Infection Prevention vs. Antimicrobial Stewardship: Does Nasal Povidone-Iodine Interfere with MRSA Screening?

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BACKGROUND

- Patients with healthcare-associated pneumonia (HCAP) are typically placed empirically on broad-spectrum antibiotics, including vancomycin.
- Intranasal PCR-based screening for MRSA is highly sensitive, has a high negative predictive value to rule out MRSA causing HCAP, and thus has been used to increase clinicians' comfort with discontinuing vancomycin in the absence of culture data.[1]
- Universal decolonization (utilizing chlorohexidine gluconate and mupirocin) is also used to reduce MRSA infections, as nasal carriage is a known risk factor for invasive MRSA disease.[2,3]
- Due to concerns of widespread use of mupirocin, some institutions (including ours) uses the antiseptic povidone-iodine (P-I) as an alternative, as it also has anti-staphylococcal properties, will not promote resistance, and may have similar efficacy.[3]
- However whether nasal P-I will diminish sensitivity of nasal MRSA PCR screening is not known.

OBJECTIVES

1) Among patients who are found to be MRSA-colonized at baseline, determine if twice daily use of nasal P-I decreases the ability to detect MRSA via PCR after up to 5 days of use.
2) Among patients who are found to be MRSA-colonized at baseline, compare the sensitivity of PCR with culture-based screening on/after 5 days of nasal P-I use.

METHODS

Study Design: Prospective proof-of-concept cohort study

Setting: >1200-bed, community-based academic healthcare system

Population: Adult patients (≥18 y) admitted to a medical ICU or stepdown unit with positive MRSA baseline nasal screening

- Baseline MRSA ordered by provider as clinically indicated
- Exclusions: P-I allergy or intolerance, patient refusal, anticipated unit stay <48 hours, prior participation

Sample size: 20 patients completed the study, with 25 originally enrolled. Reasons for not completing the study included patient refusal of nasal P-I, or final MRSA screen not completed.

Study Procedure:

- RNs applied intranasal P-I (7.5%) twice daily for 5 days or until ICU discharge, per usual protocol.
- All positive PCR results underwent confirmatory testing via non-quantitative cultures using MRSA-specific media (CHROMagar™). All baseline +PCR results were confirmed via culture.
- RNs obtained follow-up MRSA PCR immediately prior to intranasal P-I or at least 8 hours after the most recent application, when ICU discharge anticipated (goal: 4-6 days). Both PCR and culture using CHROMagar™ were performed for all follow-up samples.
- Study personnel performed chart review to collect demographic, admission, and prior MRSA positivity information.

Analyses:

- Calculated means, frequencies, percentages to describe the cohort's demographics
- Calculated sensitivity of MRSA PCR at follow-up, using culture as the gold standard

RESULTS

Table 1: Demographics

	All Patients N = 20
Age, mean (SD)	72.4 (10.8)
Male, n (%)	7 (35)
Race, n (%)	
White	16 (80)
African American	4 (20)
Hispanic, n (%)	2 (10)
Location Admitted from, n (%)	
Home	12 (60)
Long term care facility	7 (35)
Other residential facility	1 (5)
Prior History of MRSA, n (%)	8 (40)

Table 2: Clinical Characteristics

	All Patients N = 20
Active Infection Suspected, n (%)	14 (70)
Admitting Diagnoses*, n (%)	
Respiratory	12 (60)
HCAP	3 (12)
Other pneumonia	8 (32)
COPD/COPD exacerbation	3 (12)
Respiratory Failure	2 (8)
Non-respiratory infections	4 (16)
MRSA bacteremia	1 (4)
Sepsis	1 (4)
Osteomyelitis	1 (4)
UTI	1 (4)
Non-infectious¥	4 (16)

** Patients may have had >1 admitting diagnosis*

¥ Included anticholinergic syndrome (1), alcohol related diagnosis (2), acute kidney injury (1) and shock esophagitis (1)

Table 3: Test Diagnostic Matrix

	Culture (=GOLD STANDARD)	
	Follow-up culture +	**Follow-up culture -**
PCR +	16	2
PCR -	1	1

Sensitivity of MRSA PCR = (16/17)*100 = 94%

Table 4: P-I Doses Received per Follow-Up MRSA Results

	Mean (SD)	Range
MRSA - Both Cx and PCR	7.5 (3.4)	4 -12
MRSA + Both Cx and PCR	8.3 (2.3)	4 – 13

RESULTS

- Enrolled population reflected diversity of healthcare system (Table 1)
- Majority admitted with active infection (Table 2)
  - 26% due to MRSA
  - 40% had known history of MRSA
- At follow up, 16/20 (80%) remained MRSA-positive via both PCR and culture (Table 3).
- Assuming culture as the gold standard, sensitivity of MRSA PCR at follow-up was 94%.
- Of the 4 patients with negative follow up results:
  - 1 was both PCR and culture-negative
  - 2 were PCR+ but culture-negative
  - 1 was PCR-negative but culture+
- All 4 had received ≥1 doses of vancomycin, and one person had received ≥1 doses of linezolid.
- Patients underwent a mean of 8.1 (range, 4-13) nasal P-I applications prior to follow-up testing, with no significant difference between MRSA+ and MRSA- results at follow-up (Table 4).

CONCLUSIONS

- MRSA PCR remains highly sensitive even after multiple applications of nasal P-I.
- Receipt of nasal P-I should not be a deterrent to screening for MRSA for stewardship or other purposes.
- Limitations of this study included the small sample size, loss to follow-up due to patients being discharged before final MRSA screen was collected, inconsistent administration of P-I doses prior to final MRSA screening, and lack of quantitative MRSA cultures to determine response to P-I application.
- While persistent MRSA positivity by PCR may be expected due to PCR's ability to detect DNA fragments in the absence of viable organisms, the fact that most patients remained culture-positive after multiple (4-13) P-I applications raises concerns that P-I may be less effective than mupirocin for clearing nasal colonization.
  - The risk of less effective decolonization must be balanced with that of promoting widespread mupirocin resistance, as health systems adopt widespread *S. aureus* decolonization.
- Larger studies using quantitative cultures should be done to investigate the effectiveness of nasal P-I.

SELECTED REFERENCES

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