

Procalcitonin as an Early Marker of the Need for Invasive Respiratory or Vasopressor Support in Adults With Community-Acquired Pneumonia

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e-Appendix 1. Supplemental Results: PCT in viral and bacterial CAP

The association of PCT with IRVS was evaluated separately in 192 (10.9%) patients with bacterial detections and 412 (23.4%) patients with viral detections. Patients with mixed bacterial-viral detections (2.9%), fungal/mycobacterial detections (0.9%) detections, and no detections (62.2%) were not included in this sub-analysis. Overall, PCT was higher in patients with bacteria (median: 1.14 ng/ml; IQR: 0.19, 8.09 ng/ml) than viruses (median: 0.09 ng/ml; IQR: < 0.05, 0.56 ng/ml) ($p < 0.01$). IRVS was more common in the bacterial subgroup (17.2%) compared to the viral subgroup (5.1%) ($p < 0.01$). Within both the viral and bacterial subgroups, higher PCT was associated with increased risk of IRVS (Table 2 in main paper).

Of the 192 patients with bacterial detections, 74 had positive blood cultures (bacteremia) and 118 did not have positive blood cultures (109 negative blood cultures; 9 blood cultures not done). Bacteremic patients had higher PCT (median 7.69 ng/ml; IQR: 1.23, 27.26 ng/ml) than patients with bacterial pneumonia without bacteremia (median 0.29 ng/ml; IQR: 0.07, 2.08 ng/ml). Areas under the ROC curve for IRVS among patients with bacteremia and those with bacterial pneumonia without bacteremia were 0.57 (95% CI: 0.42, 0.72) and 0.67 (95% CI: 0.50, 0.84), respectively (e-Table 4).

e-Table 1. American Thoracic Society Minor Criteria for Severe Community-Acquired Pneumonia.

Criteria

Respiratory rate ≥ 30 /minutePartial pressure of oxygen/ fraction of inspired Oxygen (PaO₂/FiO₂ ratio) ≤ 250

Multilobar infiltrates

Confusion

Blood urea nitrogen (BUN) ≥ 20 mg/dLWhite blood cell count (WBC) < 4000 cells/mm³Platelet count $< 100,000$ cells/mm³Temperature $< 36^{\circ}$ C

Hypotension requiring aggressive fluid resuscitation

(operationalized as a systolic blood pressure < 90 mm Hg)

e-Table 2. Patient characteristics of included patients and patients from the Etiology of Pneumonia in the Community (EPIC) study cohort excluded due to no procalcitonin measurement at the time of hospital presentation.

Characteristic	Included Patients (n = 1770)	Excluded Patients (n = 550)
Age - median years (IQR)	57 (47, 70)	60 (46, 72)
Female sex - n (%)	905 (51.1)	285 (51.8)
Race and ethnicity - n (%)		
Non-Hispanic White	783 (44.2)	303 (55.1)
Non-Hispanic Black	693 (39.2)	205 (37.3)
Hispanic	215 (12.2)	28 (5.1)
Other	79 (4.5)	14 (2.5)
Age Groups - n (%)		
18-44 years	396 (22.4)	128 (23.3)
45-64 years	766 (43.3)	198 (36.0)
65-79 years	373 (21.1)	144 (26.2)
≥ 80 years	235 (13.3)	80 (14.6)
Chronic Medical Conditions - n (%)		
Asthma	459 (25.9)	139 (25.3)
Chronic Obstructive Lung Disease	367 (20.7)	162 (29.5)
Cancer	320 (18.1)	96 (17.5)
Chronic Heart Failure	318 (18.0)	122 (22.2)
Diabetes Mellitus	438 (24.8)	159 (28.9)
Chronic Kidney Disease	271 (15.3)	95 (17.3)
Chronic Liver Disease	93 (5.3)	37 (6.7)
Immunosuppression	294 (16.6)	87 (15.8)
HIV infection	47 (2.7)	21 (3.8)
Current Smoker	463 (26.2)	144 (26.2)
Pneumonia Severity Index Risk Class		
I	339 (19.2)	90 (16.4)
II	474 (26.8)	143 (26.0)
III	345 (19.5)	119 (21.6)
IV	462 (26.1)	144 (26.2)
V	150 (8.5)	54 (9.8)
Pneumonia Etiology - n (%)		
Bacterial	192 (10.9)	66 (12.0)
Viral	412 (23.3)	121 (22.0)
Bacterial-Viral Mixed	51 (2.9)	8 (1.5)
Fungal	15 (0.9)	2 (0.4)
Unknown	1100 (62.2)	353 (64.2)
Invasive Respiratory or Vasopressor Support within 72 hours - n (%)	115 (6.5)	24 (4.4)
Any ICU Admission - n (%)	397 (22.4)	101 (18.4)
Hospital Length of Stay - median days (IQR)	3 (2, 6)	3 (2, 6)
In-hospital Death - n (%)	37 (2.1)	15 (2.7)

