Establishing A Culture of Safety: The 7 S Bundle To Prevent Surgical Site Infections

Maureen Spencer, RN, M.Ed., CIC
Corporate Infection Preventionist Consultant
Universal Health Services

www.7sbundle.com
www.workingtowardzero.com
EPIDEMIOLOGY OF HAI
NATIONAL AND STATE HEALTHCARE ASSOCIATED INFECTIONS PROGRESS REPORT

THIS REPORT IS BASED ON 2014 DATA, PUBLISHED IN 2016

Centers for Disease Control and Prevention National Center for Emerging and Zoonotic Infectious Diseases
Healthcare-associated infections (HAIs) are infections patients can get while receiving medical treatment in a healthcare facility. Working toward the elimination of HAIs is a CDC priority. The standardized infection ratio (SIR) is a summary statistic that can be used to track HAI prevention progress over time; lower SIRs are better. The infection data are reported to CDC’s National Healthcare Safety Network (NHSN). HAI data for nearly all U.S. hospitals are published on the Hospital Compare website. This report is based on 2014 data, published in 2016.

**CLABSIs**

Central Line-Associated Bloodstream Infections

When a tube is placed in a large vein and not put in correctly or kept clean, it can become a way for germs to enter the body and cause deadly infections in the blood.

- **U.S. hospitals reported a significant decrease in CLABSIs between 2013 and 2014.**
- **Among the 2,442 hospitals in U.S. with enough data to calculate an SIR, 30% had an SIR significantly higher (worse) than 0.50, the value of the national SIR.**

**CAUTIs**

Catheter-Associated Urinary Tract Infections

When a urinary catheter is not put in correctly, not kept clean, or left in a patient for too long, germs can travel through the catheter and infect the bladder and kidneys.

- **U.S. hospitals reported a significant decrease in CAUTIs between 2013 and 2014.**
- **Among the 2,880 U.S. hospitals with enough data to calculate an SIR, 12% had an SIR significantly higher (worse) than 1.00, the value of the national SIR.**

**MRSA Bacteremia**

Laboratory Identified Hospital-Onset Bloodstream Infections

Methicillin-resistant Staphylococcus aureus (MRSA) is bacteria usually spread by contaminated hands. In a healthcare setting, such as a hospital, MRSA can cause serious bloodstream infections.

- **U.S. hospitals reported a significant decrease in MRSA bacteremia between 2013 and 2014.**
- **Among the 2,042 U.S. hospitals with enough data to calculate an SIR, 8% had an SIR significantly higher (worse) than 0.87, the value of the national SIR.**

**SSIs**

Surgical Site Infections

When germs get into an area where surgery is or was performed, patients can get a surgical site infection. Sometimes these infections involve only the skin. Other SSIs can involve tissues under the skin, organs, or implanted material.

- **U.S. hospitals reported no significant change in SSIs related to abdominal hysterectomy surgery between 2013 and 2014.**
- **Among the 794 U.S. hospitals with enough data to calculate an SIR, 6% had an SIR significantly higher (worse) than 0.83, the value of the national SIR.**

- **U.S. hospitals reported a significant increase in SSIs related to colon surgery between 2013 and 2014.**
- **Among the 2,051 U.S. hospitals with enough data to calculate an SIR, 8% had an SIR significantly higher (worse) than 0.98, the value of the national SIR.**

**C. difficile Infections**

Laboratory Identified Hospital-Onset C. difficile Infections

When a person takes antibiotics, good bacteria that protect against infection are destroyed for several months. During this time, patients can get sick from Clostridium difficile (C. difficile), bacteria that cause potentially deadly diarrhea, which can be spread in healthcare settings.

- **U.S. hospitals reported a significant increase in C. difficile infections between 2013 and 2014.**
- **Among the 3,554 U.S. hospitals with enough data to calculate an SIR, 11% had an SIR significantly higher (worse) than 0.92, the value of the national SIR.**
# NATIONAL SSIs BY PROCEDURE TYPE

Surgical Site Infections, Acute Care Hospitals

<table>
<thead>
<tr>
<th>PROCEDURE CATEGORY</th>
<th># HOSPITALS REPORTING</th>
<th># PROCEDURES REPORTED</th>
<th>2014 NAT’L SIR VS. NAT’L BASELINE</th>
<th>2014 NAT’L SIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Laminectomy</td>
<td>477</td>
<td>100,750</td>
<td>↓ 47%</td>
<td>0.53</td>
</tr>
<tr>
<td>17 Liver transplant</td>
<td>21</td>
<td>1,307</td>
<td>↓ 63%</td>
<td>0.37</td>
</tr>
<tr>
<td>18 Neck surgery</td>
<td>62</td>
<td>1,080</td>
<td>↓ 32%</td>
<td>0.68</td>
</tr>
<tr>
<td>19 Kidney surgery</td>
<td>276</td>
<td>9,157</td>
<td>↓ 68%</td>
<td>0.32</td>
</tr>
<tr>
<td>20 Ovarian surgery</td>
<td>371</td>
<td>32,082</td>
<td>↑ 16%</td>
<td>1.16</td>
</tr>
<tr>
<td>21 Pacemaker surgery</td>
<td>328</td>
<td>24,347</td>
<td>↑ 5%</td>
<td>1.05</td>
</tr>
<tr>
<td>22 Prostate surgery</td>
<td>86</td>
<td>2,384</td>
<td>↓ 21%</td>
<td>0.79</td>
</tr>
<tr>
<td>23 Refusion of spine</td>
<td>300</td>
<td>5,740</td>
<td>↑ 39%</td>
<td>0.61</td>
</tr>
<tr>
<td>24 Small bowel surgery</td>
<td>396</td>
<td>22,058</td>
<td>↓ 40%</td>
<td>0.60</td>
</tr>
<tr>
<td>25 Spleen surgery</td>
<td>249</td>
<td>2,488</td>
<td>↓ 74%</td>
<td>0.26</td>
</tr>
<tr>
<td>26 Thoracic surgery</td>
<td>307</td>
<td>18,993</td>
<td>↓ 48%</td>
<td>0.52</td>
</tr>
<tr>
<td>27 Thyroid and/or parathyroid surgery</td>
<td>109</td>
<td>3,820</td>
<td>↓ 71%</td>
<td>0.29</td>
</tr>
<tr>
<td>28 Ventricular shunt</td>
<td>105</td>
<td>7,399</td>
<td>↓ 43%</td>
<td>0.57</td>
</tr>
<tr>
<td>29 Abdominal surgery</td>
<td>408</td>
<td>56,754</td>
<td>↓ 32%</td>
<td>0.68</td>
</tr>
</tbody>
</table>

