Infection Control for the Surgeon

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VCU Medical Center
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Outline

• Paradigm shift in NI prevention
• Part I- Reduction of SSI and Device Associated Infections
  – Perioperative antibiotics, hair removal, glycemic control, and normothermia
  – Surgical Hand Preparation
  – Device associated infections
  – S. aureus/MRSA SSI
    • Mupirocin and other decolonization measures
• Part II-Prevention of BBF exposures in the OR
  – Double gloving, HFT, Blunt Suture Needles
• Mandatory public reporting of NIs
• Conclusion
Shifting Vantage Points on Nosocomial Infections

Many infections are inevitable, although some can be prevented.

Each infection is potentially preventable unless proven otherwise.

Part I
Prevention of SSI and Device Associated Nosocomial Infections
Sadly, we as medical professionals do not practice well known nosocomial infection risk reduction practices until system level changes are implemented or mandated.
SCIP
Surgical Care Improvement Project

• A national partnership of organizations to improve the safety of surgical care by reducing post-operative complications
• Goal: reduce surgical complications 25% by 2010
• Initiated in 2003 by CMS & CDC
  – Steering committee of 10 national organizations
  – >20 additional organizations provide technical expertise
• Strategy: Surgeons, anesthesiologists, periop nurses, pharmacists, infection control professionals, & hospital executives work together to improve surgical care
• Target areas: Surgical site infections, perioperative adverse cardiac events, deep venous thrombosis, postoperative pneumonia
# SCIP Measures

<table>
<thead>
<tr>
<th></th>
<th>Perioperative antibiotic prophylaxis</th>
<th>Antimicrobial given within 1 hour prior to incision</th>
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<tbody>
<tr>
<td>2</td>
<td>Appropriate antibiotic selected</td>
<td>Antibiotic selected</td>
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<tr>
<td>3</td>
<td>Antibiotic discontinued within 24 hrs of surgery end time (48 hrs for cardiac surgery)</td>
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<td>4</td>
<td>Glycemic control</td>
<td>Cardiac surgery patients with 6 AM glucose ≤ 200 mg/dL on postop day 1 &amp; 2</td>
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<tr>
<td>5</td>
<td>Appropriate hair removal</td>
<td>No hair removal, or hair removal with clippers or depilatory</td>
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<td>6</td>
<td>Normothermia</td>
<td>Colorectal surgery patients with T ≥96.8°F within the first hour after leaving the OR</td>
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<tr>
<td>7</td>
<td>Perioperative β-blockers</td>
<td>Patients on a β-blocker prior to admission who received a β-blocker 24 hrs prior to incision through discharge from PACU</td>
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<tr>
<td>8</td>
<td>DVT prophylaxis</td>
<td>Patients with recommended DVT prophylaxis ordered during the admission</td>
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<td>9</td>
<td></td>
<td>Patients who received appropriate DVT prophylaxis within 24 hours prior to <em>Surgical Incision Time</em> to 24 hours after <em>Surgery End Time</em></td>
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</tbody>
</table>
Meta-analyses:
Antibiotic Prophylaxis vs Placebo

- OR 0.35; TAH; 17 trials
- OR 0.35; TAH; 25 trials
- OR 0.30; biliary surgery; 42 trials
- OR 0.20; CT surgery; 28 trials

Effect of Appropriate Perioperative Antibiotic Prophylaxis at a 650-bed Tertiary Care Hospital

- Right antibiotic
- Within 60 minutes of incision
- D/C within 24 hrs
- SSI %

Process Indicators:

Timing of First Antibiotic Dose

Infusion should begin within 60 minutes of the incision

• Little controversy regarding this indicator

Process Indicators:  
Duration of Antimicrobial Prophylaxis

Prophylactic antimicrobials should be discontinued within 24 hrs after the end of surgery

• Areas of controversy:
  – ASHP recommends continuing prophylaxis for CT surgery procedures for up to 72 hrs after the operation; Society of Thoracic Surgeons recommends 48 hrs

The Timing of Surgical Antimicrobial Prophylaxis

- **Objective:** to determine the optimal timing of surgical antimicrobial prophylaxis
- **Prospective observational cohort at Basel University Hospital**
  - Consecutive series of 3836 surgical procedures
  - Multiple logistic regression analyses for the odds of SSI when the antimicrobial was administered in less than 30 minutes prior to incision vs 59 to 30 minutes prior to incision

The Timing of Surgical Antimicrobial Prophylaxis

FIGURE 1. Risk-adjusted odds ratios and 95% confidence intervals for surgical site infection versus timing of antimicrobial prophylaxis divided into 3 time intervals. Association of timing of antibiotic prophylaxis and the odds of SSI obtained with multivariable logistic regression analysis, which included wound classification, ASA score in groups I to IV, division of surgical specialty (visceral, vascular, trauma), lowest intraoperative body temperature, body mass index, preoperative antibiotic therapy, smoking status, diabetes, immunosuppression, T time surpassed, sex, and age by 10-year intervals.