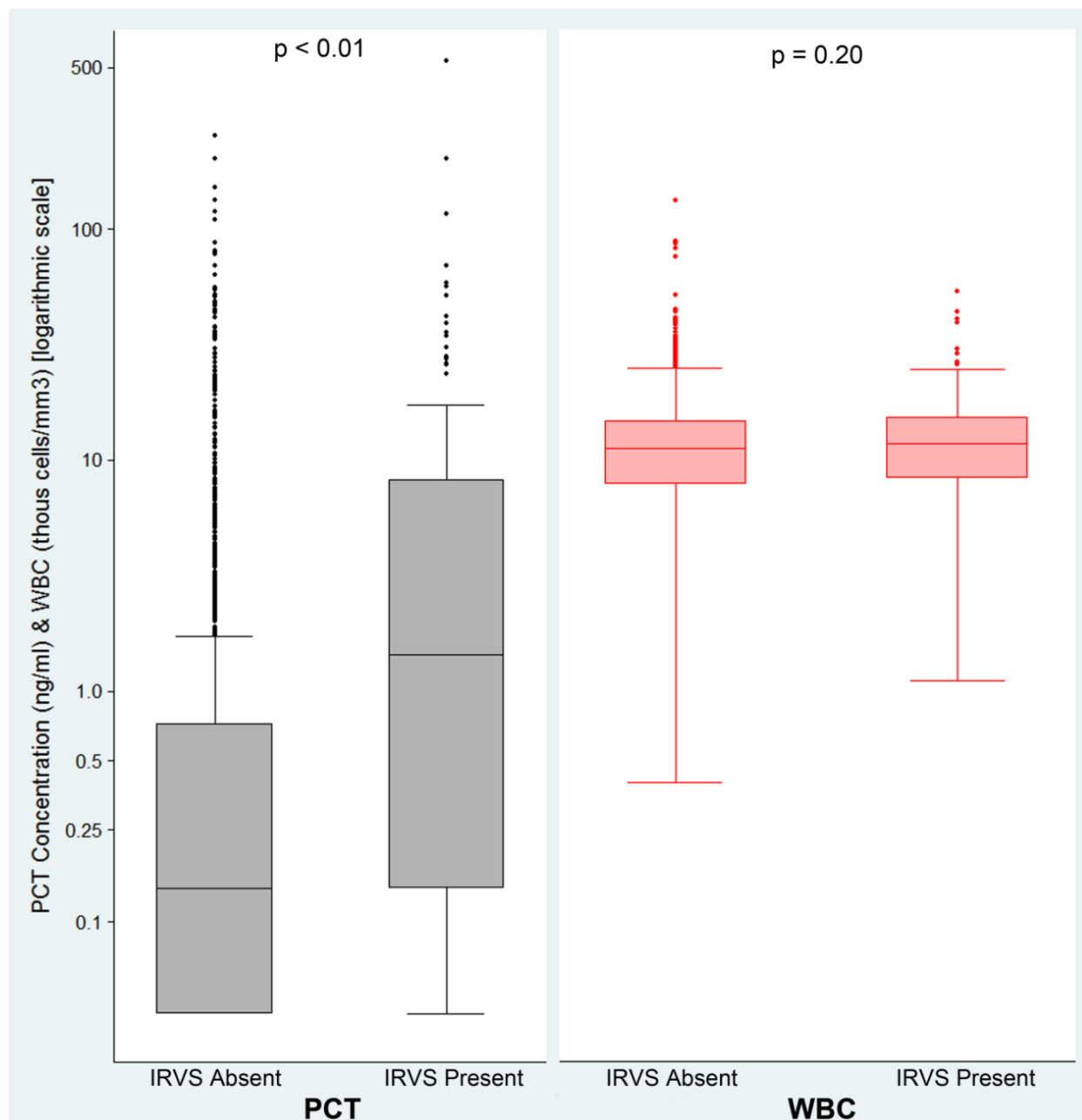
e-Table 3. Percentage of patients who experienced invasive respiratory or vasopressor support (IRVS) according to four selected procalcitonin (PCT) cut-points, representing the 50th, 75th, 90th, and 95th percentile of PCT concentration in the study population.

