

# THE CURRENT STATE OF BACTERIAL SCREENING & DECOLONIZATION IN ORTHOPAEDIC SURGERY

## AAOS PATIENT SAFETY COMMITTEE

### SURGICAL SITE INFECTION BY THE NUMBERS

#### Burden – US

- **500,000 – 1 million SSIs/yr**
- **2%-5%** of patients undergoing inpatient surgery
- **↑** number of total joint arthroplasties (TJA)
- **1/4** of SSIs after TJA occurred after **2 years**
- Prevalence of SSIs after TJA – underestimated and **↑**

#### Mortality

- **3 %** mortality
- **2 – 11** times higher risk of death
- **75%** of deaths are directly attributable to SSIs (among patients with SSIs)

#### Morbidity

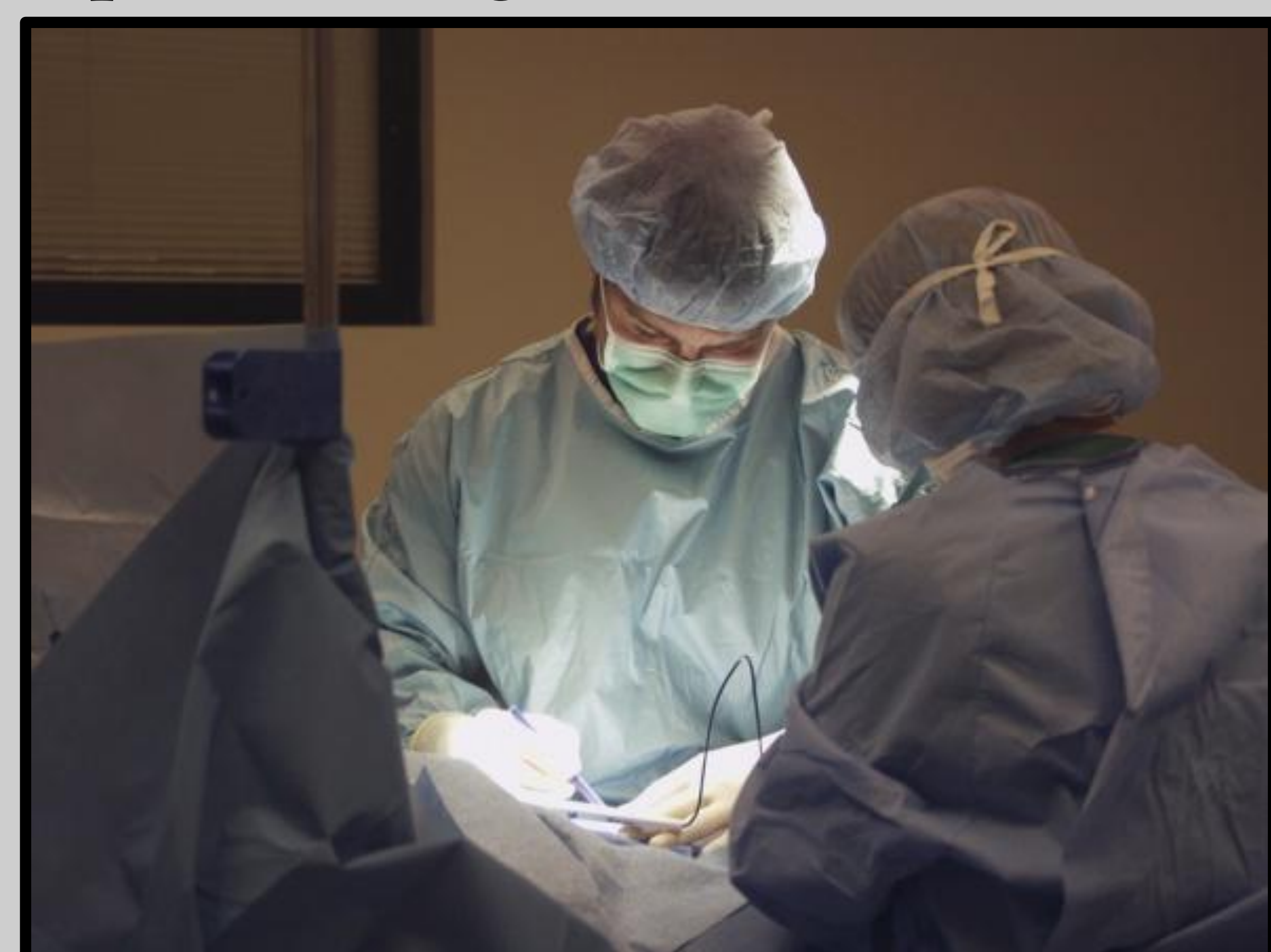
- **↓** health-related quality of life
- Usually associated with multiple surgical procedures
- Leads to long-term disabilities

