Quality Improvement in Standardized Approaches to SSI Prevention

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Corporate Director, Universal Health Services

November 6, 2015

www.7sbundle.com
www.workingtowardzero.com
www.creativehandhygiene.com
Objectives

• Describe the impact of quality issues in healthcare
• Discuss the benefits of standardization to improve quality in healthcare
• Identify initiatives to manage risk factors for HAIs
• Focus on improving patient skin preparation
• Illustrate the implementation process
• Describe a 7 step bundled approach to the prevention of SSIs
Quality Control and Standardization in Healthcare
Standardization Can Minimize Variability in Processes

- The standardization process involves continuous improvement
- Innovation occurs amid a backdrop of standardization

LSL = lower specification limit; USL = upper specification limit.
Quality Improvement Models Applied to Healthcare

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Application in Healthcare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six Sigma</td>
<td>• Identifies/removes causes of defects (errors)</td>
<td>• Improve OR throughput at Southwestern Vermont Medical Center²</td>
</tr>
<tr>
<td></td>
<td>• Minimizes variability in processes</td>
<td></td>
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<tr>
<td></td>
<td>• Creates infrastructure and promotes culture of change (e.g., Six Sigma Black Belt)</td>
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<tr>
<td>Toyota Production System (Lean)</td>
<td>• Eliminates overburden, inconsistency, and waste</td>
<td>• Patient Safety Alert System at Virginia Mason Medical Center³</td>
</tr>
<tr>
<td></td>
<td>• Designs a process able to deliver required results smoothly</td>
<td></td>
</tr>
<tr>
<td>Quality by Design</td>
<td>• Designs processes to be free of errors/defects</td>
<td>• Improved new pharmaceutical application process used by the FDA¹</td>
</tr>
<tr>
<td></td>
<td>• Reduces variability through standardization of procedures</td>
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</tbody>
</table>

For Example: The Six Sigma Approach May Improve On-Time Surgeries

• Prior to Six Sigma initiative
  ◦ Average of 11.6 min in the holding area
  ◦ 40.4% of patients spent longer than 10 min in holding

• Six Sigma approach to identify the critical path
  ◦ Time in holding area
  ◦ Surgeon on-time arrival

• Process improvement
  ◦ PACU as staging area

PACU = postanesthesia care unit.
Standardization for Skin Preparation to reduce HAIs
Skin: An Overview

- 80% of skin flora in the first 5 cell layers of the stratum corneum\(^1\)
- \(10^{13}\) cells in the human body, \(10^{14}\) colonizing microbial cells, a 10-to-1 inequality\(^2\)
- Major risk factor for HAIs

Proper skin preparation is critical to prevent serious complications

Many Risk Factors Influence HAI Rate

One thing could lead to the failure

Standardization Mitigates Risk Factors

Standardization of Skin Prep

Inputs
• Audit of current processes
• Evidence-based medicine
• Ancillary support from manufacturers
• Current overall costs

Outputs
• Minimize errors
• Avoid delays/cancellation of procedures
• Improve patient flow
• Consistency among staff
• Minimize waste
• Reduce overall costs
• Resource for staff training

Identify the risk factor to work on
Patient Skin Prep

• Critically important in reducing the risk of HAIs
• Helps to reduce the bacteria that can potentially cause skin infection
• Key factors include:
  ◦ Antiseptic agent
  ◦ Application method
  ◦ Dry time
• Numerous choices available, which can lead to confusion and improper application
• Opportunity to standardize procedures and reduce variability
### Comparison of Skin Antiseptics Agents

<table>
<thead>
<tr>
<th>Advantage</th>
<th>CHG</th>
<th>IPA</th>
<th>I₂/Iodophors</th>
<th>PCMX</th>
<th>CHG/IPA</th>
<th>Iodophor/IPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broad spectrum</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Rapid activity</td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Long-acting</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Active in blood/organic matter</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

### Disadvantages

- Resistance: +/–, +/–, +/–, +/–, −a, −a
- Flammable: +
- Skin irritation: +/–, +, +/–, +, +

CHG = chlorhexidine gluconate; IPA = isopropyl alcohol; I₂ = iodine; PCMX = parachlorometaxylenol.

*aBecause of dual mechanisms of action, resistance to the combination product is expected to be low.*

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# Differing Application Instructions Among Patient Skin Prep Agents

<table>
<thead>
<tr>
<th></th>
<th>CHG/IPA</th>
<th>Iodine/IPA</th>
<th>Aqueous CHG</th>
<th>Iodine Scrub/Paint</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Example</strong></td>
<td>ChloraPrep®¹</td>
<td>DuraPrep™²</td>
<td>Exidine®⁵</td>
<td>Wet PVP-I Tray⁶</td>
</tr>
<tr>
<td><strong>Application method</strong></td>
<td>Gentle back and forth strokes</td>
<td>Paint in concentric circles</td>
<td>Swab back and forth</td>
<td>Scrub and paint in concentric circles</td>
</tr>
<tr>
<td><strong>Application time</strong></td>
<td>0.5-2 min</td>
<td>≥0.5 min⁴</td>
<td>4 min</td>
<td>5 min⁷</td>
</tr>
<tr>
<td><strong>Dry time</strong></td>
<td>≥3 min</td>
<td>≥3 min</td>
<td>Blot</td>
<td>~2-3 min</td>
</tr>
</tbody>
</table>

¹ On hairless skin.

