



Risk of Methicillin-Resistant Staphylococcus Aureus (MRSA) Surgical Site Infection in Patients with Nasal MRSA Colonization

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Introduction

❖ MRSA nasal colonization in hospitalized patients increased from 0.8% in 2001-2002 to 10.8% according to a 2008 tertiary care center study.^{1,2}

❖ MRSA colonized patients have a higher risk for invasive MRSA infection when compared with non-colonized patients (e.g. increased incidence of MRSA bacteremia and pneumonia).^{3,4,5}

❖ Surgical site infection (SSI) complicates 5% of surgeries.⁶ MRSA SSI constitutes approximately 15% of all SSI reported to National Healthcare Safety Network (NHSN).⁷

❖ Each SSI contributes \$12,000-\$35,000 in additional costs, prolonged hospitalization and increased mortality.⁸

Question

❖ Are patients colonized with MRSA at higher risk for subsequent MRSA SSI?

Methods & Materials

❖ **Study Type:** Retrospective cohort study.

❖ **Study Population:** Inpatients at Hershey Medical Center (HMC) who underwent nasal MRSA PCR screening and a primary NHSN surgical procedure within the subsequent 30 days (n=9871).

❖ **Study Period:** Surgeries performed between April 2008 - July 2010 and were followed from April 2008 - December 2010.

❖ **Groups:** Patients were classified into two groups based on the following definitions:

❖ **MRSA PCR-positive patients:** Patients with a positive MRSA PCR who underwent surgery on the same day or within the subsequent 30 days (n=431).

❖ **MRSA PCR-negative patients:** Patients with a negative MRSA PCR who underwent surgery on the same day or within the subsequent 30 days (n=9440).

❖ **Outcome:** MRSA SSI as defined by CDC/NHSN.¹⁰

Results

Table 1: Baseline Characteristics of MRSA PCR-Positive Group vs. MRSA PCR-Negative Group

Variable	MRSA PCR-Positive (n=431)	MRSA PCR-Negative (n=9440)	p- Value
Age (Mean +/- SD)	56.2 +/- 22.6	51.26 +/- 23.24	<0.001
Gender [M (%) / F (%)]	213 (49.4) / 218 (50.6)	4455 (47.2) / 4985 (52.8)	0.36
Wound Class			0.16
I-Clean (%)	281 (65.2)	6208 (65.8)	
II-Clean Contaminated (%)	130 (30.2)	2987 (31.6)	
III-Contaminated (%)	10 (2.3)	127 (1.3)	
IV- Dirty & Infected (%)	7 (1.6)	98 (1)	
No Incision (%)	3 (0.7)	20 (0.2)	
ASA Score*			0.001
>= 4	38 (8.8)	464 (4.9)	
<4	353 (81.9)	7998 (84.7)	
Duration of Surgery (min)			0.39
Mean Time +/- SD	160 +/- 115	164 +/- 110	
1-60 min	63 (14.6)	1190 (12.6)	0.38
61-120 min	131 (30.4)	2789 (29.5)	
>120 min	237 (54.9)	5454 (57.8)	
Case Status			0.56
Elective	345 (80)	7706 (81.6)	
Urgent	72 (16.7)	1400 (14.8)	
Emergency	14 (3.24)	334 (3.5)	
Vancomycin Use	87 (20.2)	964 (10.2)	<0.001

* ASA Score: American Society of Anesthesiologists physical status classification system is a system for assessing the fitness of patients before surgery

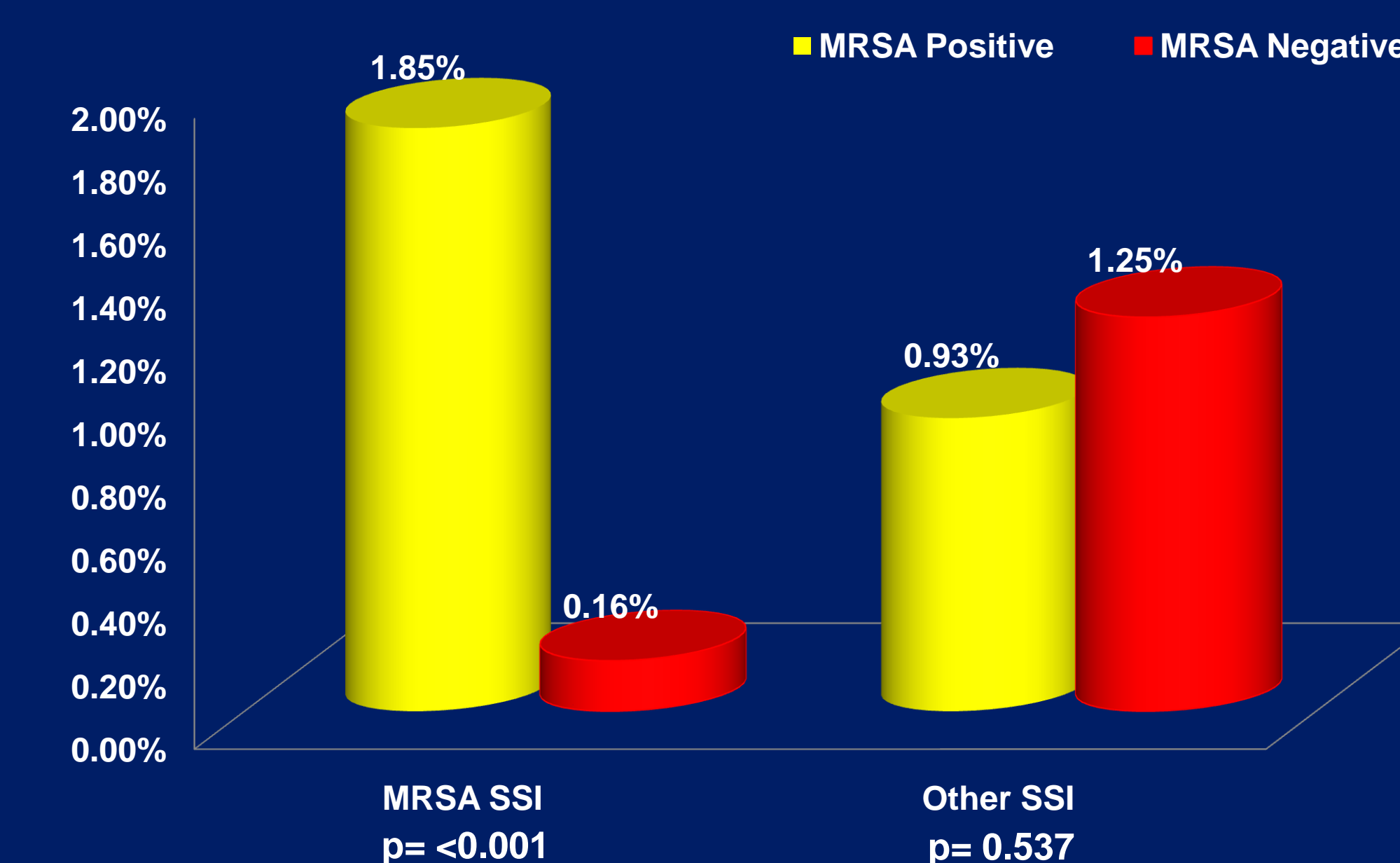
Table 2: Characteristics of MRSA SSI Group vs. No MRSA SSI Group