**Legend**
- ↓ 2014 national SIR is significantly lower (better) than the 2008 SSI national baseline
- ↑ or ↓ Change in 2014 national SIR compared to the 2008 SSI national baseline is not statistically significant
- ↑ 2014 national SIR is significantly higher (worse) than 2008 SSI national baseline

This report is based on 2014 data, published in 2016.
Standardized Infection Ratio (SIR)

- Observed Cases = Number of infections
- Predicted Cases =
  \[(\text{NHSN Pooled Mean} \times \text{Unit-specific \# Device days})/1000\]
  
  - Yields a risk adjusted comparison number based on unit specific device use
- SIR formula = Observed/Predicted
SIR

- The SIR value will be from ZERO to 1 and above
  - A value LESS than 1 indicates that observed cases were LOWER than expected (Desirable)
    - SIR = 0.75 = Performing at 25% lower than comparable groups
  - A value of 1 indicates that observed cases were EQUAL to expected
  - A value MORE than 1 indicates that observed cases were HIGHER than expected (Undesirable)
    - SIR = 1.30 = Performing at 30% higher than comparable groups
    - SIR = 2.50 = Performing at 150% higher than comparable groups
<table>
<thead>
<tr>
<th>Pathogens Involved with SSIs</th>
<th>No (%) of SSI Pathogens</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staph aureus (includes MRSA)</td>
<td>6415 (30.4)</td>
<td>1</td>
</tr>
<tr>
<td>Coagulase neg staph</td>
<td>2477 (11.7)</td>
<td>2</td>
</tr>
<tr>
<td>E.Coli</td>
<td>1981 (9.4)</td>
<td>3</td>
</tr>
<tr>
<td>Enterococcus faecalis</td>
<td>1240 (5.9)</td>
<td>4</td>
</tr>
<tr>
<td>Pseudomonas aerug</td>
<td>1156 (5.5)</td>
<td>5</td>
</tr>
<tr>
<td>Enterobacter spp</td>
<td>849 (4.0)</td>
<td>6</td>
</tr>
<tr>
<td>Klebsiella spp</td>
<td>844 (4.0)</td>
<td>7</td>
</tr>
<tr>
<td>Enterococcus spp</td>
<td>685 (3.2)</td>
<td>8</td>
</tr>
<tr>
<td>Proteus spp</td>
<td>667 (3.2)</td>
<td>9</td>
</tr>
<tr>
<td>Enterococcus faecium</td>
<td>517 (2.5)</td>
<td>10</td>
</tr>
<tr>
<td>Serratia spp</td>
<td>385 (1.8)</td>
<td>11</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>367 (1.3)</td>
<td>12</td>
</tr>
<tr>
<td>Acinetobacter baum</td>
<td>119 (0.6)</td>
<td>13</td>
</tr>
<tr>
<td>Other Candida spp</td>
<td>96 (0.5)</td>
<td>14</td>
</tr>
<tr>
<td>Other organisms</td>
<td>3399 (16.1)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>21,100 (100)</td>
<td></td>
</tr>
</tbody>
</table>

Mortality risk is high among patients with SSIs

• A patient with an SSI is:
  – 5x more likely to be readmitted after discharge\textsuperscript{1}
  – 2x more likely to spend time in intensive care\textsuperscript{1}
  – 2x more likely to die after surgery\textsuperscript{1}

• The mortality risk is higher when SSI is due to MRSA
  – A patient with MRSA is 12x more likely to die after surgery\textsuperscript{2}

Special Risk Population: Orthopedic Implants

- Hip or Knee aspiration
- If positive – irrigation and debridement
- Removal of hardware may be necessary
- Insertion of antibiotic spacers
- Revisions at future date
- Long term IV antibiotics in community or rehab
- Future worry about the joint
- In other words – DEVASTATING FOR THE PATIENT AND SURGEON
COST OF HEALTHCARE ASSOCIATED INFECTIONS
HAC reduction program

Overview of HAC reduction program

Starting in FY2015, CMS will penalize institutions in top 25% for HAC rates by reducing overall Medicare payments by 1%

Penalty is in addition to withheld Medicare reimbursement related to these conditions

Several major infections will be tracked, including central line-associated bloodstream infections (CLABSI) and surgical site infections (SSI)

<table>
<thead>
<tr>
<th>Metric</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Catheter-associated urinary tract infection (CAUTI)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C. Difficile</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>MRSA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Difficile</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>C. Difficile</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
Increasing Financial Penalty for HAIs

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Hospital-acquired condition (HAC) program: $ withheld for 10 HACs</td>
</tr>
<tr>
<td>2013</td>
<td>VBP withholdings begin</td>
</tr>
<tr>
<td>2014</td>
<td>VBP penalty increases</td>
</tr>
<tr>
<td>2015</td>
<td>VBP penalty increases</td>
</tr>
<tr>
<td>2016</td>
<td>VBP penalty increases</td>
</tr>
<tr>
<td>2017</td>
<td>VBP penalty increases</td>
</tr>
</tbody>
</table>

HAC program expanded to complications after colon and abdominal hysterectomy surgeries

**VBP Domain Weights**

<table>
<thead>
<tr>
<th>Year</th>
<th>Clinical Process</th>
<th>Patient Experiences</th>
<th>Outcome</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>40%</td>
<td>30%</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>2014</td>
<td>45%</td>
<td>30%</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>2015</td>
<td>50%</td>
<td>30%</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>2016</td>
<td>55%</td>
<td>30%</td>
<td>20%</td>
<td>15%</td>
</tr>
</tbody>
</table>

VBP = Value-Based Purchasing Program; RRP = Readmission Reduction Program.