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High Variability in Patient Skin Prep

Primary Skin Prep Use\(^1\)
3005 Observations in 197 Hospitals\(^a\)

Processes Followed\(^2\)

- Skin prep application time sufficient: 60%
- Skin prep drying time sufficient: 53%
- Gloves used during skin prep application: 91%
- Skin prep application follows label directions: 63%
- Skin prep application from surgical site to periphery: 86%

\(^a\) OR observations conducted between October 2013 and July 2014.

1. Data on file. 2. Xi H, et al. Focus on Quality Care: An Audit of Surgical Skin Prep Practices in U.S. Hospitals. Presented at the 2014 AORN Surgical Expo and Conference; March 30–April 2, 2014; Chicago, IL. Chloraprep, Prevail-Fx, Exidine, CareFusion and the CareFusion logo are trademarks or registered trademarks of CareFusion Corporation or one of its subsidiaries. All other trademarks are the property of their respective owners.
Effectiveness of Skin Prep Agents

**Shoulder surgery**¹
Positive Culture After Prep

- Chloraprep skin prep: 7% (P < .0001 vs DuraPrep; P = .01 vs Preop)
- DuraPrep: 19% (P = .05)
- PVI: 31% (P = .05 vs Techni-Care; cP < .05 vs Techni-Care and preop)

**Foot/Ankle Surgery**²
Positive Culture Before Surgery

- Before surgery: 100%
- Chloraprep skin prep: 40% (aP < .05 vs DuraPrep)
- DuraPrep: 20%
- Techni-Care: 80%

Implementation of Standardization
Standardization Process: The Four E’s

1. Explain why the interventions are important
2. Share the evidence supporting the interventions
3. Regularly assess for performance measures and unintended consequences
4. Design an intervention “toolkit” targeted at barriers, standardization, independent checks, reminders, and learning from mistakes

A Culture of Team Engagement Improves Quality

- Comprehensive Unit-Based Safety Program (CUSP)
  - Introductory safety education
  - Staff safety survey
    - How will surgical infection complication develop in next patient?
    - What can we do to prevent this?
  - Senior executive partnership
  - Learning from defects
    - Trained to use a structured tool
  - Implement teamwork and communication tools
    - Review unit safety data monthly and develop local quality initiatives

Overall surgical infection complications decreased from 27% to 18% ($P<.0001$)

Patient Engagement Is Critical

- Healthy volunteers showered with 4% CHG soap 2-3 times, ± electronic alert system (EAS) reminder
  - With an EAS reminder, patients had about 3-fold higher mean composite skin-surface CHG concentrations (*P* < .007)

EAS reminders were by SMS text message, voicemail, or e-mail.

Standardized bundled approach to prevent SSIs
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?
AORN Recommended Practices and Evidence Based Guidelines

- Preoperative Patient Skin Antisepsis
- Environmental Cleaning in the Perioperative Setting
- Surgical Tissue Banking
- Surgical Hand Antisepsis
- Cleaning and Care of Instruments and Powered Equipment
- Cleaning and Care of Surgical Instruments
- Cleaning and Processing of Flexible Endoscopes
- High Level Disinfection
- Cleaning and Processing Anesthesia Equipment
- Sterilization in the Perioperative Setting
- Hand Hygiene in the Perioperative Setting
- Prevention of Transmissible Infections in Perioperative Settings
- Surgical attire
- Sharps Safety
#1 – Safe Operating Room

 ✓ Traffic control, number staff in room

 ✓ Air handling systems, filtration, grills
   ◦ Relative Humidity in the OR – Joint Communication to Healthcare Organizations, January 2015
     (AORN, AAMI, TJC, ASHE, AHA, and others)

 ✓ SCIP: hair clipping, warmers, oxygenation, surgical prophylaxis – weight based dosing, Foley catheter removal 48 hrs

 ✓ Room turnover and terminal cleaning
   ◦ AORN EVS Cleaning and Disinfection 2014

 ✓ Surgical technique and handling of tissues
   ◦ AORN Recommended Practices for Sterile Technique 2012

 ✓ Instrument cleaning/sterilization process, biological indicators
   ◦ AORN Recommended Practices for Cleaning and Care of Surgical Instruments 2014

 ✓ Storage of supplies, clean supply bins, carts, tables, stationary equipment
   ◦ AORN EVS Cleaning and Disinfection 2014
Surgical Care Improvement Program (SCIP)

Surgical prophylaxis: selection, time, discontinuation of abx (24hrs or 48hrs cardiac)

