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Procalcitonin (PCT)

Safely reduce antibiotic exposure

Algorithms for antibiotic stewardship in LRTI and sepsis

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Clinical suspicion of LRTI

WHEN TO **START** ANTIBIOTICS?

Procalcitonin (PCT) Testing

PCT <0.25 µg/L

Bacterial infection unlikely

ABx NOT recommended

PCT ≥0.25 µg/L

Bacterial infection likely

ABx recommended

PCT measurement every 24–48 h recommended for monitoring

WHEN TO **STOP** ANTIBIOTICS?[1]

Clinical improvement

Decline in PCT ΔPCT ≥80%

OR

PCT <0.25 µg/L

Clinical suspicion of Sepsis

WHEN TO **START** ANTIBIOTICS?

Procalcitonin (PCT) Testing

Immediate start of empiric ABx because of high risk

PCT <0.5 µg/L

Systemic bacterial infection unlikely

Repeat PCT measurement after 6–24 h

PCT <0.5 µg/L

Discontinue ABx in patients who subsequently show limited clinical evidence of infection and low PCT level

PCT ≥0.5 µg/L

Systemic bacterial infection likely

PCT measurement every 24–48 h recommended for monitoring

WHEN TO **STOP** ANTIBIOTICS?[2]

Clinical improvement

Decline in PCT ΔPCT ≥80%

OR

PCT <0.5 µg/L

LRTI Lower Respiratory Tract Infection **ABx** Antibiotics

The PCT reference ranges are a valuable aid for the clinician but they should always be interpreted in context of the patient's clinical condition. PCT concentrations in blood are elevated in clinically relevant bacterial infections and continue to rise with the increasing severity of the disease. However, as an expression of individually different immune responses and different clinical situations, the same focus of infection may be associated with varying individual elevations in PCT concentrations. Antibiotic treatment should be started/continued on suspicion of infection, particularly in high-risk patients.

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PCT reference ranges for differential diagnosis of **Lower Respiratory Tract Infections**[3,4]

PCT [µg/L]	Interpretation
<0.1	**Indicates absence of bacterial infection*** Use of antibiotics strongly discouraged, also in the presence of impaired pulmonary reserve in AECOPD
≥0.1 – <0.25	**Bacterial infection unlikely** The use of antibiotics is discouraged
≥0.25 – <0.5	**Bacterial infection possible** Advice to initiate antimicrobial therapy
≥0.5	**Suggestive of the presence of bacterial infection** Antibiotic treatment strongly recommended

* PCT levels may not be elevated in patients infected by certain atypical pathogens, such as *Chlamydophila pneumoniae* and *Mycoplasma pneumoniae*.[5]

PCT reference ranges for diagnosis of **Systemic Bacterial Infection/Sepsis**[6–8]

Sepsis and septic shock were categorized according to the criteria of The Third International Consensus Definition for Sepsis and Septic Shock.[9]

PCT [µg/L]	Interpretation
<0.5	**Local bacterial infection possible, systemic infection unlikely** Low risk for progression to severe systemic infection with organ failure (sepsis). **Caution:** PCT levels below 0.5 µg/L do not exclude an infection, because localized infections (without systemic signs) may be associated with such low levels. If the PCT measurement is done very early after bacterial insult (<6 hours), values may still be low. In this case, PCT should be re-assessed 6–24 hours later.
≥0.5 – <2	**Systemic bacterial infection possible, but various other conditions are known to induce PCT as well**[10] Moderate risk for progression to sepsis. The patient should be closely followed-up both clinically and by re-assessing PCT within 6–24 hours.
≥2	**Systemic bacterial infection likely, unless other causes are known**[10] High risk for progression to sepsis or septic shock.

In order to assess treatment success and to support a decision to discontinue antibiotic therapy, follow-up samples should be tested once every 24–48 hours.

References: 1. Schuetz et al., BMC Med 2011 Sep 22; 9: 107. **2.** de Jong et al., Lancet Infect Dis 2016; 3099: 1–9. **3.** Christ-Crain et al., Lancet 2004; 363: 600–607. **4.** Schuetz et al., JAMA 2009; 302(10): 1059–1066. **5.** Krüger and Welte, Expert Rev of Respir Med 2012; 6(2): 203–214. **6.** Mueller et al., Crit Care Med 2000; 28(4): 977–983. **7.** Harbarth et al., Am J Respir Crit Care Med 2001; 164(3): 396–402. **8.** Brunkhorst et al., Int Care Med 2000; 26: S148–152. **9.** Singer et al., JAMA 2016; 315(8): 801–810. **10.** Meisner M. Procalcitonin – Biochemistry and Clinical Diagnosis. Bremen 2010.

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