Much Cleaner Cuts

**Problem:** Infection related to surgery

**Proposal:** Better use of antibiotics, don’t shave with razor prior to surgery, tighten control of blood sugar

**Possible Lives Saved:** 8,000

A hospital is a risky place for people who have had surgery. No matter how much antibacterial solution is painted on before the first cut, opening the body invites lurking microbes. Infections at the surgery site complicate an estimated 780,000 operations a year, or more than 1 in every 40 procedures. For abdominal surgery, the likelihood is as high as 1 in 5. And the complications are tough to treat. Infected patients are two to three times more likely to die and are hospitalized an average of seven days longer than uninfected patients who had the same operation.

Even before the 100K campaign got underway, IHI had been working with a group of 56 hospitals on strategies to lower the rate of surgical-site infections. Results of the yearlong effort, published last month in the *American Journal of Surgery*, showed a re-

Pathophysiology of Shaving & SSI

• Hair removal with a razor can disrupt skin integrity
• Microscopic exudative rashes and skin abrasions can occur during hair removal.
• These rashes and skin abrasions can provide a portal of entry for microorganisms
### Cochrane Database of Systematic Reviews: Preoperative Hair Removal and SSIs

<table>
<thead>
<tr>
<th>Trial</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>3 trials compared hair removal with razor or depilatory cream vs no hair removal</td>
<td>No significant difference in SSI</td>
</tr>
<tr>
<td>3 trials compared hair removal with clippers vs shaving</td>
<td>Increased risk of SSI with Shaving (RR=2.02)</td>
</tr>
<tr>
<td>7 trials compared hair removal with shaving vs depilatory cream</td>
<td>Increased risk of SSI with Shaving (RR=1.54)</td>
</tr>
<tr>
<td>One trial each compared shaving the night before vs day of surgery, and clipping the day before vs day of surgery</td>
<td>No significant difference in SSI</td>
</tr>
</tbody>
</table>

Tanner et al. *Cochrane Database of Systematic Reviews* 2006, issue 3, Art No. CD004122
Cochrane Database of Systematic Reviews: Preoperative Hair Removal and SSIs

• If hair removal is necessary then clipping and depilatory creams result in fewer SSIs than shaving with a razor
• There is no difference in SSI if hair is removed one day prior or on the day of surgery

Tanner et al. Cochrane Database of Systematic Reviews 2006, issue 3, Art No. CD004122
Effect of Shaving in Spinal Surgery

789 patients randomized

371 patients shaved

4 patients (1.08%) developed SSI

418 patients not shaved

1 patient (0.24%) developed SSI

P<.01

Perioperative Glycemic Control
Perioperative Glucose Control

- Poor glucose control has been shown to be an *independent* risk factor for SSI in multiple studies.
- Risk is increased due to vascular disease, neutrophil dysfunction, impairment of complement & antibodies.
- Intervention: maintain glucose at 151-200 mg/dL via a continuous insulin infusion.
Perioperative Glucose Control

• 141 diabetic patients undergoing CABG were randomized to tight glycemic control (125-200 mg/dL) with GIK or standard therapy (<250 mg/dL) using SQ SSI beginning before anesthesia & continuing for 12 hours after surgery.