Hospital Readmissions Reduction Program (RRP) penalize institutions with high readmission rates

Overview of RRP

Starting in FY2013, hospitals with above-average readmission rates for specific conditions will see a reduction in overall Medicare payments.

Conditions evaluated under RRP:
- Acute myocardial infarction (AMI)
- Heart failure
- Pneumonia
- COPD*
- Total Hip Arthroplasty
- Total Knee Arthroplasty
- CABG*
- PCI**

Medicare payment reduction:
- 2013: 1%
- 2014: 2%
- 2015: 3%

* COPD = chronic obstructive pulmonary disease
** PCI = percutaneous coronary intervention
Health Care-Associated Infections
A Meta-analysis of Costs and Financial Impact on the US Health Care System

Eyal Zimlichman, MD, MSc; Daniel Henderson, MD, MPH; Orly Tamir, PhD, MSc, MHA; Calvin Franz, PhD; Peter Song, BSE; Cyrus K. Yamin, MD; Carol Keohane, BSN, RN; Charles R. Denham, MD; David W. Bates, MD, MSc

OBJECTIVE To estimate costs associated with the most significant and targetable HAIIs.

DATA SOURCES For estimation of attributable costs, we conducted a systematic review of the literature using PubMed for the years 1986 through April 2013. For HAI incidence estimates, we used the National Healthcare Safety Network of the Centers for Disease Control and Prevention (CDC).

STUDY SELECTION Studies performed outside the United States were excluded. Inclusion criteria included a robust method of comparison using a matched control group or an appropriate regression strategy, generalizable populations typical of inpatient wards and critical care units, methodologic consistency with CDC definitions, and soundness of handling economic outcomes.
<table>
<thead>
<tr>
<th>HAI</th>
<th>Est Annual %</th>
<th>Est Direct Cost</th>
<th>Avg Length of Stay</th>
<th>Attributable Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical Site Infection (SSI)</td>
<td>33.7%</td>
<td>$20 785</td>
<td>~11 days</td>
<td>~4%</td>
</tr>
<tr>
<td>MRSA SSI</td>
<td></td>
<td>$42 300</td>
<td>~23 days</td>
<td>~26%</td>
</tr>
<tr>
<td>Central Line Associated Bloodstream Infection (CLABSI)</td>
<td>18.9%</td>
<td>$45 814</td>
<td>~10 days</td>
<td>~26%</td>
</tr>
<tr>
<td>MRSA CLABSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilator Associated Pneumonia (VAP)</td>
<td>31.6%</td>
<td>$40 144</td>
<td>~13 days</td>
<td>~24%</td>
</tr>
<tr>
<td>Catheter Associated Urinary Tract Infection (CAUTI)</td>
<td>&lt;1%</td>
<td>$896</td>
<td>&lt; 1 day</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Clostridium difficile Infection (CDI)</td>
<td>15.4%</td>
<td>$11 285</td>
<td>~ 3 days</td>
<td>~4%</td>
</tr>
</tbody>
</table>

Environmental Contamination from Colonized Patients and Cross Contamination from Staff

• Poor hand hygiene
• Inadequate environmental discharge disinfection
• Inadequate terminal disinfection of isolation/precaution rooms
• Contamination of shared equipment
• Contamination of workstations on wheels
## Pathogens survive on surfaces

<table>
<thead>
<tr>
<th>Organism</th>
<th>Survival period</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Clostridium difficile</em></td>
<td>35- &gt;200 days.²,⁷,⁸</td>
</tr>
<tr>
<td>Methicillin resistant <em>Staphylococcus aureus</em> (MRSA)</td>
<td>14- &gt;300 days.¹,⁵,¹⁰</td>
</tr>
<tr>
<td>Vancomycin-resistant enterococcus (VRE)</td>
<td>58- &gt;200 days.²,³,⁴</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>&gt;150- 480 days.⁷,⁹</td>
</tr>
<tr>
<td><em>Acinetobacter</em></td>
<td>150- &gt;300 days.⁷,¹¹</td>
</tr>
<tr>
<td><em>Klebsiella</em></td>
<td>&gt;10- 900 days.⁶,⁷</td>
</tr>
<tr>
<td><em>Salmonella typhimurium</em></td>
<td>10 days- 4.2 years.⁷</td>
</tr>
<tr>
<td><em>Mycobacterium tuberculosis</em></td>
<td>120 days.⁷</td>
</tr>
<tr>
<td><em>Candida albicans</em></td>
<td>120 days.⁷</td>
</tr>
<tr>
<td>Most viruses from the respiratory tract (eg: corona, coxsackie, influenza, SARS, rhino virus)</td>
<td>Few days.⁷</td>
</tr>
<tr>
<td>Viruses from the gastrointestinal tract (eg: astrovirus, HAV, polio- or rota virus)</td>
<td>60- 90 days.⁷</td>
</tr>
<tr>
<td>Blood-borne viruses (eg: HBV or HIV)</td>
<td>&gt;7 days.⁵</td>
</tr>
</tbody>
</table>

