

# Eradication of Methicillin Sensitive *Staphylococcus aureus* and Methicillin Resistant *Staphylococcus aureus* Before Orthopedic Surgery

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## Background

➤ Asymptomatic colonization with methicillin-resistant *Staphylococcus aureus* (MRSA) and Methicillin-sensitive *Staphylococcus aureus* (MSSA) has been described as a risk factor for subsequent surgical site infection. Identifying *Staphylococcus aureus* colonization in the presurgical screening process is important in reducing subsequent surgical site infection.

## Objective

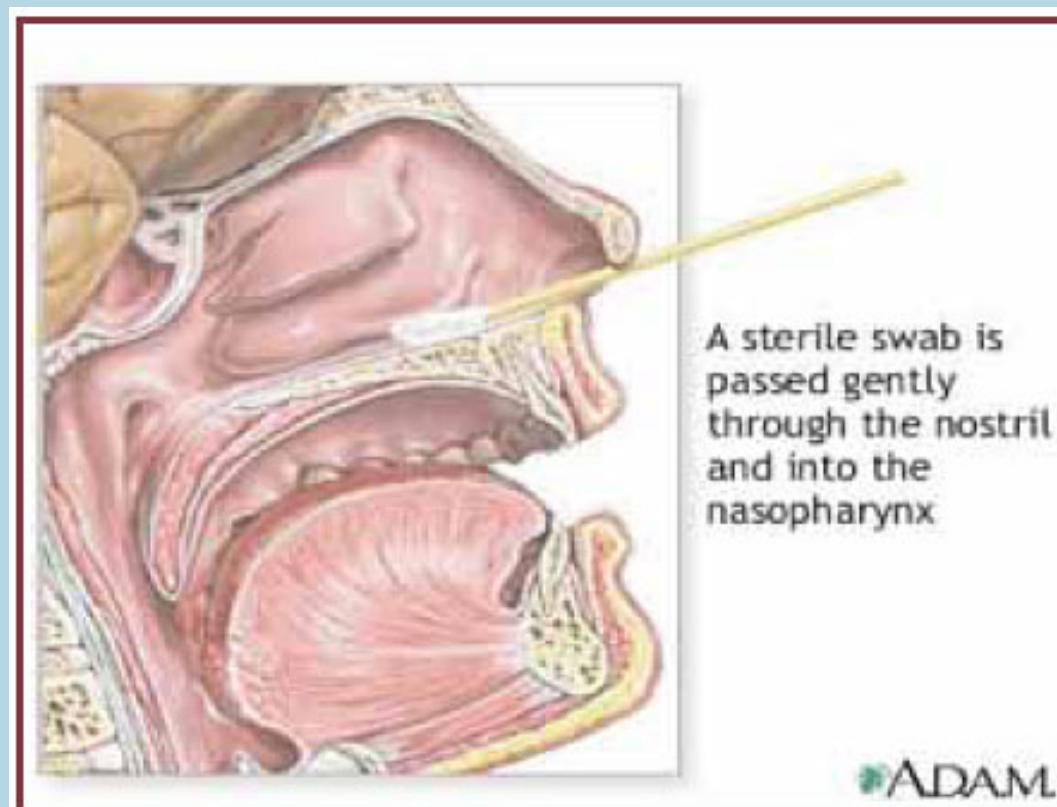
- We initiated active surveillance screens using polymerase chain reaction (PCR) rapid testing technology. This was directed to all inpatients undergoing orthopedic surgery. The intent of the program was to eradicate nares colonization in the preop screening process by the administration of a decolonization protocol and therefore reduce post surgical site infections due to MRSA and MSSA.

## Materials and Methods

- Patients admitted for orthopedic surgery were screened in the prescreening unit using PCR technology. The treatment intervention was a 5-day application of intranasal mupirocin 2% applied twice daily and a daily cleansing with chlorhexidine 2%. MRSA positive screens were required to be re-screened prior to surgery. Contact precautions were implemented if the second screen was positive. All MRSA positives received vancomycin for surgical prophylaxis.

## Study Sample

➤ From July 17, 2006 through September 30, 2007, 7019 patients who underwent inpatient orthopedic surgery were screened in the prescreening process.