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<tr>
<th></th>
<th>SSI</th>
<th>GIK</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection (wound, pneumonia)</td>
<td>13%</td>
<td>0%</td>
<td>0.01</td>
</tr>
<tr>
<td>Post-op LOS</td>
<td>9.2 days</td>
<td>6.5 days</td>
<td>0.001</td>
</tr>
<tr>
<td>Mortality</td>
<td>0%</td>
<td>0%</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Perioperative Glucose Control

- 2,467 diabetic patients undergoing cardiac surgery at a community hospital
  - 968 patients treated with sliding scale insulin (1987-91)
  - 1499 patients treated with CII to target glucose of 150-200 until POD 3 (1991-97)

<table>
<thead>
<tr>
<th></th>
<th>SSI</th>
<th>CII</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound infection</td>
<td>1.9%</td>
<td>0.8%</td>
<td>0.01</td>
</tr>
<tr>
<td>LOS</td>
<td>10.7 days</td>
<td>8.5 days</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mortality</td>
<td>6.1%</td>
<td>3.0%</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Perioperative Glycemic Control

• An increasing body of evidence demonstrates that tight glycemic control of blood glucose improves overall outcomes for patients with DM.
• The best quality data currently available is in the CT surgical literature
• Data appear promising but quality studies in the non-cardiac surgical populations are not yet available.
Perioperative Normothermia
Physiologic Effects of Hypothermia

Anesthetic drugs, opioids, sedatives

↓ Impaired thermoregulatory control

Vasoconstriction

↓ Production of superoxide radicals

↓ Collagen deposition

↓ Tissue oxygenation

↓ Killing of pathogens by neutrophils

↑ Risk of SSI
Perioperative Normothermia

- Blinded, randomized trial of 421 patients undergoing clean surgery (breast, varicose vein or hernia) comparing routine preoperative care to systemic warming (forced air warming blanket 30 minutes preop) to local warming (30 minute preop warming of planned incision with a radiant dressing)

<table>
<thead>
<tr>
<th>Infection rate</th>
<th>Non-warmed</th>
<th>Local warming</th>
<th>Systemic warming</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>4%</td>
<td>6%</td>
<td>5%</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Perioperative Normothermia

- Double-blinded, randomized trial of 200 patients undergoing colorectal surgery comparing routine intraoperative thermal care (34.5°C) to normothermia (36.5°C) using a forced air cover and heated fluids

<table>
<thead>
<tr>
<th></th>
<th>Hypothermia</th>
<th>Normothermia</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Infection rate</td>
<td>19%</td>
<td>6%</td>
<td>0.009</td>
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</tbody>
</table>

## Surgical Hand Antisepsis

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Meers et al. J Hygiene 1978</td>
<td>Surgical hand preparation requiring scrubbing with a brush damages the skin and leads to increased shedding of bacteria and squamous epithelial cells</td>
</tr>
<tr>
<td>• Kikuchi et al. Acta Derm Venereol 1999</td>
<td></td>
</tr>
<tr>
<td>• Dineen, P. Surg Gynecol Obstet 1973</td>
<td>Scrubbing with a disposable sponge or combination sponge-brush has reduced bacterial counts on the hands as effectively as scrubbing with a brush.</td>
</tr>
<tr>
<td>• Bornside GH. Surgery 1968</td>
<td></td>
</tr>
<tr>
<td>• Mulberry et al. Am J Infect Control 2001</td>
<td>Neither brush nor sponge is necessary to reduce bacterial counts on the hands of surgical staff to acceptable levels</td>
</tr>
<tr>
<td>• Loeb et al. Am J Infect Control 1997</td>
<td></td>
</tr>
</tbody>
</table>

CDC. MMWR, Guideline For Hand Hygiene in Healthcare Setting, October 25, 2002
Comparison of Different Regimens for Surgical Hand Preparation

• Prospective clinical trial comparing a traditional surgical scrub with chlorhexidine vs. a short application without scrub of a waterless, alcohol-based hand preparation (waterless hand rub)

• Waterless hand rub:
  • Caused less skin damage (P=0.002)
  • Produced lower microbial counts postscrub at days 5 (P=0.002) & 19 (P=0.02)
  • Required less time (1.3 minutes vs. 2.4 minutes; P<0.0001)
  • Was preferred by surgical staff (P=0.001)
  • Was cheaper

Alcohol-based Hand Rub vs Traditional Scrub
Prevention of Surgical Site Infection

• Prospective, randomized equivalence trial comparing comparing the effectiveness of waterless, alcohol-based hand rub vs traditional scrub (betadine or chlorhexidine) to prevent SSI
• 4,387 consecutive patients who underwent clean and clean contaminated surgery
• Findings:
  – Alcohol hand rub was as effective as traditional scrub in preventing SSIs in a 30 day follow-up
  – Alcohol hand rub was better tolerated by surgical teams
  – Alcohol hand rub can be safely used as an alternative to traditional surgical hand-scrubbing

Nosocomial Bloodstream Infections
The CVC is the greatest risk factor for Nosocomial BSI.