2. BIOQUELL trials, unpublished data.
## Prior room occupancy increases risk

<table>
<thead>
<tr>
<th>Study</th>
<th>Healthcare associated pathogen</th>
<th>Likelihood of patient acquiring HAI based on prior room occupancy (comparing a previously ‘positive’ room with a previously ‘negative’ room)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martinez 2003¹</td>
<td>VRE – cultured within room</td>
<td>2.6x</td>
</tr>
<tr>
<td>Huang 2006²</td>
<td>VRE – prior room occupant</td>
<td>1.6x</td>
</tr>
<tr>
<td></td>
<td>MRSA – prior room occupant</td>
<td>1.3x</td>
</tr>
<tr>
<td>Drees 2008³</td>
<td>VRE – cultured within room</td>
<td>1.9x</td>
</tr>
<tr>
<td></td>
<td>VRE – prior room occupant</td>
<td>2.2x</td>
</tr>
<tr>
<td></td>
<td>VRE – prior room occupant in previous two weeks</td>
<td>2.0x</td>
</tr>
<tr>
<td>Shaughnessy 2008⁴</td>
<td>C. difficile – prior room occupant</td>
<td>2.4x</td>
</tr>
<tr>
<td>Nseir 2010⁵</td>
<td>A. baumannii – prior room occupant</td>
<td>3.8x</td>
</tr>
<tr>
<td></td>
<td>P. aeruginosa – prior room occupant</td>
<td>2.1x</td>
</tr>
</tbody>
</table>

A 7 S BUNDLE APPROACH TO PREVENTING SURGICAL SITE INFECTIONS
7 “S” Bundle to Prevent SSI

SAFETY – is your OPERATING ROOM safe?

SCREEN – are you screening for risk factors and presence of MRSA & MSSA

SHOWERS – do you have your patients cleanse their body the night before and morning of surgery with CHLORHEXIDINE (CHG)?

SKIN PREP – are you prepping the skin with alcohol based antiseptics such as CHG or Iodophor?

SOLUTION - are you irrigating the tissues prior to closure to remove exogenous contaminants? Are you using CHG?

SUTURES – are you closing tissues with antimicrobial sutures?

SKIN CLOSURE – are you sealing the incision or covering it with an antimicrobial dressing to prevent exogenous contamination?
#1 – **Safe Operating Room**

- traffic control, number staff in room
- air handling systems, filtration, grills
- SCIP: hair clipping, warmers, oxygenation, surgical prophylaxis, foley catheter removal 48 hrs
- room turnover and terminal cleaning
- surgical technique and handling of tissues
- instrument cleaning/sterilization process, biological indicators
- storage of supplies, clean supply bins, carts, tables, stationary equipment
AORN Recommended Practices

✓ Preoperative Patient Skin Antisepsis
✓ Environmental Cleaning in the Perioperative Setting
✓ Surgical Hand Antisepsis
✓ Cleaning and Care of Instruments and Powered Equipment
✓ High Level Disinfection
✓ Cleaning and Processing Anesthesia Equipment
✓ Sterilization in the Perioperative Setting
✓ Hand Hygiene in the Perioperative Setting
✓ Perioperative Management of Multiple Drug Resistant Organisms.
✓ Surgical attire
✓ Cleaning and Disinfection of Endoscopes
Surgical Care Improvement Program (SCIP)

*Surgical prophylaxis: selection, time, discontinuation of abx (24hrs or 48hrs cardiac)
*Hair clippers (no razors) – done outside the OR room
*Warming patient (pre-postop)
*Increased oxygen
*Remove foley catheter within 48 hours
Antimicrobial prophylaxis

• Performance measures include the antibiotic being
  – given within 60 minute before incision
  – consistent with current published recommendations
  – re-dosed if the time since administration exceeds two half-lives of the medication
  – dose per BMI
  – discontinued within 24 hours of conclusion of procedure

ASHP 2013 Surgical Prophylaxis Guidelines 2013
Surgical attire

• Normal individuals shed more than 10 million particles from their skin every day.
• Approximately 10% of skin squames carry viable microorganisms and it’s estimated that individuals shed approximately 1 million microorganisms from their bodies each day.
• AORN “Recommended practices for surgical attire” section IV.a. states that:
  “a clean, low-lint surgical head cover or hood that confines all hair and covers scalp skin should be worn. The head cover or hood should be designed to minimize microbial dispersal. Skullcaps may fail to contain the side hair above and in front of the ears and hair at the nape of the neck.”

Boyce, Evidence in Support of Covering the Hair of OR Personnel AORN Journal ● Jan 2014
Personal Items Don’t Belong in the OR

- Items may harbor pathogens and be difficult to clean or disinfect adequately
  - Pathogens have been shown to survive on fabrics and plastics
  - Microorganisms may be transported from one location to another

AORN Journal ● January 2012 Vol 95 No 1
Jewelry and Personal Clothing Doesn’t Belong in OR

- Wearing jewelry increases bacterial counts on skin surfaces
  - when jewelry is in place
  - after removal
- Removing watches and bracelets allows for more thorough hand washing
- Personal clothing should be completely covered by surgical attire

New scrubs with sleeves

AORN Journal ● January 2012 Vol 95 No 1
Scrubs and Jackets in OR

• “Facility approved, clean, and freshly laundered surgical attire should be donned in a designated dressing area of the facility upon entry or reentry to the facility

• If scrubs are worn into the institution from outside, they should be changed before entering semi-restricted or restricted areas to minimize the potential for contamination (e.g., animal hair, cross contamination from other uncontrolled environments)

• Home laundering of surgical attire is not recommended

• Non scrubbed personnel should wear long sleeved jackets that are buttoned or snapped closed during use

• Complete closure of the jacket avoids accidental contamination of the sterile field

• Long-sleeved attire is advocated to prevent bacterial shedding from bare arms and is included in the Occupational Safety and Health Administration (OSHA) regulation for the use of personal protective equipment (PPE)”
Laminar Flow and Exhaust Suits

No data to support reduction in SSIs

- Lipsett PA. Do we really need laminar flow ventilation in the operating room to prevent surgical site infections? Ann Surg 2008;248:701
Environmental cleaning

- Evaluate between room cleaning procedures
- Terminal cleaning procedures on evening/night shift
- Are there sufficient staff to terminally clean all OR rooms?
OR Environmental Cleaning References

Hot Topic due to recent outbreaks: Cleaning/Sterilization of Instruments

- Inspection of Instruments
  - Lumens, grooves, sorting, hand cleaning, disassembly required – massive kits
  - Many instruments cannot be disassembled
  - Correct use of Biologic Indicators

