BAPTIST HEALTH

**Antimicrobial Stewardship System Subcommittee**

# MRSA Nasal Swabs and Procalcitonin Guidance

MRSA nasal swabs and procalcitonin are both helpful markers when used in patients that have a probable diagnosis of pneumonia. Updated literature has provided evidence for expanding the use of MRSA nasal swabs to indications that fall outside of pneumonia. They can both be used as tools to direct antibiotic therapy and whether or not it is necessary. The goal of this document will be to provide guidance when ordering MRSA nasal swabs and procalcitonin on patients to help determine antibiotic therapy selection and duration.

## MRSA Nasal Swabs

MRSA nasal swabs are highly sensitive rapid diagnostic tests. Recent literature has suggested these nasal swabs retain their high negative predictive value (NPV) when used for disease states outside of pneumonia, with reported NPVs ranging from 92-99%. Moreover, new literature suggests that results of this rapid diagnostic can be expected to retain their high NPV for up to 14 days. The high NPV is beneficial as this allows for rapid de-escalation of anti-MRSA agents. It should be noted that a positive MRSA Nares result has a poor positive predictive value (PPV), meaning that the patient should not be presumed to have a true MRSA infection and a positive test alone does not warrant the initiation of anti-MRSA therapy.[21-23]

## Procalcitonin

Procalcitonin levels can be used concomitantly with other diagnostic factors to discriminate between a viral or bacterial infection. During an inflammatory process, procalcitonin is produced by two main mechanisms: directly by lipopolysaccharide or by toxic metabolites produced by microbes or indirectly by inflammatory mediators. When a patient is septic, the bacteria induce an inflammatory state resulting in an increase in procalcitonin. A higher procalcitonin is more closely correlated to a typical bacterial infection. Procalcitonin drawn while an infection is still in its initial stage (<6 hours from onset) may not be detectable and cause a falsely low reading of <0.5ng/mL. If a procalcitonin level results as <0.5ng/mL, the level was drawn at < 6 hours, and the patient is still suspected to have pneumonia the level should be repeated. Overall, procalcitonin declines by 50% every 1-1.5 days after reaching peak concentrations with appropriate antimicrobial therapy.

Procalcitonin trending down over the course of 4 days can indicate the resolution of a bacterial infection and be used as a tool to direct therapy. Several studies have been published demonstrating that if antibiotics are withheld for a procalcitonin of <0.1-0.25 ng/mL there are no adverse outcomes defined as mortality, days with health impairment, hospital length of stay, etc. More recent studies have now shown a decrease in mortality when procalcitonin is used to guide discontinuation of antibiotics.

Some limitations of procalcitonin use can occur in patients that have had recent severe trauma, burns, surgery, prolonged cardiogenic shock, autoimmune disorders or severe pancreatitis due to the systemic inflammation induced by these major stressors. If a patient is in acute renal failure or has baseline renal dysfunction, procalcitonin may be falsely elevated due to prolonged elimination.

## MRSA Nasal Swab Ordering

Inclusion/exclusion criteria for ordering MRSA Nasal swab:

- Initiated on anti-MRSA therapy for indications including pneumonia, bone and joint, skin and soft tissue, and intra-abdominal (although anti-MRSA agents not typically recommended) infections
- Do not have an abscess which is presumed to be contributing to infectious presentation
- Do not have a positive culture for MRSA, including MRSA nasal swab, within previous 7 days
- For patients that have received nasal decolonization during hospitalization
    - Mupirocin: One study showed the NPV in the group receiving mupirocin before the MRSA screen was 95.2% and after the screen was 99%; -3.8% (90% CI -7.8% - 0.2%; p=0.31)
    - 62% Ethyl Alcohol: No clinical data is available; although alcohol only has a transient antibacterial effect requiring more frequent dosing. Recommend to collect MRSA PCR at least 12 hours following application of ethyl alcohol.

If the patient meets the above criteria, providers may order or pharmacists may order MRSA nasal swab per policy (if not already ordered) within 72 hours of anti-MRSA therapy initiation per the "Lab Ordering by Pharmacists" policy.

If the nasal swab returns and is **negative,** pharmacists may then recommend to the provider or the provider may proceed with below:

- Discontinue or de-escalate from anti-MRSA therapy to another antibiotic to appropriately treat the suspected or identified source of infection as the clinical picture necessitates.

## Procalcitonin Ordering

Identify and evaluate whether a patient:

- Is within the first 24 hours with clinical suspicion of pneumonia
- Has any risk factors (see table 1 risk factors for falsely elevated procalcitonin for more details) for an increased procalcitonin aside from pneumonia
    - If risk factors are identified, adjust evaluation accordingly

If the patient meets the above criteria, provider may order or pharmacists may order per policy (if not already ordered) per the "Lab Ordering by Pharmacists" policy:

- An initial procalcitonin level
- Follow table below for monitoring and follow up

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**Table 1. Procalcitonin Monitoring Guidance**

| PCT ≤0.25 ng/L | PCT ≥ 0.25-0.5 ng/L |
|---|---|
| • **Recommend discontinuation of antibiotics to the provider**<br>• **Do not recommend initiation of antibiotics**<br>If patient is clinically unstable due to infectious causes, then continuation of antibiotics will likely be necessary and repeat procalcitonin should be considered | • **Recommend starting antibiotics for pneumonia, if clinically appropriate**<br>• **Continue appropriate antibiotics for pneumonia** |
| If patient is clinically unstable due to infectious causes, then continuation of antibiotics will likely be necessary<br>• Recheck procalcitonin in 24 hours<br>• If it has increased to ≥ 0.25 ng/L **follow algorithm on right**<br>• If it remains ≤0.25 ng/L, consider recommending discontinuation of antibiotics | Follow-up:<br>• Repeat procalcitonin in 1-2 days<br>• If procalcitonin decreases by 80% after the first 4 days or when PCT is ≤ 0.25 ng/L **Recommend discontinuation of antibiotics** |
| **Risk factors for falsely elevated procalcitonin:<br>• Acute renal failure, chronic kidney disease, liver failure, severe trauma, burns, surgery, prolonged cardiogenic shock, autoimmune disorders, or severe pancreatitis<br>o Indications such as pancreatitis and prolonged cardiogenic shock can cause increased levels >2-10<br>o Indications such as renal dysfunction will only cause a mild increase | |

*If procalcitonin was drawn prior to peak (24 hours), need to re-order level in order to see if level has increased as it approached the peak, if clinically appropriate

** **If patient's baseline procalcitonin is falsely elevated (see risk factors above), then monitoring for a >80%** reduction is recommended for therapy guidance

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