As the host cannot be altered, preventive measures are focused on risk factor modification of catheter use, duration, placement and manipulation.

The risk factors interact in a dynamic fashion.
**Nosocomial Bloodstream Infections**

- 12-25% attributable mortality
- Risk for bloodstream infection:

<table>
<thead>
<tr>
<th>Device</th>
<th>BSI per 1,000 catheter/days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central venous SQ port</td>
<td>0.1</td>
</tr>
<tr>
<td>Peripheral IV</td>
<td>0.5</td>
</tr>
<tr>
<td>PICC (outpatient setting)</td>
<td>1.0</td>
</tr>
<tr>
<td>Noncuffed, rifampin/minocycline CVC</td>
<td>1.2</td>
</tr>
<tr>
<td>Noncuffed, chlorhexidine/silver sulfadiazine CVC</td>
<td>1.6</td>
</tr>
<tr>
<td>Cuffed, tunneled CVC</td>
<td>1.6</td>
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<tr>
<td>PICC (inpatient setting)</td>
<td>2.1</td>
</tr>
<tr>
<td>Noncuffed, nonmedicated CVC</td>
<td>2.7</td>
</tr>
<tr>
<td>Pulmonary artery catheter</td>
<td>3.7</td>
</tr>
<tr>
<td>Temporary dialysis catheter</td>
<td>4.8</td>
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</tbody>
</table>

Risk Factors for Nosocomial BSIs

- Heavy skin colonization at the insertion site
- Internal jugular or femoral vein sites
- Duration of placement
- Contamination of the catheter hub
Prevention of Nosocomial BSIs
Hopkins Model (Central Line Bundle)

- Creation of a central line insertion cart
- Use of a insertion checklist to ensure:
  - Hand hygiene prior to the procedure
  - Sterile gloves, gown, mask, cap, full-size drape
  - Chlorhexidine skin prep of the insertion site
  - Use of subclavian vein as the preferred site
- Bedside nurse empowered to stop the procedure if a step is missed
- Ask every day during rounds whether catheters can be removed

Practice Standardization Leads to Major Reduction in ICU CR-BSIs


Catheter-related bloodstream infections are expensive and result in significant morbidity and mortality.

Simple, inexpensive, and evidence-based interventions to reduce these infections are effective.

Broad use of these interventions could significantly reduce cost, morbidity and mortality.
Ventilator associated Pneumonia
Head of Bed Elevation in VCU Medical ICU: Effect of Feedback

## STICU Nosocomial Infections Dashboard

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Q2-06</th>
<th>Q3-06</th>
<th>Q4-06</th>
<th>Q1-07</th>
<th>Q2-07</th>
<th>Q3-07</th>
<th>Q4-07</th>
<th>Q1-08</th>
<th>Q2-08</th>
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<tbody>
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<td><strong>BSI/1,000 catheter days</strong></td>
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<td>&gt;75th %ile</td>
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<td>9.2</td>
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<td>6.4</td>
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<td>50th–74th %ile</td>
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<td><strong>UTI/1,000 catheter days</strong></td>
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<td><strong>Pneumonia/1,000 vent. days</strong></td>
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<td><strong>Patient-days w/femoral CVC</strong></td>
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<td><strong>Hand hygiene</strong></td>
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<td><strong>CVC insertion checklist completed</strong></td>
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* Dialysis lines excluded from analysis  ** prior to 2007: <40%, 40-59%, >60%
Staphylococcus aureus nasal carriage and surgical site infections
S. aureus carriage in healthy populations

• Cross sectional surveys
  – Nasal carriage 20%-55%

• Longitudinal studies
  – 10%-35% of healthy adults are persistent nasal carriers
  – 20%-75% of healthy adults are intermittent carriers

Vandenberg et al. J Lab Clin Med 1999;133:525-34
Correlation of *S. aureus* nasal carriage and *S. aureus* SSI

<table>
<thead>
<tr>
<th>Nasal <em>S. aureus</em> carriage CFUs (n)</th>
<th>Patients (N)</th>
<th>Infections rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>345</td>
<td>8</td>
</tr>
<tr>
<td>$10^1$ to $10^3$</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>$10^3$ to $10^5$</td>
<td>28</td>
<td>11</td>
</tr>
<tr>
<td>$10^5$ to $10^6$</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>$&gt; 10^6$</td>
<td>38</td>
<td>29</td>
</tr>
</tbody>
</table>

What about MRSA SSI?

