

Thermo Scientific Spectra MRSA

Methicillin-Resistant *Staphylococcus aureus* (MRSA) Screening Predictive Value Fact Sheet

Diagnostic tests help clinicians make reasoned decisions about patient care.

These tests can be helpful for screening, diagnosis, and patient management. The performance of a diagnostic test depends on the “establishment” of the test against its criterion or gold standard through clinical trials. The value of a diagnostic test is defined by the sensitivity, specificity, predictive values, and accuracy.

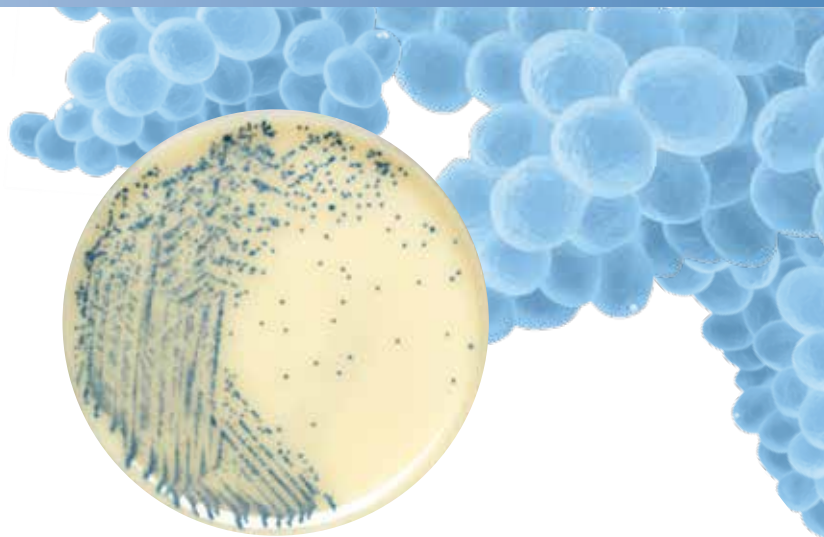
Criterion Standard

Criterion Standard Test		
	+	-
Test (+)	True Positive (TP)	False Positive (FP)
Test (-)	False Negative (FN)	True Negative (TN)

MRSA Agreement and **Non-MRSA Agreement** describe how well the test discriminates between patients colonized with MRSA and those not colonized with MRSA. When evaluating a patient, clinicians and infection prevention want to know: **Given a certain test result, what is the probability of MRSA colonization?** This is the predictive value of the test.

The predictive value measures the likelihood that a positive test result indicates MRSA colonization, or a negative test result rules out MRSA colonization

Both **PPV** and **NPV** will change as the prevalence of the MRSA colonization changes. **PPV is mainly affected by Non-MRSA Agreement (specificity) and prevalence.** Tests will have a greater PPV in a population with a higher prevalence rate for MRSA colonization. As long as the MRSA Agreement (sensitivity) and Non-MRSA Agreement (specificity) are reasonably high, their effect on NPV is negligible. A low prevalence of colonization will result in a high NPV if the MRSA Agreement (sensitivity) and Non-MRSA Agreement (specificity) are reasonably high. The MRSA Agreement (sensitivity) of a test will remain constant.



Definition of Terms

Term	Calculation	What it Means
MRSA Agreement	$\frac{TP}{(TP + FN)}$	The proportion of true positives that are correctly identified by a test.
Non-MRSA Agreement	$\frac{TN}{(TN + FP)}$	The proportion of true negatives that are correctly identified by a test.
Positive Predictive Value (PPV)	$\frac{TP}{(TP + FP)}$ or $\frac{(Sensitivity)(Prevalence)}{(Sensitivity)(Prevalence) + (1 - Specificity)(1 - Prevalence)}$	The proportion of patients with positive test results who are colonized with MRSA.
Negative Predictive Value (NPV)	$\frac{TN}{(TN + FN)}$ or $\frac{(Sensitivity)(1 - Prevalence)}{(Sensitivity)(1 - Prevalence) + (1 - Specificity)(Prevalence)}$	The proportion of patients with negative test results who are not colonized with MRSA.
Accuracy	$\frac{(TP + TN)}{(TP + TN + FP + FN)}$	The probability that the results of a test will accurately predict presence or absence of MRSA colonization.

Predictive Value Comparison

Package Insert Data	Thermo Scientific™ Spectra™ MRSA	Chromogenic Media A	Chromogenic Media B	Chromogenic Media C	PCR
MRSA Agreement	95%	95%	96%	94%	86-93%
Non-MRSA Agreement	100%	99%	98%	97%	95-96%
PPV	98%	91%	87%	91%	80-85%
NPV	99%	100%	99%	98%	97-98%
Prevalence*	14%	7%	13%	23%	19%

The Role of Prevalence in PPV and NPV

	Spectra MRSA	Chromogenic Media A	Chromogenic Media B	Chromogenic Media C	PCR
Prevalence**	PPV				
7%	96%	91%	77%	72%	56-63%
14%	98%	96%	88%	85%	73-79%
19%	99%	97%	91%	89%	80-84%
Prevalence**	NPV				
7%	100%	100%	100%	100%	99%
14%	99%	99%	99%	99%	98-99%
19%	99%	99%	99%	99%	97-99%

*Clinical trial prevalence rate **MRSA colonization ranges from 1-9%^{1,2}

Prevalence Rates

- MRSA colonization ranges from 1-9% depending on geographic region, type of health care facility, and specific population^{1,2}
- Infection rates vary by hospital but can be greater than 60%³

What are the costs of a false positive?

Cost to Hospital:

- Contact precautions
 - Gloves, gown
 - Additional nursing/physician time
 - Housekeeping – disinfectant, cleaning time
 - Room availability – semi-private (cohorting) vs. private
 - Laboratory testing
- Antibiotics
- Decolonization
- Other

Cost to Patient:

- Morale
- Quality of care
- Warning letter on medical records
- Lost wages

To learn more about Thermo Scientific Healthcare-Associated Infection solutions, and how to reduce unnecessary isolation and infection costs, contact your microbiology products representative.

References:

1. Gorwitz, R.J., et. al. Journal Infectious Disease 2008;197:1226 -1234.
2. Davis, K.A., et. al. Clinical Infectious Disease 2004;34:776 -782.
3. Boucher, H.W. and G.R. Corey. Clinical Infectious Disease 2008;46:S344-S349.

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