VCMC/SANTA PAULA HOSPITAL CLINICAL PRACTICE GUIDELINE
Procalcitonin Algorithm for Guidance in Antibiotic Therapy Decisions in Respiratory Tract Infections & Sepsis

The contents of this clinical practice guideline are to be used as a guide. Healthcare professionals should use sound clinical judgment and individualize patient care. This CPG is not meant to be a replacement for training, experience, CME or studying the latest literature and drug information.

A. Algorithm for nonpneumonic upper and/or lower resp. tract infections (URI, bronchitis, etc) in primary care and emergency department (ED) settings.

PCT result	≤0.10 ng/ml	<0.25 ng/ml	≥0.25 ng/ml	>0.50 ng/ml
Recommendation Regarding use of Abx:	Strongly discouraged	Discouraged	Encouraged	Strongly encouraged
Overruling The algorithm	Consider use of antibiotics if patient is clinically unstable, has strong evidence of pneumonia, is at high risk (ie. COPD GOLD III-IV) or needs hospitalization; can repeat in 4-6 hrs.			
Follow-up	If no improvement, clinician to consider Starting antibiotics.		Reevaluation as appropriate	

B. Algorithm for pneumonic infections in hospital and ED settings.

PCT result	≤0.10 ng/ml	<0.25 ng/ml	≥0.25 ng/ml	>0.50 ng/ml
Recommendation Regarding use of Abx:	Strongly discouraged	Discouraged	Encouraged	Strongly encouraged
Overruling The algorithm	Consider alternative diagnosis, or Abx if patient is clinically unstable, is at high risk for adverse outcome (eg. PSI classes IV-V, immunosuppression) or has strong evidence of a bacterial pathogen.			
Follow-up	Reassess patient's condition and recheck PCT level after 6 to 12 hours if admitted. Follow up as appropriate if patient not admitted			

C. Algorithm for sepsis in inpatient and intensive care unit settings.

PCT result	<0.25 ng/ml	<0.50 ng/ml	≥0.50 ng/ml	>1.0 ng/ml
Recommendation Regarding use of Abx patients	Strongly discouraged	Discouraged	Encouraged	Strongly encouraged
Overruling the algorithm.	Empirical antibiotic therapy recommended in all patients with clinical suspicion of bacterial infection.			
Follow-up	Repeat PCT in 6-12 hours if abx not begun and suspicion for bacterial infection is high.		Reassess patient's condition and recheck PCT level every 1-2 days to consider cessation of ABX. (see algorithm D)	

D. Algorithm for evaluation of cessation of ABX based on PCT level in septic patients.

PCT result	<0.25 ng/ml or drop by >90%	<0.50 ng/ml or drop by >80%	≥0.50 ng/ml	>1.0 ng/ml
Recommendation Regarding use of Abx	Cessation of Abx strongly encouraged	Cessation of Abx encouraged	Cessation of Abx discouraged	Cessation of Abx strongly discouraged
Overruling the algorithm	Consider continuation of Abx if patient is clinically unstable.			
Follow-up	Reevaluation as appropriate; recheck PCT every 1-2d		Recheck PCT every 1-2 days A failure of PCT to fall is consistent with inadequate "source control" and/or inappropriate abx coverage.	

***CESSATION OF THERAPY BASED ON PCT LEVELS REQUIRES ATTENDING PHYSICIAN AUTHORIZATION**

Approvals:
Antimicrobial Stewardship Committee 9/2016
Medicine/ED/Surgery: 10/2016
MEC: 11/2016

Procalcitonin algorithm for guidance in antibiotic therapy decisions in respiratory tract infections and sepsis

1) OVERVIEW: Procalcitonin (PCT) has been evaluated as a biomarker to assist the clinician in the diagnosis and treatment of bacterial infections. It has been studied most thoroughly for lower respiratory tract infections and sepsis.

- It is an amino acid precursor of calcitonin in which under normal circumstances is produced by thyroid C-cells. Serum concentrations are normally < 0.05ng/ml. In circumstances of systemic inflammation, particularly bacterial infections, PCT is produced in large quantities by many body tissues. It is detectable within 2-4 hours and peaks within 6-24 hours. Levels are not elevated in pure viral infections.
- Levels parallel the severity of the inflammatory insult or infection and individuals with more severe diseases have higher levels. Furthermore, PCT has some utility as a prognostic indicator with higher serum concentrations related to risk of mortality.
- Production is not impaired by neutropenia or other immunosuppressive states.
- PCT has some advantages over other biomarkers used in common clinical practice such as C-reactive protein (CRP) and white blood cell (WBC) count. The advantages include: increased specificity for bacterial infections, the rapidity of its rise after an insult, excellent correlation with severity of disease and the rapid decline with control of infection.

PCT monitoring has been shown to decrease antibiotic exposure and antibiotic associated adverse events in respiratory tract infections without worsening of clinical outcomes.

In septic patients, PCT serial monitoring protocols have been shown to reduce antibiotic treatment duration and exposure without harm to patients.

Current literature limits widespread use to assessing antibiotic regimens in pneumonia and sepsis.

2) ROLE IN THERAPY TO ASSIST IN DECISION MAKING:

- Differentiation of bacterial versus viral respiratory tract infection.
- Determination of antibiotic treatment length in respiratory infections and sepsis.
- Monitoring response to anti-infective therapy (source control) in sepsis and bacterial pneumonia.
- Diagnosis, risk stratification and monitoring of sepsis and septic shock.
- May assist in diagnosing bacterial infection in neutropenic patients.
- May assist in diagnosing septic arthritis (vs non septic)
- May assist in differentiating bacterial meningitis and viral meningitis

3) LIMITATIONS OF PCT

PCT MAY BE FALSELY ELEVATED IN THE FOLLOWING CONDITIONS:

- Newborns (<48-72 hours; after 72 hours, interpret levels as usual)
- Massive stress (severe trauma, surgery, cardiac shock, burns within the first 72 hours, after 72 hours, interpret levels as usual). In absence of infection, levels trend down after inciting event.
- Treatment with agents that stimulate cytokines (OKT3, anti-lymphocyte globulins, alemtuzumab, IL-2, granulocyte transfusion).
- Malaria and some fungal infections.
- Prolonged, severe cardiogenic shock or organ perfusion abnormalities.
- Acute graft vs. host disease.
- Medullary thyroid tumors and small cell lung CA (paraneoplastic production of PCT).
- ESRD/HD
- Pancreatitis due to sterile necrosis (but can also indicate a secondary bacterial infection).

PCT MAY NOT RISE IN THE FOLLOWING CONDITIONS:

- Localized bacterial diseases (skin abscess, osteomyelitis, etc.)
- Infections caused by organisms that lack a cell wall (Mycoplasma, Chlamydia, etc)

4) CONCLUSION:

PCT CAN BE USED TO ASSIST CLINICIANS IN DIAGNOSING BACTERIAL INFECTIONS AND DETERMINING LENGTH OF ANTIBIOTIC THERAPY BUT ANY DECISION SHOULD NOT BE BASED SOLELY ON LEVELS.

ALWAYS CONSIDER THE PATIENT'S CLINICAL CONDITION AND AN ID CONSULT

***References available on Antimicrobial Stewardship Website**

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