SSI pathogens isolated from 10,672 surgeries in rural and urban community hospitals

<table>
<thead>
<tr>
<th>Organism</th>
<th>Number of Isolates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S. aureus</strong></td>
<td>19 (21.3)</td>
</tr>
<tr>
<td><strong>MRSA</strong></td>
<td>4 (4.5)</td>
</tr>
<tr>
<td>Streptococcal species</td>
<td>10 (11.2)</td>
</tr>
<tr>
<td>CNS</td>
<td>9 (10.1)</td>
</tr>
<tr>
<td>Enterococcus species</td>
<td>7 (7.9)</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td>6 (6.7)</td>
</tr>
<tr>
<td>Enterobacteriacea</td>
<td>11 (12.4)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (3.4)</td>
</tr>
<tr>
<td>No organism isolated</td>
<td>20 (22.5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>89 (100)</strong></td>
</tr>
</tbody>
</table>

Cantlon et al. Amer Journal Infect Control 2006;34:8, 526-529
Intranasal Mupirocin to prevent S.\textit{aureus} SSI

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mupirocin Group</th>
<th>Placebo group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S.\textit{aureus} carriers</td>
<td>S.\textit{aureus} carriers</td>
</tr>
<tr>
<td>N=444</td>
<td>N=447</td>
<td></td>
</tr>
<tr>
<td>Nosocomial infection</td>
<td>57/444 (12.8)</td>
<td>72/447 (16.1)</td>
</tr>
<tr>
<td>Nosocomial S.\textit{aureus} infection</td>
<td>17/430 (4.0)</td>
<td>34/439 (11.6)</td>
</tr>
<tr>
<td>SSI</td>
<td>44/444 (9.9)</td>
<td>52/447 (11.6)</td>
</tr>
<tr>
<td>S.\textit{aureus} SSI</td>
<td>16/32 (3.7)</td>
<td>26/439 (5.9)</td>
</tr>
</tbody>
</table>

Randomized, placebo controlled trial of placebo vs intranasal mupirocin ointment in 4030 patients undergoing general, gynecologic, neurologic or cardiothoracic surgeries

Rapid Detection of MRSA

• The BD GeneOhm™ MRSA Assay
  – Qualitative *in vitro* diagnostic test for the direct detection of methicillin-resistant *Staphylococcus aureus* (MRSA) from a nasal specimen.

• Results available in less than 2 hours, directly from a nasal swab specimen

• No culture step required
Highly Effective Regimen for Decolonization of Methicillin-Resistant \textit{Staphylococcus aureus} Carriers

- Prospective cohort study with a mean follow-up period of 36 months
- 62 patients
  - Decolonization treatment was performed
  - At least 6 body sites were screened for MRSA (including by use of rectal swabs) before the start of treatment.

Buehlmann et al \textit{Infect Control Hosp Epidemiol} 2008;29:510–516
Highly Effective Regimen for Decolonization of Methicillin-Resistant Staphylococcus aureus Carriers

• Standardized decolonization treatment
  – Mupirocin nasal ointment
  – Chlorhexidine mouth rinse
  – Full-body wash with chlorhexidine soap for 5 days.
  – Intestinal and urinary-tract colonization treated with oral vancomycin and cotrimoxazole, respectively
  – Vaginal colonization treated with povidone-iodine or, alternatively, with chlorhexidine ovula
  – Successful decolonization was considered to have been achieved if results were negative for 3 consecutive sets of cultures of more than 6 screening sites.

Highly Effective Regimen for Decolonization of Methicillin-Resistant \textit{Staphylococcus aureus} Carriers

Decolonization was successful in 54 (87\%) of the patients in the intent-to-treat analysis.