PCT cut-point, ng/ml (percentile)	Below PCT cut-point		Above PCT cut-point	
	n (%)	IRVS, n (%)	n (%)	IRVS, n (%)
0.15 (50 th percentile)	870 (49)	30 (3.5)	900 (51)	85 (9.4)
0.83 (75 th percentile)	1327 (75)	52 (3.9)	443 (25)	63 (14.2)
4.98 (90 th percentile)	1593 (90)	77 (4.8)	177 (10)	38 (21.5)
15.96 (95 th percentile)	1681 (95)	95 (5.7)	89 (5)	20 (22.5)

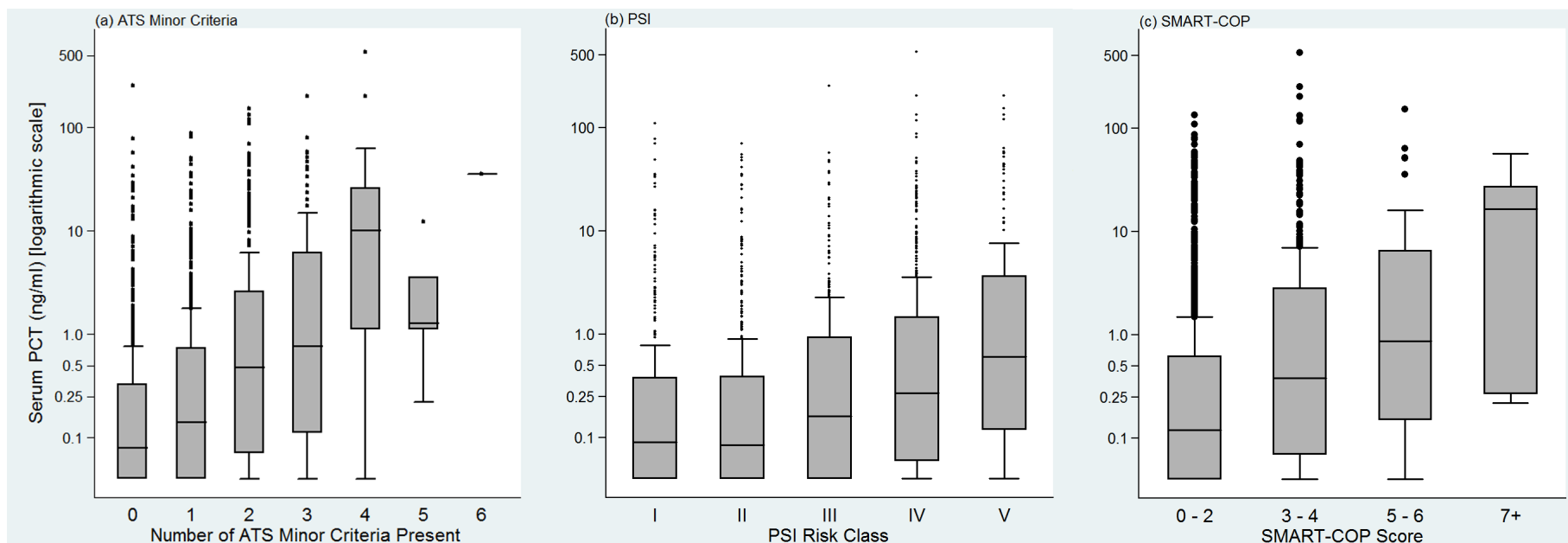
e-Table 4. Serum procalcitonin (PCT) concentration among patients who did and did not receive intensive respiratory or vasopressor support (IRVS) within 72 hours after stratifying the bacterial CAP population into bacteremic and non-bacteremic sub-groups.

Population	n	IRVS, n (%)	Serum PCT, Median (IQR) [ng/ml]		AUC (95% CI)
			IRVS Present	IRVS Absent	
Bacterial CAP	192	33 (17.2%)	5.62 (1.10, 27.26)	0.73 (0.14, 6.22)	0.68 (0.61, 0.75)
Bacterial Etiology Subgroups					
Bacteremia	74	19 (25.7%)	9.54 (1.43, 51.42)	7.16 (0.95, 23.39)	0.57 (0.43, 0.72)
No Bacteremia	118	14 (11.9%)	3.15 (0.19, 5.79)	0.27 (0.06, 1.56)	0.67 (0.50, 0.84)

e-Figure 1. Box and whisker plots of serum procalcitonin (PCT) concentration and white blood cell count (WBC) in patients who did (n = 115) and did not (n = 1655) require invasive respiratory or vasopressor support (IRVS). The center of each box plot represents the median, with the box denoting the interquartile range (IQR), the upper and lower whiskers representing 1.5-times the IQR above and below the 75% percentile and 25% percentile, respectively, and dots representing outliers beyond the whiskers. The y-axis is on a logarithmic scale.



e-Figure 2. Box plots of serum procalcitonin (PCT) concentration by (a) number of American Thoracic Society (ATS) minor criteria; (b) Pneumonia Severity Index (PSI) Risk Class; and (c) SMART-COP score.



e-Figure 3. Box plots of serum procalcitonin (PCT) concentration in patients who did and did not require invasive respiratory or vasopressor support within 72 hours (IRVS), stratified by: (a) ATS minor criteria; (b) pneumonia severity index (PSI); and (c) SMART-COP.