- Pre-soaking and rinsing of tissue and blood from the instruments in the operating room before sent to decontamination

Most Important Control Measure

- HAND HYGIENE in the operating room
- Wash hands several times a shift – especially if you have had gloves on for more than 20 minutes – organisms multiply every 20 minutes

Communication between organisms to pass resistance factors
Hand Contamination of Anesthesia Providers Is an Important Risk Factor for Intraoperative Bacterial Transmission

Randy W. Loftus, MD,* Matthew K. Muffly, MD,* Jeremiah R. Brown, PhD, MS,* Michael L. Beach MD, PhD,* Matthew D. Koff, MD,* Howard L. Corwin, MD,* Stephen D. Surgenor, MD,* Kathryn B. Kirkland, MD,* and Mark P. Yeager, MD*

(Anesth Analg 2011;112:98–105)
Table 2. Baseline Provider Hand Contamination

<table>
<thead>
<tr>
<th>Organism</th>
<th>Providers N/total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA</td>
<td>12/164 (7%)</td>
</tr>
<tr>
<td>MSSA</td>
<td>18/164 (11%)</td>
</tr>
<tr>
<td>VRE</td>
<td>4/164 (2%)</td>
</tr>
<tr>
<td>Enterococcus (non-VRE)</td>
<td>1/164 (0.6%)</td>
</tr>
<tr>
<td>Staph other</td>
<td>164/164 (100%)</td>
</tr>
<tr>
<td>Micrococcus</td>
<td>110/64 (67%)</td>
</tr>
<tr>
<td>Corynobacterium</td>
<td>14/164 (9%)</td>
</tr>
<tr>
<td>Streptococcus</td>
<td>128/164 (78%)</td>
</tr>
<tr>
<td>Gram negative&lt;sup&gt;b&lt;/sup&gt;</td>
<td>81/164 (49%)</td>
</tr>
</tbody>
</table>

MRSA = methicillin-resistant Staphylococcus aureus; MSSA = methicillin-sensitive Staphylococcus aureus; VRE = vancomycin-resistant Enterococcus.

<sup>a</sup> Samples taken upon entry to the patient environment but before patient contact and after an opportunity to perform hand hygiene.

<sup>b</sup> E. coli, Klebsiella, Serratia, Pseudomonas, and Acinetobacter.

(Anesth Analg 2011;112:98–105)
<table>
<thead>
<tr>
<th>Provider hands (site B)</th>
<th>Stopcock</th>
<th>Machine APL/D</th>
<th>Provider hands (site E)</th>
<th>Stopcock</th>
<th>Machine APL/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro</td>
<td>Attending</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. epi</td>
<td>Attending</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. hae</td>
<td>Attending</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. epi</td>
<td>Attending</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. epi</td>
<td>Attending</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro</td>
<td>Attending</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. epi</td>
<td>Attending</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro</td>
<td>Attending</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. epi</td>
<td>Attending</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro</td>
<td>Attending</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. epi</td>
<td>Attending</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro</td>
<td>Attending</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sites were cultured as described, and pathogens were found at the times and locations noted.

APL = anesthesia machine adjustable pressure limiting valve; D = anesthesia machine inhaled agent concentration dial; X = transmission event confirmed by biotype analysis; S. epi = Staphylococcal epidemicus; S. hae = Staphylococcal haemolyticus; Strep = streptococcus; Pseud = pseudomonas; MRSA = meticillin-resistant Staphylococcal aureus; MSSA = meticillin-sensitive Staphylococcal aureus; S. auric = Staphylococcal auricularis; CRNA = certified registered nurse anesthetist.

* Provider was negative at the start of case 1; hands contaminated by bacterial organisms brought in by other providers.

(Anesth Analg 2011;112:98–105)
Contaminated hands have the potential to leave biofilm on stopcocks and other devices
#2 SCREEN for Risk Factors and MRSA and MSSA Colonization
Evaluate Your Patient Risk Characteristics that might increase risk of SSI

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>ASA Score 3 or &gt;</td>
</tr>
<tr>
<td>Nutritional status</td>
<td>Obesity</td>
</tr>
<tr>
<td><strong>Diabetes mellitus</strong></td>
<td>Blood glucose level</td>
</tr>
<tr>
<td><strong>Chronic tobacco use</strong></td>
<td>Corticosteroid use</td>
</tr>
<tr>
<td>Drug abuse</td>
<td>Alcoholism</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>Chronic lung disease</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>Malignant disease</td>
</tr>
<tr>
<td>Preoperative chemotherapy</td>
<td>Anergy</td>
</tr>
<tr>
<td><strong>Nasal colonization</strong></td>
<td>Previous infection</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>Hematoma</td>
</tr>
<tr>
<td>Preoperative antibiotics</td>
<td>Immunosuppression</td>
</tr>
</tbody>
</table>
## Risk Factors for Orthopedic Surgical Infections

### Table 4. Infection risk factor

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Odds ratio (confidence interval)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current tobacco use</td>
<td>3.00 (1.78 5.06)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Current or history of bone cancer</td>
<td>12.85 (4.64 35.59)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>2.44 (1.55 3.82)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>7.34 (0.96 56.1)</td>
<td>0.027</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>5.59 (2.21 14.19)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>MRSA colonization or prior infection</td>
<td>7.34 (2.85 18.91)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>MSSA colonization or prior infection</td>
<td>8.64 (3.75 19.89)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Staphylococcal colonization or prior infection</td>
<td>6.52 (3.41 12.51)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Underweight (BMI &lt; 18.5 kg/m²)</td>
<td>1.90 (0.26 13.7)</td>
<td>0.56</td>
</tr>
<tr>
<td>Overweight (BMI 25.0 29.9 kg/m²)</td>
<td>0.60 (0.24 1.50)</td>
<td>0.24</td>
</tr>
<tr>
<td>Obese (BMI 30.0 39.9 kg/m²)</td>
<td>0.84 (0.51 1.41)</td>
<td>0.52</td>
</tr>
<tr>
<td>Morbid obesity</td>
<td>1.28 (0.61 2.65)</td>
<td>0.51</td>
</tr>
<tr>
<td>(BMI 40.0 49.9 kg/m²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Super obesity (BMI 50 + kg/m²)</td>
<td>15.69 (5.97 41.21)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Obesity hypoventilation syndrome</td>
<td>10.2 (1.17 88.5)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

MRSA = methicillin resistant *Staphylococcus aureus*; MSSA = methicillin susceptible *S aureus*; BMI = body mass index.