Variable	MRSA SSI (n=23)	No MRSA SSI (n=9848)	p- Value
MRSA PCR Positive	8 (34.7)	423 (4.3)	<0.001
Negative	15 (65.2)	9425 (95.7)	
Age (Mean +/- SD)	56.4 +/- 18.6	51.4 +/- 23.25	0.31
Gender [M (%) / F (%)]	12 (52.2) / 11 (47.8)	4656 (47.3) / 5192 (52.7)	0.79
Wound Class			0.13
I-Clean (%)	19 (82.6)	6470 (65.7)	
II-Clean Contaminated (%)	4 (17.4)	3113 (31.6)	
III-Contaminated (%)	0 (0)	137 (1.4)	
IV- Dirty & Infected (%)	0 (0)	105 (1.1)	
No Incision (%)	0 (0)	23 (0.2)	
ASA Score			1.0
>= 4	1 (4.3)	501 (5.1)	
<4	20 (87)	8331 (84.6)	
Duration of Surgery (min)			<0.001
Mean Time +/- SD	306 +/- 216	163.9 +/- 109.58	
1-60 min	1 (4.3)	1252 (12.7)	0.005
61-120 min	2 (8.7)	2918 (29.6)	
>120 min	20 (87)	5671 (57.6)	
Case Status			0.11
Elective	22 (95.6)	8029 (81.5)	
Emergency & Urgent	1 (4.4)	1819 (18.5)	
Vancomycin Use			0.15
Y	0 (0)	1051 (10.6)	
N	23 (100)	8797 (89.33)	

Table 3: Multivariate Logistic Regression Model for MRSA PCR and Duration of Surgery.

	MRSA SSI [OR (95% C.I.)]	p -Value
MRSA PCR Positive	13.3 (4.8-33.836)	<0.0001
Duration of Surgery >120 min	5 (1.5-26.7)	0.0044

Figure 1: Incidence of MRSA SSI vs. Other SSI in MRSA PCR- Positive Patients



❖ Prevalence of MRSA in study population was 4.4% (prevalence in all inpatients at HMC was 7%).

❖ Overall incidence of all SSI was 1.46% and MRSA was responsible for 15% of all SSI.

❖ MRSA PCR-positive patients were older and had higher ASA scores than MRSA PCR-negative patients.

❖ Odds of developing MRSA SSI in patients with a positive MRSA PCR were 13 times higher than patients with negative MRSA PCR.

❖ Odds of developing MRSA SSI in patients undergoing prolonged surgery (>120 min) were 5 times higher than patients undergoing shorter duration of surgery.

❖ None of the patients in whom vancomycin was used as pre-operative prophylaxis developed MRSA SSI although this was not statistically significant.

Discussion

❖ The prevalence of MRSA colonization was 7% in hospitalized patients, and 4.4% in the study population.

❖ Nasal MRSA PCR-positive test and prolonged surgery appear to be significant independent risk factors for the development of MRSA SSI.

❖ While the absolute risk of MRSA SSI in screen positive patients is low (1.85%), it is known that each SSI causes significant morbidity and increased healthcare costs.

❖ No patient who received vancomycin as pre-operative prophylaxis developed MRSA SSI, however prospective studies with more power are needed to determine if vancomycin has a protective effect.

❖ **Limitations of our study:** This is a retrospective cohort study. The influence of de-colonization procedures such as use of mupirocin and chlorhexidine prior to surgery was not examined; however, de-colonization procedures prior to surgery are not routine at our institution.

❖ However, since the absolute risk of MRSA SSI in screen-positive patients appears to be low (1.85%), identifying subsets of these patients at highest risk of SSI may help to target decolonization and other interventions.

Conclusion

❖ Patients with a positive nasal MRSA PCR result had a significantly higher risk of subsequent MRSA SSI compared to patients with a negative nasal MRSA PCR.

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