#### Length of Hospital Stay

- **Doubles** the risk of readmission
- **~7 – 10** additional postoperative hospital days

#### Cost

- Direct medical costs of TJA revisions for infections are approximately **\$100,000 per patient**
  - 3-4 times more than a primary TJA
- More than **\$1.6 billion** in excess hospital charges



# COMMONLY PROPOSED STRATEGIES TO REDUCE SURGICAL SITE INFECTION

## TRADITIONAL PREOPERATIVE MODIFIABLE RISK FACTORS



### INTRAOPERATIVE METHODS

Laminar flow rooms  
Operating room traffic  
Body exhaust hoods  
Antimicrobial incise drapes  
Surgical team hand scrub  
Patient's skin preparation  
Scrub attire  
Irrigation techniques  
Fascia & skin closure methods  
Antibiotic bone cement  
Drains (+/-)  
Dressings (+/- silver)

### SURGICAL CARE IMPROVEMENT PROJECT (SCIP)

Developed by Centers for Medicare & Medicaid Services  
Goal of 25% reduction in morbidity & mortality  
Evidence based initiative  
Specific Measures:

- antibiotic prophylaxis timing, selection & duration
- appropriate hair removal (clipping not shaving)
- normalizing core body temperature
- glycemic control



# ISSUES ASSOCIATED WITH CURRENT INFECTION PREVENTION STRATEGIES

## GENERAL DIFFICULTIES ENCOUNTERED WITH OPTIMIZATION OF TRADITIONAL MODIFIABLE RISK FACTORS

- Patient compliance
- Time constraints prior to surgery limit usefulness (especially in urgent and/or semi-elective cases)
- Relies on agreement and effective communication between surgeon and other health-care providers



## SURGICAL CARE IMPROVEMENT PROJECT (SCIP)

- Compliance continues to be an issue
- Challenging to measure the impact
- ↓ in SSIs not seen in all studies
- SCIP adherence ↔ prevalence of SSI unclear
- Some SCIP measures not as benign as suggested (e.g., tight glucose control)
- Tourniquet use ultimately impacts antibiotic effectiveness – not reflected in documentation
- ↓ Susceptibility of traditional surgical pathogens to antibiotics recommended by SCIP

## INTRAOPERATIVE METHODS

- Reducing bacterial colony forming units (CFU) may not correlate with a reduction in SSI.
- Operating room infection control is associated with numerous uncontrollable variables. As such, it is difficult at this time to conclude which of the currently used strategies to diminish the risk of SSI are most effective.



# CASE STUDY – MRSA SCREENING & TOTAL KNEE ARTHROPLASTY

## PATIENT A

- Mid 50s
- Colonized w/ MRSA
- Screened for MRSA
- Decolonized preoperatively
- Cefazolin prophylaxis
- Successful TKA
- No SSI