Everheart JS et al. Medical comorbidities are independent preoperative risk factors for surgical infections after total joint arthroplasty. Clin orthoped relat res. March22, 2013 online pub
Patients who carry *Staph aureus* in their nares or on their skin are more likely to develop *Staph aureus* SSIs.

This is true for methicillin-resistant as well as methicillin-sensitive *Staph aureus*.


Huang SS, Platt R. Risk of methicillin *Staphylococcus aureus* infection after previous infection or colonization. *Clinical Infectious Diseases*. 2003;36(3):281-5.

Decolonization Protocol
Evidence Based

*Staph aureus* carriers treated with five days of intranasal mupirocin and CHG washes before surgery have a **60% lower** *Staph aureus SSI rate** than the placebo group


Preoperative screening/decolonization was associated with **fewer SSIs** after elective Total Joint Arthroplasty

Does using mupirocin eradicate *Staph aureus* nasal carriage? – Evidence Based

- Short-term nasal mupirocin (4-7 days) is an effective method for *Staph aureus* eradication
- 90% success at one week
- 1% develop mupirocin resistance

Systematic review (Ammerlaan HS, et al. CID 2009): 8 studies comparing mupirocin to placebo
Institutional Prescreening for Detection and Eradication of Methicillin-Resistant Staphylococcus aureus in Patients Undergoing Elective Orthopaedic Surgery

David H. Kim, Maureen Spencer, Susan M. Davidson, Ling Li, Jeremy D. Shaw, Diane Gulczynski, David J. Hunter, Juli F. Martha, Gerald B. Miley, Stephen J. Parazin, Pamela Dejoie and John C. Richmond

Polymerase Chain Reaction (PCR) for Nasal Screens – Lab Challenges

- Instructing staff on how to obtain a nares specimen with proper swabs
- Lab differentiation of the colonized screens from routine cultures.
- Molecular lab up and running in a short time frame with cross-training of staff of Cepheid’s GeneXpert System
- Reporting system for positive results
Institutional Prescreening for Detection and Elimination of Methicillin Resistant Staphylococcus aureus in Patients Undergoing Elective Orthopaedic Surgery

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>5293</td>
<td>7019</td>
<td></td>
</tr>
<tr>
<td>MRSA Infection</td>
<td>10 (0.18%)</td>
<td>4 (0.06%)</td>
<td>0.0315</td>
</tr>
<tr>
<td>MSSA Infection</td>
<td>14 (0.26%)</td>
<td>9 (0.13%)</td>
<td>0.0937</td>
</tr>
<tr>
<td>Total SSIs</td>
<td>24 (0.46%)</td>
<td>13 (0.18%)</td>
<td>0.0093</td>
</tr>
</tbody>
</table>

#3 – Showers with CHG
OR Risk Factors: Bacteria on Patient’s Skin

• Pre-op Showers:
  – Liquid chlorhexidine shower
  – CHG impregnated washcloths
<table>
<thead>
<tr>
<th>Publication</th>
<th>CHG Prep Cloth Applications</th>
<th>Outcome</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson JKS 2012</td>
<td>2</td>
<td>72% SSI reduction</td>
<td>p.021</td>
</tr>
<tr>
<td>Kapadia JOA 2012</td>
<td>2</td>
<td>70% SSI reduction</td>
<td>p.05</td>
</tr>
<tr>
<td>Lipke AORN 2010</td>
<td>2</td>
<td>62% SSI reduction</td>
<td>p.0196</td>
</tr>
<tr>
<td>Eiselt Orthop Nurs 2009</td>
<td>2</td>
<td>50% SSI reduction</td>
<td></td>
</tr>
<tr>
<td>Murray JSES 2011</td>
<td>2</td>
<td>66% reduction of MRSA colonization</td>
<td>p.0001</td>
</tr>
<tr>
<td>Thompson AJIC 2013</td>
<td>2 preop + postop</td>
<td>72% SSI reduction</td>
<td>P0.003 (Cardio/Neuro)</td>
</tr>
<tr>
<td>Phillips ID Week 2012 Poster of RCT (manuscript submitted)</td>
<td>2</td>
<td>0% SSI reduction</td>
<td>p.05</td>
</tr>
<tr>
<td>Kapadia/Mont RCT interim data submitted to FDA hearing on Sterile Preps 12/2012</td>
<td>2</td>
<td>0% SSI reduction</td>
<td>p.05</td>
</tr>
<tr>
<td>Bailey ICHE 2011</td>
<td>2</td>
<td>CHG Cloth product is cost effective for routine distribution even low patient compliance.</td>
<td>N/A</td>
</tr>
<tr>
<td>Graling AORN 2013</td>
<td>1</td>
<td>77% SSI reduction</td>
<td>p.01</td>
</tr>
</tbody>
</table>
Empowering the Surgical Patient: A Randomized, Prospective Analysis of an Innovative Strategy for Improving Patient Compliance with Preadmission Showering Protocol

Charles E Edmiston Jr, PhD, Candace J Krepel, MS, Sarah E Edmiston, MEd, Maureen Spencer, MEd, Cheong Lee, MD, Kellie R Brown, MD, FACS, Brian D Lewis, MD, FACS, Peter J Rossi, MD, FACS, Michael Malinowski, MD, Gary Seabrook, MD, FACS

