Procalcitonin Protocol for Adult Lower Respiratory Tract Infections (LRTI)

This protocol is intended to serve as a guide for procalcitonin (PCT) ordering and to aid in decision making on antibiotic therapy for patients with community-acquired pneumonia (CAP), acute bronchitis, and acute exacerbation of chronic obstructive pulmonary disease (AECOPD).

PCT results should always be interpreted in the context of the clinical status of the patient and other laboratory results. Additionally, decisions regarding antibiotic therapy should not be based solely on PCT concentrations.[1]

- Serial PCT measurements provide more insight to help aid in decisions about antibiotic effectiveness and duration.
- To assess treatment success and support a decision to discontinue antibiotic therapy, follow up samples should be tested once every 1 to 2 days, based upon clinician discretion and considering the patients' evolution and progress.[2]

PCT FACTS

- In the presence of a bacterial infection, PCT levels will begin to increase in the first 3 to 6 hours after the onset of infection. The levels will continue to rise rapidly, reaching a peak at 12 to 24 hours. The half-life of PCT is approximately 24 hours.[3]
- Viral infections do not usually induce a significant PCT response (values < 0.5 µg/L).

IMPORTANT CONSIDERATIONS WHEN INTERPRETING PCT RESULTS

PCT levels may not be elevated in patients infected by certain atypical pathogens, such as *Chlamydophila pneumoniae* and *Mycoplasma pneumoniae*.[4]

There are situations and conditions where PCT can be elevated by non-infectious causes. These include, but are not limited to: [3,5,6,7]

- Patients experiencing major trauma and/or recent surgical procedure including extracorporeal circulation or burns.
- Patients under treatment with OKT3 antibodies, OK-432, interleukins, TNF-alpha and other drugs stimulating the release of pro-inflammatory cytokines or resulting in anaphylaxis.
- Patients diagnosed with active medullary C-cell carcinoma, small cell lung carcinoma, or bronchial carcinoid.
- Patients with acute or chronic viral hepatitis and/or decompensated severe liver cirrhosis (Child-Pugh Class C).
- Patients with prolonged or severe cardiogenic shock, prolonged severe organ perfusion anomalies or after resuscitation from cardiac arrest.
- Patients receiving peritoneal dialysis or hemodialysis treatment.
- Patients with biliary pancreatitis, chemical pneumonitis or heat stroke.
- Patients with invasive fungal infections (e.g. candidiasis, aspergillosis) or acute attacks of *Plasmodium falciparum* malaria.
- Neonates during the first 72 hours of life.

PCT PROTOCOL ORDERS

☐ **Draw initial PCT level upon suspicion or confirmation of LRTI**. [Insert your hospital's instructions here. For example: *Notify MD of all results if patient NOT on antibiotics.*]
Refer to *Initial PCT Level Algorithm* below for clinical decision support regarding PCT level.

☐ **If Initial PCT level<0.25 µg/L:** [Insert your hospital's instructions here. For example: *Repeat PCT level in X hours if suspicion of bacterial infection remains, despite initial negative PCT result; notify MD of all results.*]

If Initial PCT level ≥ 0.25 µg/L: [Insert your hospital's instructions here. For example: *Repeat PCT level on day X and on day X from initial PCT draw.]*
Refer to *Repeat PCT Level Algorithm* below for clinical decision support regarding PCT level.

INITIAL PCT LEVEL ALGORITHM[1]

PCT Result	< 0.1 µg/L	0.10 to <0.25 µg/L	0.25 to <0.50 µg/L	≥ 0.50 µg/L
Interpretation	Antibiotic therapy strongly discouraged.	Antibiotic therapy discouraged.	Antibiotic therapy encouraged.	Antibiotic therapy strongly encouraged.
Follow-up	Antibiotic therapy should be considered regardless of PCT result if the patient is clinically unstable, is at high risk for adverse outcome, has strong evidence of bacterial pathogen, or the clinical context indicates antibiotic therapy is warranted. If antibiotics are withheld, reassess if symptoms persist/worsen and/or repeat PCT measurement within 6 to 24 hours.		To assess treatment success and support a decision to discontinue antibiotic therapy, follow up samples should be tested once every 1 to 2 days, based upon physician discretion taking into account patient's evolution and progress.[2] Antibiotic therapy may be adjusted using the Antibiotic Discontinuation Algorithm.	

REPEAT PCT LEVEL ALGORITHM

PCT Result	< 0.10 µg/L	0.10 to<0.25 µg/L	0.25 to <0.50 µg/L	≥ 0.50 µg/L
Interpretation	*Insert your hospital's recommendation.*	*Insert your hospital's recommendation.*	*Insert your hospital's recommendation.*	*Insert your hospital's recommendation.*
Follow-up	*Insert your hospital's recommendation.* *Consider repeating: "Antibiotic therapy should be considered regardless of PCT result if the patient is clinically unstable, is at high risk for adverse outcome, has strong evidence of bacterial pathogen, or the clinical context indicates antibiotic therapy is warranted.* *If antibiotics are withheld, reassess if symptoms persist/worsen and/or repeat PCT measurement within 6 to 24 hours."*		*Insert your hospital's recommendation.* *Consider repeating: "In order to assess treatment success and to support a decision to discontinue antibiotic therapy, follow up samples should be tested once every 1 to 2 days, based upon physician discretion taking into account patient's evolution and progress.[5]* *Antibiotic therapy may be adjusted using the Discontinuation Algorithm."*	

ANTIBIOTIC DISCONTINUATION ALGORITHM[1]

Antibiotic therapy may be discontinued if current PCT is <0.25 µg/L or if the ΔPCT > 80%.

- Peak PCT: Highest observed PCT concentration.
- Current PCT: Most recent PCT concentration.
- ΔPCT: Calculate by using the following equation:

$$\triangle PCT = \frac{PCT_{Peak} \square - PCT_{current} \square}{PCT_{Peak} \square} \times 100\%$$

Antibiotic therapy may be continued based upon other clinical findings, such as apparent progression on chest X-ray or ongoing/increasing toxicity.

If clinical picture has not improved and PCT remains high, re-evaluate and consider treatment failure or other causes.

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1 B·R·A·H·M·S GmbH (part of Thermo Fisher Scientific), B·R·A·H·M·S PCT sensitive KRYPTOR® Instruction for Use (Version 19.0us) [Internet]. 2018. Available from: https://assets.thermofisher.com/TFS-Assets/CDD/Package-Inserts/IFU-825-PCT-sensitive-KRYPTOR-HN-CUS-0888-R19-EN-US-USA-19-EN-US.pdf.
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