Evaluation of risk factors for methicillin-resistant *Staphylococcus aureus* nosocomial pneumonia in the surgical intensive care unit at an urban level I trauma academic medical center

Nicole Wex PharmD, Janelle Juul PharmD, Ryan Feldman PharmD, Joel Feih PharmD, William Peppard PharmD, John Weigeldt MD, Charles Edmiston Jr Ph.D.
Froedtert & The Medical College of Wisconsin, Milwaukee, WI

Background

- Previously identified risk factors for hospital-acquired pneumonia (HAP) caused by methicillin-resistant *Staphylococcus aureus* (MRSA) may not apply to all patient populations
- In the surgical intensive care unit (SICU) at Froedtert Hospital, approximately 60% of patients treated for HAP received anti-MRSA antimicrobial therapy; however, MRSA comprises only 6% of SICU isolates and 15% all *S. aureus* isolates
- Further characterization of risk factors for the development of MRSA HAP as compared to MSSA HAP in a SICU population is needed

Methods

Objective: Identify risk factors for MRSA among adult SICU patients with culture-positive *S. aureus* HAP

Design: Single center, retrospective, observational study

Study Period: July 2007 – August 2012

Inclusion Criteria:
- Adult SICU patients hospitalized for at least 48 hours
- Positive MRSA or methicillin-susceptible *S. aureus* (MSSA) semi-quantitative (1+, 2+, etc.) and/or quantitative culture via bronchoscopy or blinded mini-bronchiolar alveolar lavage (mBAL) as defined by > 10,000 cfu/ml and > 100,000 cfu/ml, respectively

Exclusion Criteria:
- < 18 years of age or > 90 years of age
- Incomplete medical record
- Pregnancy
- Negative culture or culture from sputum sample

Primary Outcome: Logistic regression of selected risk factors for the development of MRSA HAP infections in the SICU patient population

Results

Table 1: Demographics/Risk Factors	MSSA, N=49	MRSA, N=18
Male, n (%)	37 (88.6)	13 (72.2)
Body Mass Index (kg/m²), mean	29.8	26.3
Cause of admission, n (%)		
• *Trauma*	18 (20.5)	9 (50)
• *Post-operative*	29 (32.9)	4 (22)
• *Medical*	41 (45.6)	5 (27)
Pneumonia subtype, n (%)		
• *Hospital Acquired Pneumonia*	9 (18.3)	4 (22.2)
• *Ventilator Associated Pneumonia*	40 (81.6)	14 (77.8)
Age (years), mean (SD)	47.2 (±19.5)	57.3 (±15.6)
Mechanically ventilated (MV), n (%)	49 (100)	18 (100)
MV days prior to culture (days), mean (SD)	5.8 (±5.1)	6.1 (±5.3)
Central venous cannulation (CVC), n (%)	41 (83.6)	13 (72.2)
Length of stay (LOS) prior to culture (days), mean (range)		
• *Hospital*	7.9 (1-29)	11 (3-18)
• *ICU*	7.1 (1-23)	7.4 (1-19)
Receipt of hemodialysis, n (%)	2 (4)	1 (5.6)
MRSA nasal colonization, n (%)	2 (4)	6 (33.3)
Antibiotic use in previous 90 days, n (%)	2 (4)	2 (10.1)
Diabetes, n (%)	5 (10.2)	2 (10.1)
Pressure ulcer, n (%)	4 (8.2)	1 (5.6)
Receipt of steroids, n (%)	4 (8.2)	3 (16.7)

Results

Table 2: Risk Factors	OR	95% CI
Age*	1.05	1.00 – 1.10
MV days prior to culture	1.72	0.89 – 3.31
Duration of CVC	0.98	0.95 – 1.02
LOS prior to culture*	1.27	1.00 – 1.60
Receipt of hemodialysis	9.55	0.45 – 199.81
MRSA nasal colonization*	11.75	2.10 – 65.70
Antibiotic use in previous 90 days	0.73	0.03 – 16.93
Diabetes	0.99	0.09 – 10.50
Pressure ulcer	0.3	0.01 – 12.25
Receipt of steroids	1.9	0.18 – 20.40

All p values >0.05 unless denoted by*

Conclusions

- In adult SICU patients with culture-positive HAP caused by MRSA, age, LOS prior to culture, and MRSA nasal colonization were associated with MRSA isolation
- MRSA nasal colonization was the most significant risk factor with a positive and negative predictive value of 77% and 79%, respectively.