Clinical Insights

When Can a MRSA Nares Swab Guide Antibiotic Stewardship?
What the Nose Knows

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Clinicians treating infections in the hospital often face uncertainty about when coverage for methicillin-resistant *Staphylococcus aureus* (MRSA) is warranted. Although MRSA infections are associated with significant mortality,[1] anti-MRSA therapy in hospitalized patients is frequently excessive and suboptimal; prescribing patterns are often discordant with practice guidelines[2] or final culture results.[3] Strategies to rapidly de-escalate unnecessary MRSA coverage (often intravenous vancomycin) could minimize potential harms, including antimicrobial resistance, nephrotoxic effects, and increased pharmacy monitoring costs.[1]

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The MRSA nares swab, whether based on polymerase chain reaction or culture, can rapidly identify patients colonized with MRSA.[1] This information may support early tailoring of antibiotics, curbing overuse of vancomycin and other anti-MRSA agents. However, the utility of the nares swab depends on several factors, including MRSA prevalence, which varies with the type of infection, as well as clinical features, such as illness severity. Here, we review how the swab may be used alongside disease prevalence and clinical factors to determine when MRSA coverage is needed for common inpatient infections.

8Community-Acquired Pneumonia

The prevalence of MRSA in community-acquired pneumonia (CAP) is low, ranging from 7% to 13%.[4] Due to this low likelihood of disease, MRSA coverage is not routinely warranted in most patients. The Infectious Diseases Society of America recommends empirical MRSA coverage only in certain at-risk patients, including those with prior detection of MRSA in respiratory cultures or those who have severe disease and recent hospitalization with exposure to intravenous antibiotics.[5] In these more vulnerable patients where empirical MRSA coverage is reasonable, clinicians may use the MRSA nares swab to safely discontinue MRSA coverage if results of the test return negative.

There is robust evidence to support using the nares swab in this manner. In a 2018 meta-analysis,[4] the swab's negative predictive value (NPV) exceeded 98%. However, this excellent NPV was dependent on low MRSA prevalence, as the 2 are inversely correlated with one another.[1] MRSA prevalence in CAP from this meta-analysis was only 7% to 13%.[4] In settings with higher prevalence and/or clinical findings that raise suspicion for MRSA pneumonia (eg, cavitary lung lesions), a negative swab result has diminished utility in excluding MRSA.[1,4]

Conversely, since a test's positive predictive value (PPV) directly correlates with disease prevalence, the swab's PPV in CAP is poor, ranging from 16% when MRSA prevalence is 3% to 45% when MRSA prevalence is 10%.[5,6] With this low PPV, clinicians should not use a positive swab result as the sole justification to add MRSA coverage to treat CAP in an otherwise hemodynamically stable patient without other risk factors for MRSA.

Skin and Soft Tissue Infections

Nonpurulent skin and soft tissue infections SSTI (ie, SSTI without abscesses, furuncles, or carbuncles) are caused by β-hemolytic *Streptococcus* in more than 90% of cases.[7] MRSA prevalence is sufficiently low in this setting such that empirical treatment should target *Streptococcal* species in hemodynamically stable patients irrespective of the nares swab result. As such, we do not recommend sending a nares swab or starting empirical MRSA coverage in stable patients admitted with nonpurulent cellulitis.

The nares swab should also not be used in purulent SSTI, where *S aureus*, especially MRSA, is the predominant pathogen.[7] In a 2019 systematic review of skin abscesses,[8] MRSA accounted for 49% of all cases. With this high prevalence, the swab's NPV was poor, ranging from 65% to 76%, making a negative swab result insufficient to justify withholding MRSA coverage.[1] The PPV in this scenario was as high as 94%.[1] However, finding purulence on examination already suggests a high likelihood of MRSA, and empirical treatment for MRSA should be initiated. A nasal swab is not indicated, as neither a positive nor a negative result will add actionable information.