Buehlmann et al \textit{Infect Control Hosp Epidemiol} 2008;29:510–516
Part II
Prevention of BBF Exposures in the OR
Double Gloving

• American College of Surgeons
  – The ACS recommends the universal adoption of the double glove (or underglove) technique in order to reduce body fluid exposure caused by glove tears and sharps injuries in surgeons and scrub personnel.
  • In certain delicate operations, and in situations where it may compromise the safe conduct of the operation or safety of the patient, the surgeon may decide to forgo this safety measure

http://www.facs.org/fellows_info/statements/st-58.html
Double Gloving

- Glove barrier perforation rates
  - As high as 61 percent for thoracic surgeons and 40 percent for scrub personnel.
  - Double gloving reduces the risk of exposure to patient blood by as much as 87
- Double gloving has disadvantages such as decreased tactile sensation
  - Example: neurosurgery where delicate manipulation of instruments and tissues is required
- Despite a large body of data documenting the benefits of double gloving, this technique has not received wide acceptance by surgeons.

http://www.facs.org/fellows_info/statements/st-58.html
Incidence of Glove Perforations in GI Surgery and the Protective Effect of Double Gloves: A Prospective, Randomized Control Study

- 566 pairs of gloves tested
  - 306 pairs of single gloves
  - 260 pairs of double gloves

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Single glove</th>
<th>Double glove</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of glove perforations</td>
<td>53/306 (17%)</td>
<td>6/260 (2%)</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Rate of surgeon blood contamination of hands</td>
<td>15/115 (13%)</td>
<td>2/98 (2%)</td>
<td>&lt;0.005</td>
</tr>
</tbody>
</table>

Glove Perforation in Orthopedic and Trauma Surgery

<table>
<thead>
<tr>
<th>1769 Gloves from 349 Operations</th>
<th>Perforations/Gloves</th>
<th>Perforations Detected During Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single Gloves</strong></td>
<td>13/186 (7%)*</td>
<td>3/13 (23%) †</td>
</tr>
<tr>
<td><strong>Indicator Gloves</strong></td>
<td>41/426 (9.6%)*</td>
<td>37/41 (90.2%) †</td>
</tr>
<tr>
<td><strong>Combination Gloves</strong></td>
<td>25/242 (10.3%)*</td>
<td>9/25 (36%) †</td>
</tr>
</tbody>
</table>

- Orthopedic surgeons randomized to either single gloves of their preference, double indicator gloves, or a combination of two regular surgical gloves

* P > 0.05, † P < 0.001

How Often Does Glove Perforation Occur in Surgery?

Double gloving to reduce surgical cross-infection

• Review of randomized, controlled trials involving: single gloving, double gloving, triple gloving, glove liners, knitted outer gloves, steel weave outer gloves and perforation indicator systems
Double gloving to reduce surgical cross-infection

<table>
<thead>
<tr>
<th>14 trials of double gloving</th>
<th>• More perforations to the single glove than the innermost of the double gloves (OR 4.10, 95% CI 3.30 to 5.09)</th>
</tr>
</thead>
</table>
| 8 trials of indicator gloves | • Fewer perforations detected with single gloves compared with indicator gloves (OR 0.10, 95% CI 0.06 to 0.16)  
• Fewer perforations detected with standard double glove compared with indicator gloves (OR 0.08, 95% CI 0.04 to 0.17) |
| 2 trials of glove liners (a glove knitted with cloth or polymers worn between two pairs of latex gloves) | • More perforations to the innermost glove of a standard double glove vs glove liner gloves (OR 26.36, 95% CI 7.91 to 87.82) |

J Tanner, H Parkinson | Cochrane Database of Systematic Reviews 2008 Issue 2
Double gloving to reduce surgical cross-infection

- There is no direct evidence that additional glove protection worn by the surgical team reduces surgical site infections in patients, however the review has insufficient power for this outcome.
- The addition of a second pair of surgical gloves significantly reduces perforations to innermost gloves.
- Triple gloving, knitted outer gloves and glove liners also significantly reduce perforations to the innermost glove.
- Perforation indicator systems results in significantly more innermost glove perforations being detected during surgery.

J Tanner, H Parkinson. Cochrane Database of Systematic Reviews 2008 Issue 2
The Neutral Zone

- The ACS recommends the use of HFT as an adjunctive safety measure to reduce sharps injuries during surgery except in situations where it may compromise the safe conduct of the operation, in which case a partial HFT can be used.

http://www.facs.org/fellows_info/statements/st-58.html
The Neutral Zone

• HFT and Sharps Neutral Zone
  – No direct handing of instruments from scrub person to surgeon and back
• Partial HFT
  – Sharps are directly handed by the scrub person to the surgeon, but then returned to the scrub person via a neutral zone

http://www.facs.org/fellows_info/statements/st-58.html
## Effectiveness of the Hands Free Technique in Reducing Operating Theatre Injuries

<table>
<thead>
<tr>
<th>Hands free Technique</th>
<th>Event rate</th>
<th>Rate ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used</td>
<td>2.1% (33/1545)</td>
<td>0.41 (0.49-1.98)</td>
</tr>
<tr>
<td>Not used</td>
<td>5.1% (110/2153)</td>
<td>1.0 reference</td>
</tr>
</tbody>
</table>

• Prospective evaluation of the hands-free technique in reducing the incidence of percutaneous injuries, contaminations, and glove tears.