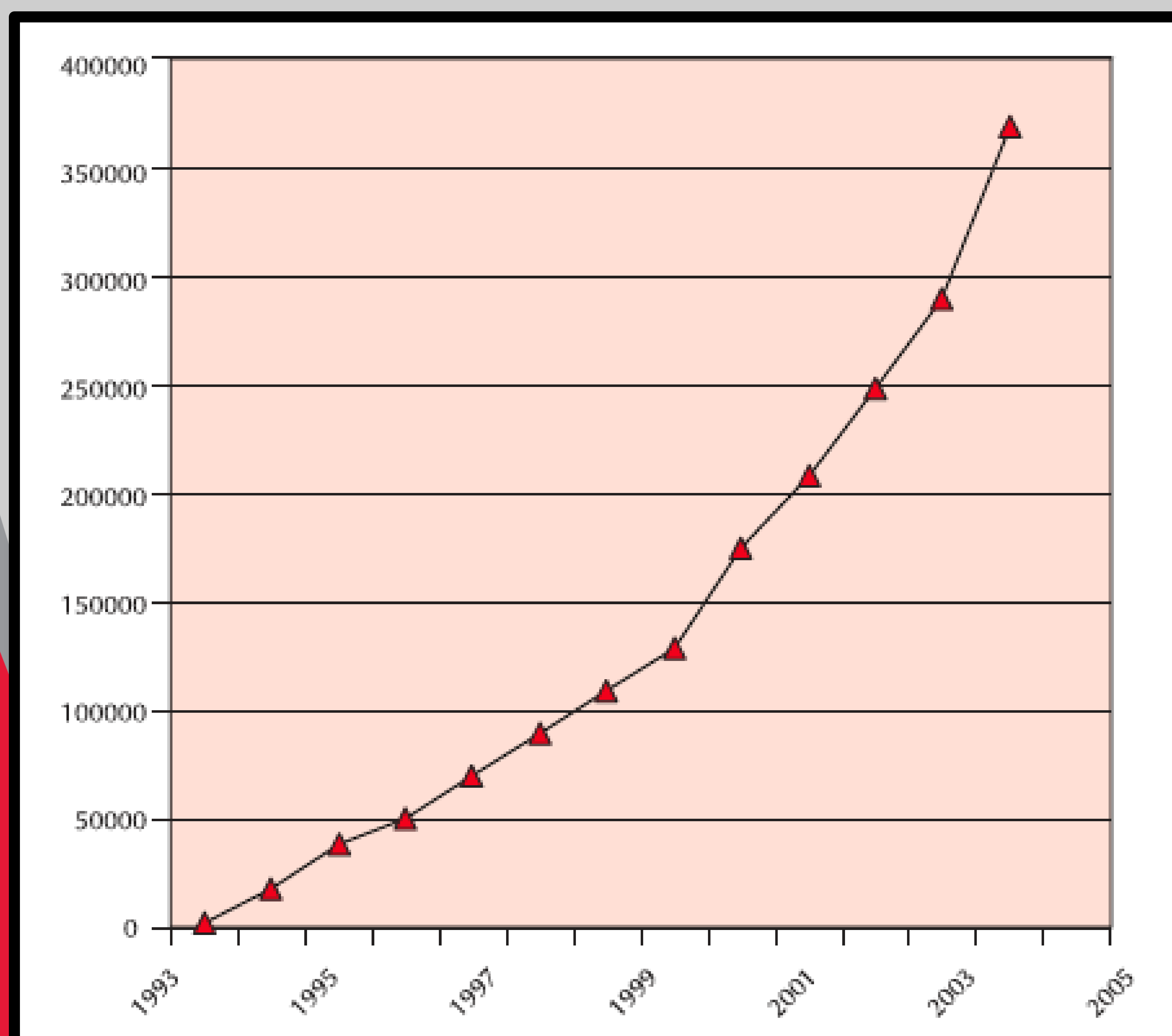


## PATIENT B

- Mid 50s
- Colonized w/ MRSA
- No MRSA screening
- No pre op decolonization
- Cefazolin prophylaxis
- MRSA SSI
- Amputation



## TRENDS OF HOSPITALIZATIONS ASSOCIATED WITH MRSA



# PREOPERATIVE DECOLONIZATION BACKGROUND

## RATIONALE

- More than 50% of SSIs in orthopaedic surgery are caused by *Staphylococcus aureus*
- Prevalence of methicillin-resistant *S. aureus* SSI is increasing
- *S. aureus* is carried in the anterior nares of 20%-30% of TJA patients
- 85% of *S. aureus* SSIs are caused by bacterial strains found in the patient's nares
- In one study, nasal carriage of *S. aureus* was the only independent risk for SSI after TJA