### Procedural Steps in the Implementation Process

January 2006 - Senior VP, Patient Care Services, Chief Nurse researched MRSA problem and developed a "MRSA White Paper" for the Board of Trustees

January 2006 - letter to the Infection Control Committee regarding eradicating MRSA in all surgeries

February 2006 - anonymous active surveillance culture study in the operating room were obtained to determine rates of colonization

133 nasal cultures revealed:  
38 - *Staph aureus* (29%)  
5 - MRSA (4%)

February 2006 - prepared three testing proposals with budgetary impact for Board of Trustees

- 1) traditional 3 day MRSA/MSSA culture process
- 2) rapid PCR test - purchased equipment plus PCR test kits
- 3) rapid PCR test - leased equipment plus PCR test kits

March 2006 - October 2006 - weekly team meetings:

Surgical Services, Infection Control, Micro, Administration, and Nurse Managers

May 2006 - Micro purchased PCR equipment (Cepheid)

and cross trained lab personnel in molecular diagnostics

July 17, 2006 - initiated 2 month pilot on Spine Service

August 2006 - distribution of letter to Medical and Surgical Staff, OR Scheduling and Operating Room Staff of

September implementation for all inpatient surgeries

September 2006 - initiated program for all inpatient surgeries

### Nasal Screen and Education Process

• Pre-Admission Screening Unit (PASU) obtained the nasal screens - MRSA Coordinating Technician was hired for the task.

• A special double swab was used to collect the sample.

• Patient received education from PASU Nurse Practitioner:

- Brochure on MRSA/MSSA and Hand Hygiene
- Instruction sheet on what to do if positive for MRSA or *Staphylococcus aureus*
- A prescription for 2% mupirocin ointment was ordered by Nurse Practitioner for the MRSA and *Staphylococcus aureus* positive screens
- Patient instructed to purchase ointment and 12 oz bottle of 4% chlorhexidine for the 5 day body wash
- MRSA positive patients received Vancomycin for surgical prophylaxis (or other appropriate antibiotic)
- Patient was flagged as MRSA-SCR in Meditech system
- MRSA positive patients required to have second screen
  - if positive, Contact Precautions instituted in pre-surgical unit, OR, PACU and nursing unit.
  - Flag in Meditech changed to MRSA and patient required to have 3 negative nasal screens to be removed from precaution list.
- Surgeon, infection control, pre-surgical unit, operating room, recovery room notified by email of all positive MRSA screens.
- Surgeon also notified by phone call.
- No surgery was canceled due to MRSA positive screen.
- Patient education provided by infection control by request.

## Results

• From July 17, 2006 through September 30, 2007, 7019 patients were screened by PCR; 1588 (22.6%) were *Staphylococcus aureus* positive and 309 (4.4%) were MRSA positive.

• Repeat nasal screens were obtained from MRSA positive patients prior to surgery and revealed 241 (78%) negative for MRSA.

• In the cohort of 309 positive MRSA screens, there were 3 infections (0.97%) and in 1588 positive *Staphylococcus aureus* screens, 3 infections (0.19%).

• In the 5122 negative screens there were 7 (0.14%) infections, with 1 MRSA

and 6 MSSA.

Therefore, the overall MRSA/*Staphylococcus aureus* orthopedic surgical site infection rate (13/7019) was 0.18%.

• In an equivalent group of orthopedic inpatients during a prior time period, there were 24 SSI in 5293 cases (0.46%).

**Table 1. SSI - Orthopedic Inpatients**

| Time Period       | Inpatient surgeries | Surgical Infections (SSI) | Infec. Rate |
|-------------------|---------------------|---------------------------|-------------|
| 10/05-07/16/06    | 5293*               | 24                        | 0.46%       |
|                   |                     | 10/5293 MRSA (0.18%)      |             |
|                   |                     | 14/5293 MSSA (0.26%)      |             |
| 07/17/06-09/30/07 | 7019 **             | 13                        | 0.18%       |
|                   |                     | 4/7019 MRSA (0.06%)       |             |
|                   |                     | 9/7019 MSSA (0.13%)       |             |

\*historical controls

\*\* screened inpatient surgeries:

**Table 2. SSI - Screened Orthopedic Inpatients N=7019**

| MRSA/MSSA Analysis | SSI          | Infec. Rate    |
|--------------------|--------------|----------------|
| Total Screen (+)   | 1897 (27.1%) | 6/1897 (0.32%) |
| *MRSA (+)          | 309 (4.5%)   | 3/309 (0.97%)  |
| MSSA (+)           | 1588 (22.6%) | 3/1588 (0.19%) |
| Total Screen (-)   | 5122 (72.9%) | 7/5122 (0.14%) |
|                    |              | (MRSA 1/0.02%) |
|                    |              | (MSSA 6/0.11%) |