Figure 2. Mean skin-surface concentration (µg/mL) of 4% chlorhexidine gluconate after 3 preadmission showers. Group B1 subjects were alerted by short message service text, email, or voicemail. Group B2 subjects were not alerted before showering. The 90% minimum inhibitory concentration = 5 µg/mL for skin staphylococcal flora (including MRSA). LF, left; RT, right.
Pharmacologic Consideration of 4% versus 2% CHG (Cloth) Using a Standardized Regimen To Maximize Skin-Surface Concentrations of CHG

Summary of Edmiston CHG Studies: Comparison of 4% CHG Bottles to 2% Sage wipes

<table>
<thead>
<tr>
<th>Study</th>
<th>MIC&lt;sub&gt;50&lt;/sub&gt; for S. aureus (µg/mL)</th>
<th>DFU</th>
<th>Conc. (µg/mL)</th>
<th>Conc. (µg/in²)</th>
<th>DFU</th>
<th>Conc. (µg/mL)</th>
<th>Conc. (µg/in²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edmiston, JACS, 2008</td>
<td>4.8</td>
<td>Shower 2x: night before and morning of; 2 apps/shower; 2 min wait; Volume of product used not controlled</td>
<td>126.4</td>
<td>13.5</td>
<td>Apply 2x: night before and morning of; scrub both arms (shoulder to wrist, including antecubital fossa), legs (hip to ankle, including popliteal fossa), and total abdominal surface including umbilicus for 2 minutes, using 3 wipes</td>
<td>1745.7</td>
<td>187.0</td>
</tr>
<tr>
<td>Edmiston, Current</td>
<td></td>
<td>Shower 2x: night before and morning of; 1 app/shower; 1 min wait; 4 oz of product used</td>
<td>968</td>
<td>104</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A) The positively charged Chlorhexidine molecule is attracted to the negatively charged phospholipids in the cell wall.

B) Chlorhexidine binds to the cell wall causing it to rupture.

C) The rupturing of the cell wall causes fluid to leak leading to lysis and cell death.
#4 Skin Prep – Alcohol based surgical skin prep
Use an alcohol-containing antiseptic agent for preoperative skin preparation

Two types of preoperative skin preparations that combine alcohol (which has an immediate and dramatic killing effect on skin bacteria) with long-acting antimicrobial agents appear to be more effective at preventing SSI than povidone-iodine (an iodophor) alone:

– Chlorhexidine plus alcohol
– Iodophor plus alcohol

Institute for Healthcare Improvement (IHI): Prevention of SSI: Use Alcohol based antiseptics  2012
## Skin antiseptic agents

<table>
<thead>
<tr>
<th>Antiseptic agent</th>
<th>Rapidity of action</th>
<th>Persistent activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>CHG</td>
<td>Moderate</td>
<td>Excellent</td>
</tr>
<tr>
<td>PI</td>
<td>Moderate</td>
<td>Minimal</td>
</tr>
<tr>
<td>CHG w/alcohol</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>PI w/alcohol</td>
<td>Excellent</td>
<td>Moderate</td>
</tr>
<tr>
<td>PCMX</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
# 5 **Sutures** – Vicryl Plus Antimicrobial
Bacterial colonization of suture

- Like all foreign bodies, sutures can be colonized by bacteria:
  - Implants provide nidus for attachment of bacteria\(^1\)
  - Bacterial colonization can lead to biofilm formation\(^1\)
  - Biofilm formation increases the difficulty of treating an infection\(^2\)

On an implant, such as a suture, it takes only 100 staphylococci per gram of tissue for an SSI to develop\(^3\)

<table>
<thead>
<tr>
<th>Contamination</th>
<th>Colonization</th>
<th>Biofilm Formation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Why Antimicrobial Sutures?
OR Air Current Contamination

In teaching hospitals:
- Surgeon leaves room
- Resident, Physician Assistant or Nurse Practitioner work on incision
- Circulating Nurse counts sponges and starts room breakdown
- Scrub Technician starts breaking down tables and preparing instruments for Central Processing
- Anesthesia move in and out of room
- Instrument representative might leave room and visitors may leave room
Potential for Contamination of Sutures at End of Case

Antibacterial Suture Challenge

- Studied the “zone of inhibition” around the suture
  - A pure culture—0.5 MacFarland Broth—of *S. aureus* was prepared on a culture plate
  
  - An antibacterial suture was aseptically cut, planted on the culture plate, and incubated for 24 hrs – held at 5 and 10 days

5 day zone of inhibition

10 day zone of inhibition

Traditional suture

Antimicrobial suture

Systematic review and meta-analysis of triclosan-coated sutures for the prevention of surgical-site infection

Z. X. Wang\textsuperscript{1,2}, C. P. Jiang\textsuperscript{1,2}, Y. Cao\textsuperscript{1,2} and Y. T. Ding\textsuperscript{1,2}

\textsuperscript{1}Department of Hepatobiliary Surgery, Affiliated Drum Tower Hospital, School of Medicine, Nanjing University, and \textsuperscript{2}Jiangsu Province’s Key Medical Centre for Liver Surgery, Nanjing, Jiangsu Province, China

Correspondence to: Professor Y. T. Ding, 321 Zhong Shan Road, Nanjing, Jiangsu Province, China 210008 (e-mail: dingyitao@yahoo.com.cn)


Is there an evidence-based argument for embracing an antimicrobial (triclosan)-coated suture technology to reduce the risk for surgical-site infections?: A meta-analysis

Charles E. Edmiston, Jr, PhD,\textsuperscript{a} Frederic C. Daoud, MD,\textsuperscript{b} and David Leaper, MD, FACS,\textsuperscript{c} Milwaukee, WI, Paris, France, and London, UK

Edmiston et al: Surgery 2013;154:89-100
#6 Solution – to Pollution is Dilution
Chlorhexidine 0.05% Irrigation Solution

- Meets American College of Emergency Physicians (ACEP) guidelines for wound irrigation volume and pressure
- Proprietary SplatterGuard protects healthcare workers, patients and the environment from biohazard contamination
- Chlorhexidine Gluconate 0.05% is an excellent biocide that binds to tissues
- It has demonstrated antimicrobial efficacy and persistence in laboratory testing
- The mechanical action effectively loosens and removes wound debris
- Safe for mucous membranes – approved by FDA
- www.irrisept.com
Why CHG Irrigation? Air current contaminants can be flushed out before closure.

