic duration, in-hospital mortality, 30-day readmission and length of hospital stay at BH

Methods

- ***Design:*** Retrospective cohort, single center, quality improvement study
- ***Inclusion Criteria:*** adult in-patients admitted to BH for CAP between January 1st, 2017 and December 31st, 2018
- ***Exclusion Criteria:*** ICU, admission to hospital in last 96 hours, severe immunocompromised status, concomitant non-respiratory infection, paraneoplastic syndrome, small cell lung cancer, comfort care, surgery/trauma/burns in last 7 days, lung empyema or abscess, end stage liver disease (Child-Pugh class C), end stage renal disease (eGFR <15mL/min), bronchiectasis, patients who leave against medical advice
- ***Sample Size:*** 100 patients in each cohort
- ***Intervention:*** Procalcitonin level ordered
- ***Primary Outcome:*** Duration of antibiotic therapy
- ***Secondary Outcomes:*** In-hospital mortality, 30-day readmission, length of hospital stay (LOS)
- ***Statistical Analysis***: Mann Whitney U test for duration of antibiotic therapy and LOS. Chi square test for in-hospital mortality and 30-day readmission. Multivariate linear or logistic regression for significant outcomes.

Results



Main reasons for exclusion:
- ICU
- Concomitant infection
- Recent admission
- Comfort care

Figure 1. Patient Screening

	Procalcitonin (N=100)	No Procalcitonin (N=100)
Mean age ± SD – years	81.2±12.9	73.2±16.8
Male sex – no. (%)	56 (56)	57 (57)
Comorbidities – no. (%)		
Diabetes	27 (27)	30 (30)
Coronary Artery Disease	25 (25)	20 (20)
Hypertension	67 (67)	55 (55)
COPD	27 (27)	24 (24)
Home oxygen	3 (3)	1 (1)
Cancer	21 (21)	13 (13)
Liver Disease	3 (3)	4 (4)
Chronic Kidney Disease	29 (29)	19 (19)
Immunocompromised	2 (2)	4 (4)
Congestive Heart Failure	25 (25)	19 (19)
Antibiotics within 90 days – no. (%)	29 (29)	39 (39)
Mean CRB-65 score	1.5	1.2

Table 1. Baseline Characteristics

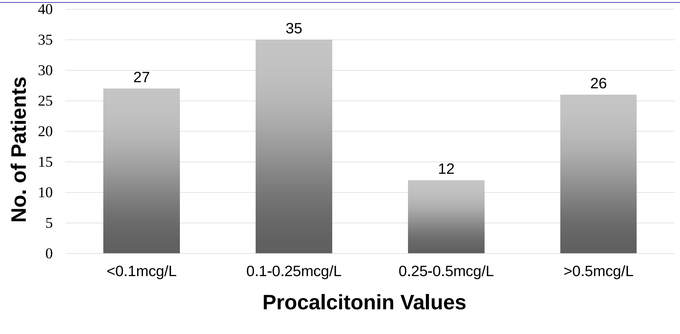


Figure 2. Procalcitonin Distribution

	Procalcitonin (N=100)	No Procalcitonin (N=100)	P-value
Primary Outcome			
Median duration of antibiotics – days (IQR)	6 (5-7)	7 (6-8)	0.07
Secondary Outcomes			
In-Hospital Mortality – no. (%)	7 (7)	7 (7)	1.00
30-day readmission – no. (%)	9 (9)	10 (10)	0.81
Median length of hospital stay – days (IQR)	7.5 (5-12.8)	6 (4-9)	0.001*

Table 2. Outcomes * statistically significant difference, p<0.05

Model Summary

Model	R Square	Adjusted R Square	R Square change	Sig. F Change
1	0.063	0.053	0.063	0.002
2	0.069	0.055	0.006	0.253

Model 1 Predictors: Sex, Age. Model 2 predictors: Sex, Age, Procalcitonin Level Present.

Table 3. Multivariate Regression Model predicting Length of Stay

Discussion

- Despite 62% of patients with PCT levels <0.25mcg/L where antibiotics would be discouraged, there was no statistically significant difference seen in the primary outcome of duration of antibiotic therapy
  - Patient's clinical status was often cited as the reason for continuing antibiotics in the context of a low PCT level
  - Clinicians may be ordering PCT without planning on using its result to change or discontinue antibiotic therapy
- PCT was not a significant predictor of any secondary outcomes

Limitations

- Retrospective study design
- Limited generalizability: single site, highly selected sample, small sample size
- Incidence of ADRs not collected therefore unable to assess if any impact or significance

Conclusions + Next Steps

- Utilization of procalcitonin was not associated with a decrease in duration of antibiotic therapy
- Findings warrant future review of site-specific adherence to procalcitonin-guided antimicrobial therapy and development of quality improvement initiatives
  - Create a checklist for when to order PCT and guidance for interpreting results

Acknowledgements

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References

- Available upon request