• 3765 operations observed over 6 months in main and surgical day care operating theatres.

• Circulating nurses recorded the proportion of use of the hands-free technique during each operation

*Occup Environ Med* 2002; 59: 703-707
Blunt Tip Suture Needles

• Suture needle injuries pose the greatest risk of sharps injury to the surgeon and scrub personnel

• The ACS recommends the universal adoption of blunt tip suture needles for the closure of fascia and muscle in order to reduce needle-stick injuries in surgeons and OR personnel

http://www.facs.org/fellows_info/statements/st-58.html
Blunt Tip Suture Needles

• The ACS recommends the universal adoption of blunt tip suture needles for the closure of fascia and muscle in order to reduce needle-stick injuries in surgeons and OR personnel
  – A new generation of blunt suture needles is now on the market with a slightly more tapered tip profile that may provide for easier suturing

http://www.facs.org/fellows_info/statements/st-58.html
Glove Perforation During Hip Arthroplasty

- Prospective randomized trial comparing the incidence of surgical glove perforation by standard surgical needle vs. taperpoint needle

Glove Perforation During Hip Arthroplasty

Number of Gloves Studied: 76
Number of Perforations Detected: 18

P = 0.049

Part III
Mandatory Public Reporting of Nosocomial Infections
Status of Mandatory Reporting Legislation for Nosocomial Infections

- Enacted legislation
- Legislation proposed in 2007
- Passed a bill to study the issue

Source: APIC, February 2007
Goals of the Ideal Mandatory Reporting & Disclosure Program

- Maximize accuracy of data collection
- Standardize methodology for data collection & analysis
- Minimize costs to hospitals & government agencies
- Produce data that are valid, fair to hospitals, & useful to consumers

<table>
<thead>
<tr>
<th>State</th>
<th>Data Source</th>
<th>Metrics Reported</th>
<th>Reporting and Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>Administrative claims &amp; clinical data</td>
<td>Class I SSI, VAP, CL-BSI</td>
<td>Mandatory quarterly reports to the Dept of Health which then submits to the General Assembly a summary report to be published on its website</td>
</tr>
<tr>
<td>Virginia</td>
<td>Clinical data using CDC definitions for nosocomial infections</td>
<td>To be set by the State Board of Health</td>
<td>Hospitals required to report selected indicators to the CDC &amp; forward adjusted infection rates to the State Health Department; data may be released to the public on request</td>
</tr>
<tr>
<td>Missouri</td>
<td>Data source not specified</td>
<td>Class I SSI, VAP, CL-BSI</td>
<td>Data collection, analysis and reporting rules to be recommended by an advisory committee. Dept of Health to publish a quarterly report on its website</td>
</tr>
<tr>
<td>Nevada</td>
<td>Data source not specified</td>
<td>SSI, VAP, CL-BSI,UTI</td>
<td>Hospitals report to the Health Division of the Department of Human Resources. No provision for public disclosure.</td>
</tr>
</tbody>
</table>
Virginia Plan for NI Reporting

State Health Department
- Board of Health determines NIs & patient populations for surveillance
- VDH serves as repository & releases data to the public on request

Hospitals
- ICPs collect NI data using CDC definitions & methodology
- ICPs transmit data to CDC’s NHSN via web-based software
- Hospitals transmit rates to VDH

CDC
- CDC calculates risk-adjusted NI rates & electronically transmits data to VA hospitals
- Hospitals transmit rates to VDH

Hospitals serve as repository & releases data to the public on request.
Conclusion

• System level changes involving the measurement and feedback of adherence to IC measures are needed to implement risk reduction strategies consistently
• S.aureus/MRSA SSI can likely be reduced by proper use of intranasal mupirocin, chlorhexidine showers and the correct preoperative antibiotic
• Measures such as double gloving, blunt suture needles and HFT will likely reduce exposure to BBF
• Mandatory reporting of NIs, including SSIs in some states, is now a reality
The End