CHG Irrigant leaves a 2 week antimicrobial action in the tissue.
Practice forum

Surgical wound irrigation: A call for evidence-based standardization of practice

Sue Barnes RN, BSN, CIC\textsuperscript{a}, Maureen Spencer RN, MEd, CIC\textsuperscript{b}, Denise Graham\textsuperscript{c}, Helen Boehm Johnson MD\textsuperscript{d,\ast}

- Surgeons, perioperative nurses, and infection preventionists must partner to deliver exceptional infection prevention results.
- Infection preventionists need to know more about what happens “behind the red line” and how they can support practice changes that deliver real results.
- There is currently an absence of evidence-based science addressing surgical irrigation. As a result, there is a lack of guidance and standardization in perioperative practice. Standardization must address irrigation solution type(s), volume(s), and method(s) of delivery.
- Existing published evidence is sufficient to support:
  - Elimination of antibiotic solution for surgical irrigation;
  - Avoidance of surfactants for surgical irrigation
- Current existing published evidence is not sufficient to guide delivery method and volume. Expert opinion could instead be used to guide best practice.
#7 Skin Adhesive – Care of the Incision

Wound Healing Phases

**Inflammatory**
1) Immediate to 2-5 days
   - i) Constriction of the blood supply
   - ii) Platelets start to clot
   - iii) Formation of a scab
2) Bleeding stops (haemostasis)
   - i) Opening of the blood supply
   - ii) Cleansing of the wound
3) Inflammation

**Proliferative**
1) 5 days to 3 weeks
   - i) New collagen tissue is laid down
   - ii) New capillaries fills in defect
2) Granulation
   - i) Wound edges pull together
3) Contraction
   - i) Cells cross over the moist surface
   - ii) Cell travel about 3 cm from point of origin
4) Epithelialization

**Maturation**
1) Collagen forms which increases tensile strength to wounds
2) Scar tissue is only 80 percent as strong as original tissue
3) 3 weeks to 2 years
Challenges in the Post-op Patient

- Incision collects fluid – serum, blood - growth medium for organisms – small dehiscence
- Spine fusions - incisions close to the buttocks or neck
- Body fluid contamination from bedpans/commodores
- Heavy perspiration common with obese patients
- Friction and sliding - skin tears and blisters
- Itchy skin - due to pain medications - skin breakdown
Innovative Technology: Topical Skin Adhesive

• Wounds are most vulnerable to infection in the first 48-72 hours\(^1\)
  – Until the epithelial barrier is complete (usually within 48 hours) wounds are solely dependent on the wound closure device to maintain integrity\(^1\)

• The extent of microbial protection depends on barrier integrity\(^1\)
  – Effective barriers must maintain their integrity for the first 48 hours

• Incisional adhesive provides a strong microbial barrier that prevents bacteria from entering the incision site\(^2\)

Topical Skin Adhesive: Benefits Beyond Risk Reduction

- For Hospital Staff
  - No time spent removing staples or sutures
  - Reduces hospitalization costs
  - Reduces number of suture set ups
  - Simplifies post-op wound checks
  - Reduces number of wound dressings
  - Can reduce staff suture exposures

- For Patients
  - **7 days of wound healing strength in less than one minute** of application
  - Shower immediately
  - Outstanding cosmesis
  - Reduced follow-up
  - Less pain and anxiety
Adhesive Border and Healing
6 Weeks Post-op and Beyond
Incisional Adhesive on Total Knee
Clinical Use of Incisional Adhesive in Orthopedic Total Joints

**Hip:** Sealed with adhesive covered with gauze and transparent dressing for incision protection

**Knee:** Sealed with incisional adhesive, covered with Telfa and a transparent dressing for incision protection

Healed incision
Which Would You Prefer???

Topical Incisional Adhesive (TSA)
Octyl Cyanoacrylate
OTHER OPTIONS
WHEN ADHESIVES ARE CONTRAINDICATED
Antimicrobial (PHMB) Dressings with Hypoallergenic Fabric Tape

Spencer et al: The Use of Antimicrobial Gauze Dressing (AMD) After Orthopedic Surgery To Reduce Surgical Site Infections  NAON 2010 Annual Congress - May 15-19, 2010
Antimicrobial Silver Dressings

Silver dressing and transparent dressing left on until discharge – seals the incision from exogenous contaminants

NAON – May 2006
Spencer et al: The Use of A Silver Gauze Dressing in Spine Surgery to Reduce the Incidence of MRSA Surgical Site Infections
Many Risk Factors Influence SSI

One thing could lead to the failure
IN CONCLUSION.....
What to DO? Establish a Multidisciplinary Team

The team representatives
OR nursing, CSS, Surgeons & Anesthesia, Managers from infection control, healthcare quality, facilities and environmental services

Evaluate
Procedures and Practices
Facility design and Environment of Care Issues
Patient Risk Factors
Infection Rates
Innovative Infection Prevention Products and Practices

Zero Harm Teams – Patient Safety Committee or Council

- Senior leadership and surgeons – must be involved and lead the effort
- Clear goals
  - Structured program with clearly defined goal of zero tolerance for HAIs
- Communication – effective and consistent
- Ongoing and creative education
- Financial support to Infection Prevention program
- Use process improvement tools (fishbone, pareto, mind-mapping)
Additional References

• Payers in Preventing Abdominal Surgical Site Infections. Infection Control and Hospital Epidemiology, Vol. 35, No. 8 (August 2014), pp. 1013-1020
The End