Pharmacist-Driven Procalcitonin Protocol

Procalcitonin (PCT) is a precursor to calcitonin which is normally produced by the thyroid; however, under systemic inflammatory conditions (especially associated with systemic bacterial infection) much larger quantities are produced in many body tissues. Because of PCT’s specificity for bacterial infection numerous studies have evaluated its use as a tool to help guide antibiotic therapy and treatment response.

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<tr>
<th>Advantages of PCT</th>
<th>Limitations of PCT</th>
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<td>• Much more specific to bacterial infection than other tests (e.g. CRP); PCT is typically not elevated in viral or other infections or generalized inflammation.</td>
<td>• May be falsely elevated in the following:</td>
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<td>• Rapid response to bacterial infection</td>
<td>o Newborns (&lt;72hrs old)</td>
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<td>o Detectable within 2-4 hours and peaks within 6-24hrs</td>
<td>o Trauma, surgery, cardiac shock, burns</td>
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<td>o Levels often decrease rapidly as infection subsides (useful to assess abx regimens)</td>
<td>o Treatment with agents which stimulate cytokines (OKT3, anti-lymphocyte globulins, alemtuzumab, IL-2, granulocyte transfusion)</td>
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<td>• Correlates well with severity of infection (i.e. higher PCT indicates worse infection)</td>
<td>o Malaria and some fungal infections</td>
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<td>• May be useful as prognostic indicator (i.e. very high levels can indicate higher risk of mortality)</td>
<td>o Acute graft Vs host disease</td>
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<td>• Not impacted by immunosupression or anti-inflammatory agents</td>
<td>o Medullary thyroid tumors and small cell lung CA</td>
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<td>o ESRD/HD</td>
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• Current literature limits widespread use to assessing antibiotic regimens in pneumonia and sepsis.

• **PCT can be used to assist clinicians in diagnosing bacterial infections but antibiotic therapy should not be based solely on PCT levels. Always consider the patient’s clinical condition.**

Protocol:
Pharmacists may order PCT levels for patients meeting the below inclusion/exclusion criteria as deemed necessary to monitor antibiotic regimens. The below algorithms will be used as a guide and results will be discussed with and/or made available to the attending provider(s) to optimize antibiotic regimens. Pharmacists will not make clinical decisions or initiate changes to patient care without consent from the attending provider.

• **Inclusion criteria:** Lower respiratory tract infections (pneumonia, COPD exacerbations, bronchitis), sepsis (SIRS, sepsis, severe sepsis, septic shock) regardless of source

• **Exclusion criteria:** ESRD/HD, trauma, post-surgery, **cardiac** shock, pancreatitis, neoplasm of the thyroid, small cell lung CA, neonates (<72hrs), recent immunotherapy (IVIG)

Updated by Justin Jellison, PharmD
Approved by ASP Committee, PT&T
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**Lower Respiratory Tract Infections:**

**Initial PCT draw (diagnosis):** Order STAT before or after initial antibiotic dose(s)

- **PCT <0.1ng/mL**
  - Antibiotics strongly discouraged
  - Consider alternative diagnosis
  - Repeat PCT in 6-12hrs if abx not begun and no clinical improvement (PCT response to infection may be delayed)
  - Consider abx if clinically unstable or immunosuppressed

- **PCT 0.1-0.24ng/mL**
  - Antibiotics discouraged

- **PCT >=0.25-0.5ng/mL**
  - Antibiotics encouraged

- **PCT >0.5ng/mL**
  - Antibiotics strongly encouraged
  - Repeat every 2-3 days to re-evaluate antibiotic regimen (see algorithm below)

Follow up PCT Monitoring: Repeat level on days 1, 3, and 6 following initial draw

- **PCT <0.1ng/mL** OR drop by >90%*
  - Cessation of abx strongly encouraged
  - If PCT rising or not decreasing consider need to broaden abx coverage or differential diagnosis

- **PCT 0.1-0.24ng/mL** OR drop by >90%*
  - Cessation of abx encouraged

- **PCT >=0.25-0.5ng/mL**
  - Cessation of abx discouraged

- **PCT >0.5ng/mL**
  - Cessation of abx strongly discouraged

*percent decrease from maximum

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**Sepsis**

**Initial PCT draw (diagnosis):** Order STAT before or after initial antibiotic dose(s)

- **PCT <0.5ng/mL**
  - Low to moderate risk for progression to severe disease/severe sepsis
  - Systemic infection less likely with lower value
  - Repeat PCT in 6-12hrs if abx not begun

- **PCT 0.5-<2ng/mL**
  - Antibiotics encouraged

- **PCT >=2-10ng/mL**
  - Antibiotics strongly encouraged

- **PCT >10ng/mL**
  - PCT 2- < 10: High risk for progression to severe sepsis
  - PCT >=10: High likelihood of severe sepsis or septic shock
  - Antibiotics should still be considered if high suspicion of infection/immunosuppression

**Follow up PCT Monitoring:** Repeat level up to every 24 hours

- **PCT <0.25ng/mL**
  - Cessation of abx strongly encouraged

- **PCT 0.25-0.49ng/mL OR drop by >=90%**
  - Cessation of abx encouraged

- **PCT >=0.5ng/mL AND decrease by <90%**
  - Cessation of abx discouraged

- **PCT >=0.5ng/mL AND rising OR not decreasing**
  - Cessation of abx strongly discouraged
  - PCT rising or not decreasing by 10% per day is a poor prognostic indicator: consider need to broaden abx coverage.

*percent decrease from maximum

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References
5. Stolz, D et al. Antibiotic Treatment of Exacerbations of COPD a Randomized, Controlled Trial Comparing Procalcitonin-Guidance withstandard Therapy