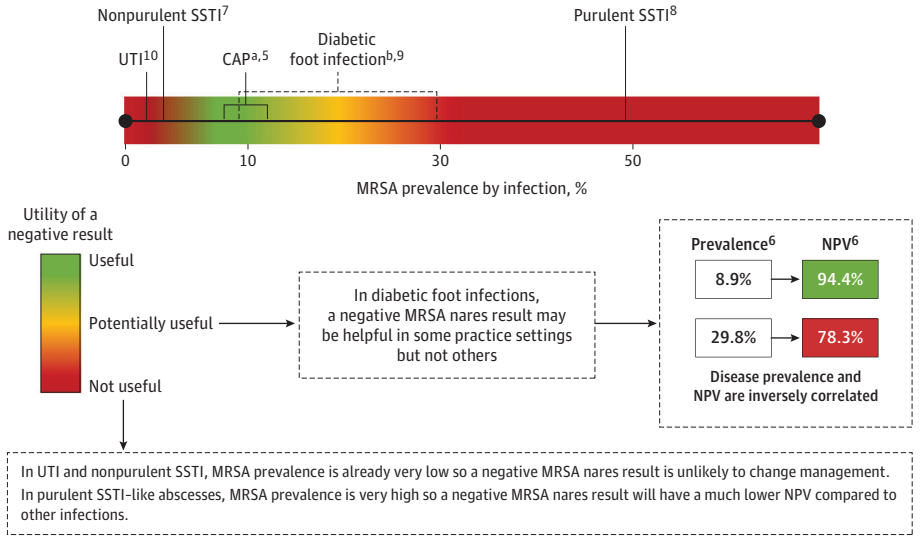
Diabetic Foot Infections

Clinicians caring for patients with diabetic foot infections usually face complex antimicrobial decisions, especially in the absence of prior culture data. Empirical MRSA coverage is often continued until definitive culture results return.[9] The nares swab holds potential to guide initial therapy before these results become available. When local antibiograms suggest a low to moderate local MRSA prevalence (eg, less than 15%), the swab maintains an excellent NPV, exceeding 90%.[9] In these settings, clinicians may discontinue MRSA coverage unless their patient is severely ill. This high NPV could be especially impactful in settings where a deep wound culture or bone biopsy cannot be easily arranged. However, as local MRSA prevalence increases, the swab's NPV decreases. Once local MRSA prevalence reaches 30% or higher, the swab's NPV is 80% at best.[9] With this much diagnostic uncertainty, clinicians should not rely solely on a negative result to guide antibiotic decisions and instead should await results of deep tissue sampling.

Urinary Tract Infections

MRSA prevalence in urinary tract infection (UTI) is exceedingly low at only 0.5% to 1%.[10] Given this extremely low likelihood of disease, the nares swab should not be ordered, as neither a negative nor positive result would change management. While a negative swab result theoretically rules out MRSA, with an NPV of nearly 100%, it is largely irrelevant to clinical practice as empirical MRSA

Figure. Relationship Between Methicillin-Resistant *Staphylococcus aureus* (MRSA) Disease Prevalence and Clinical Utility of a Negative MRSA Nares Swab Result



CAP indicates community-acquired pneumonia; NPV, negative predictive value; SSTI, skin and soft tissue infection; UTI, urinary tract infection.

[a]Prevalence of CAP in 2 included studies was 7.1% to 13.0%.

[b]Prevalence of diabetic foot infection in 6 included studies was 8.9% to 29.8%.

coverage is rarely chosen for UTI. Even when a nasal swab result is positive, the posttest probability of MRSA UTI remains exceedingly low due to its baseline low prevalence.[1]

Conclusions

Identification of MRSA colonization holds promise as a stewardship strategy to reduce morbidity and costs associated with overuse of vancomycin and other therapies directed against MRSA. Existing literature suggests that the swab is most useful in rapidly ruling out MRSA, allowing clinicians to discontinue MRSA coverage in areas of low to moderate MRSA prevalence (**Figure**).[1,4,9] Positive swab results are generally unhelpful and should not be used to justify changes in antimicrobial management. Importantly, clinicians must remember that the prevalence of MRSA in a particular infection is driven by the frequency of *S aureus* infection at that anatomic site, which is relatively constant across institutions, and the proportion of *S aureus* isolates that are MRSA (ie, local prevalence), which varies across institutions and can be ascertained by review of local antibiograms. When the pretest probability of MRSA is exceedingly low or high or when consequences of a missed MRSA infection are unacceptably high, clinicians should avoid using the nares swab altogether.

ARTICLE INFORMATION

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