## ECONOMICS

- Cost of mupirocin is \$5 - \$100 (depends on formulation)
- Cost of test
  - \$10 - \$50 (traditional)
  - \$50 - \$75 (PCR)
- Recent economic analysis showed that *treat all* and *screen & treat* regimens are **both** cost-effective

## MOST WIDELY STUDIED REGIMEN

- Screening for *S. aureus* 2-4 weeks prior to surgery
- Mupirocin ointment to both nares 2X daily, chlorhexidine bath daily X 5 days immediately before surgery if cultures are positive for *S. aureus*
- Eradication rate is  $\approx$  83% over short term



## MUPIROCIN MECHANISM OF ACTION

- Inhibition of bacterial protein and RNA synthesis
- Effective against most species of *Staph* & other gram positive and gram negative bacteria

## POTENTIAL ADVERSE EFFECTS

- Rare
- Local irritation +/- itching
- Possibility of resistance

# PREOPERATIVE DECOLONIZATION RESULTS

Seven studies comparing mupirocin & chlorhexidine to control and 4 studies comparing mupirocin alone to control have been identified in the literature. Many of these studies reported mixed results due to differences in design, patient populations (mixed surgery including orthopaedic surgery), sample size, end point, decolonization protocol, prophylactic antibiotic regimens and follow-up.

A recently published study (Rao et al. J Arthroplasty 2011. Dec;26(8):1501-7) specifically evaluated screening/decolonization to prevent orthopaedic SSI.

- 1440 patients in intervention group
- 2284 patients in concurrent control group
- 741 patients in historical pre-intervention group

155/1440 missed screening and 1285/1440 participated in screening

321/1285 (25%) had a positive nasal culture and received preop mupirocin and chlorhexidine body wash

278/321 (22%) had MSSA on nasal swab and 43/321 (3%) had MRSA on nasal swab

All patients with + nasal cultures positive for MRSA received Vancomycin prophylaxis

**Infection occurred in:**

- 19/2284 (0.8%) of concurrent (unscreened/untreated) control group
- 20/741 (2.7%) pre-intervention cases
- 17/1285 (1.3%) of all screened patients (positive & negative swabs)
- 0/321 of screened and treated patients

According to authors, if one assumes that 19/2284 infections all occurred in *Staph* carriers (571/2284 based on 25% assumption) **then infection rate in untreated carriers would have been 3.3%** (versus 0% [0/321] in actually screened & treated patients)

The number of non-*S. aureus* SSIs was similar between groups during pre-intervention and intervention periods.

## CONCLUSION

Screening and decolonization of patients undergoing TJA who are *S.aureus* nasal carriers appears to diminish the risk of SSIs. Decolonization does **not** eliminate the risk of an SSI. Further research is required to recommend routine screening and decolonization of orthopaedic patients.

## FUTURE RESEARCH

- Role of 3M™ *nasal antiseptic* (Povidone-Iodine Solution 5% w/w [0.5% available iodine] USP) for decolonization
- Incidence of Mupirocin resistance on patients treated after a positive screen
- Safety & efficacy of traditional 2% mupirocin ointment vs. “*nasal*” 2% mupirocin calcium ointment
- Universal decolonization and its impact on resistance
- Screening using Polymerase Chain Reaction (PCR)
- Antibiotic choice in patients with a positive preop MRSA nasal swab (Cephalosporin +/- Vancomycin)
- Screening & decolonization of surgical team and postoperative nursing staff decolonization (\*some studies exist)
- Screening & decolonization in patients undergoing urgent/emergency surgery

**For additional Patient Safety Resources visit us at our booth on Academy Row in the AAOS Resource Center Moscone West Lobby**

**[aaos.org/patientsafety](http://aaos.org/patientsafety)**