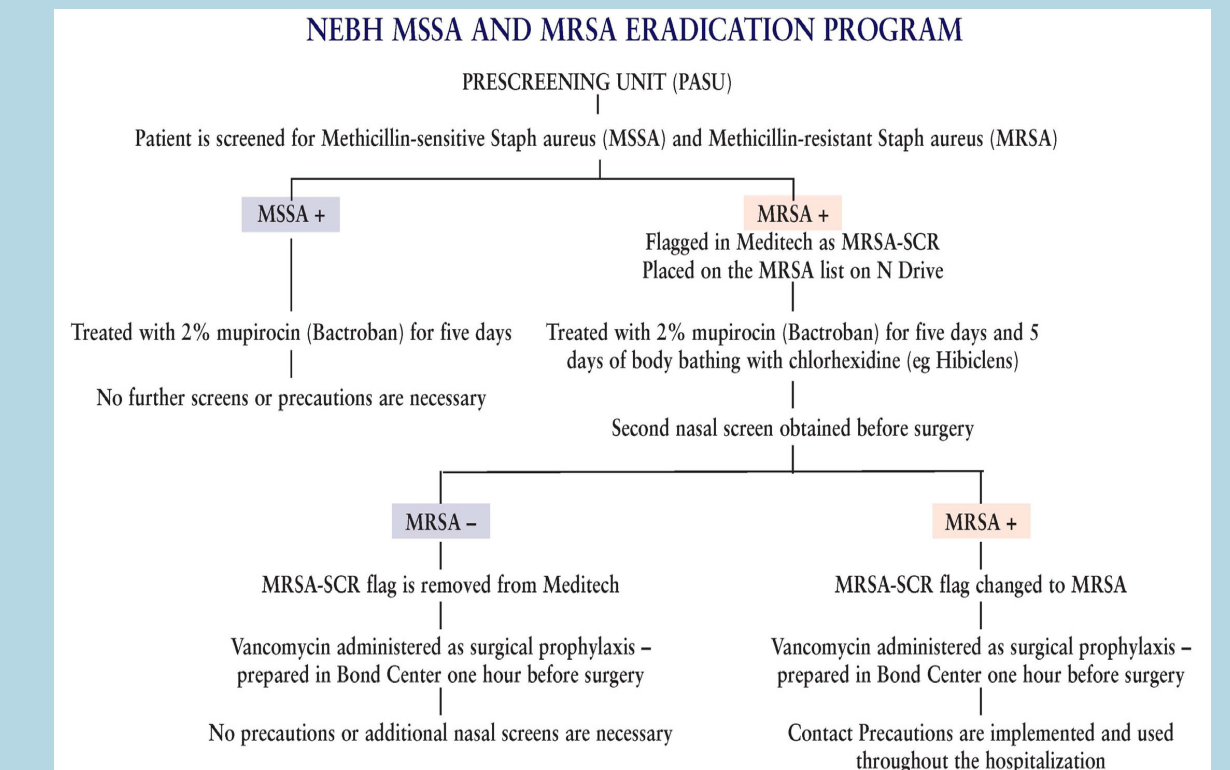
\*Vancomycin was administered to 95% of the MRSA positive patients who underwent inpatient surgery. Rate has since increased to 100%

**Table 3. Eradication of MRSA**

|                                |                       |
|--------------------------------|-----------------------|
| MRSA (+) on first nasal screen | 309                   |
| MRSA (-) on second screen      | 241 (78% elimination) |

**Table 4. SSI in Same Day Surgery Cases**

| Not Screened | SSIs             | Infec. Rate    |
|--------------|------------------|----------------|
| 3105 cases   | 9                | 9/3105 (0.29%) |
|              | 2 - MRSA (0.06%) |                |
|              | 7 - MSSA (0.22%) |                |



## Conclusions

- We have successfully implemented a *Staphylococcus aureus* and MRSA eradication program for all inpatient orthopedic surgeries during the prescreening process.
- It has allowed for early identification of patients with *Staphylococcus aureus* and MRSA decolonization treatment, and appropriate surgical prophylaxis for MRSA.
- Since implementation we have documented a significant reduction in infections due to *Staphylococcus aureus* and MRSA.
- A multidisciplinary approach with strong administrative support and consistent communication was vital to the implementation of the program.

## References:

1. Perl T, et al. Intranasal Mupirocin to Prevent Postop *Staphylococcus aureus* Infections. NEJM 2002; 346:1871-1877.
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3. Huang SS, et al. Risk of methicillin-resistant *Staphylococcus aureus* infection after previous infection or colonization. Clin Infect Dis. 2003; 36:281-285.