Hair clippers (no razors)

Warming patient (pre-postop)

Increased oxygen

Remove Foley catheter within 48 hours

Several studies questioning the value of the SCIP initiative:


Hair Clipping in Surgery

• Clipping should always be done outside of the OR
• Removal of stray hairs from clipping should be done using tape and/or suction, while clipping on top of a disposable underpad.
• In cases of excessive amounts of hair and sensitivity/privacy for the patient, the ClipVac suction device and associated single-use disposable can be used in the OR after the patient is anesthetized
• Always remove and dispose of single-use clipper head immediately after use and clean the clipper unit according to manufacturer instructions before storing.
Prevent Colon and Abd Hysterecomy SSIs– Wound Protector/Retractor

➢ Wound protector/retractor provides 360 of circumferential, atraumatic retraction, while significantly reducing surgical site infection and maintaining moisture at the incision

➢ The self-retaining design of the wound protector/retractor effectively holds the incision site open, allowing the surgeon to easily access the operative field and maximize surgical assistance


Hair Coverage in OR

• 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:
  • “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.”

Check out this simulation of Indoor Microbiome Animation
https://vimeo.com/90059732

1. AORN RP – Surgical Attire 2014
2. Boyce, Evidence in Support of Covering the Hair of OR Personnel AORN Journal ● Jan 2014
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, dust and dirt, 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 (circulator, anesthesia, reps).
- 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).
Environmental cleaning and disinfection

- Evaluate and observe between room cleaning procedures – are they done correctly (clean to dirty)
- Evaluate and observe terminal cleaning procedures on evening/night shift – use of checklist
- Are there sufficient staff to terminally clean all OR rooms each day (plus PACU, offices, hallways, Pre-op, etc)
- New operating rooms are much larger and will need increased staff

* AORN RP: Environmental Cleaning in the Perioperative Setting Updated 2014
* Spencer M, Edmiston C. The Role of the OR Environment in Preventing Surgical Site Infections. AORN Journal December 2014
Hot Topic due to recent outbreaks: Cleaning/Sterilization of Instruments

- Inspection of Instruments
  - Lumens, grooves, sorting, hand cleaning, disassembly required – massive kits for ortho cases
  - Many instruments cannot be disassembled
  - Daily use of Biologic Indicators, accurate logs
- Pre-soaking and rinsing of tissue and blood in the operating room before sent to decontamination
- Ultrasonic machine cleaning
- Brushes, enzymatic solution
- Sterilizer maintenance and cleaning
- Air pressure: negative in decontamination and positive in sterile processing

Key Outbreak:

1. AORN Recommended Practices for Cleaning and Care of Surgical Instruments Updated 2014
2. AAMI released new guidelines ANSI/AAMI ST91:2015 Flexible and semi-rigid endoscope
#2 SCREEN for MRSA and MSSA Colonization
### 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 (BMI 40.0–49.9 kg/m²)</td>
<td>1.28 (0.61 2.65)</td>
<td>0.51</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.

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Everheart JS et al. Medical comorbidities are independent preoperative risk factors for surgical infections after total joint arthroplasty. *Clin orthoped relat res.* March 22, 2013
Screening and Decolonization Protocol Evidence Based

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

- Short-term nasal mupirocin (4-7 days) is an effective method for *Staph aureus/MRSA* eradication
- >80% success at one week
- Low level mupirocin resistance when used at home

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

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

Challenges:
• Budget approval for equipment
• Lab support of new technology
• Staff education on product use
• Instructing staff on how to obtain a nares specimen with proper swabs
• Lab differentiation of the colonized screens from routine cultures.
• Cepheid’s GeneXpert Reporting system for positive results

GeneXpert – Cepheid PCR
Orthopedic SSIs

- Orthopedic Total Joint Infections:
  - Hip or Knee aspiration
  - If positive – irrigation and debridement
  - Removal of hardware may be necessary
  - Re-implantation at future date
  - Patient lives with no joint for period of time
  - Long term IV antibiotics in community or rehab
  - Future worry about the joint
  - In other words – DEVASTATING FOR THE PATIENT

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Institutional Prescreening for Detection and Elimination of Methicillin Resistant Staphylococcus aureus in Patients Undergoing Elective Orthopaedic Surgery


<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>N</strong></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
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, ME, Maureen Spencer, ME, 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.
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 (Chloroprep)
- Iodophor plus alcohol (Duraprep)
# 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 – Antimicrobial Plus Sutures
Bacterial colonization of sutures

• Like all foreign bodies, sutures can be colonized by bacteria:
  ◦ Implants provide nidus for attachment of bacteria
  ◦ Bacterial colonization can lead to biofilm formation
  ◦ Biofilm formation increases the difficulty of treating an infection

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

Why Antimicrobial Sutures? OR Air Current Contamination

**In teaching hospitals:**
- End of the case – a lot of room activity and traffic
- Circulating Nurse counts sponges and starts room breakdown
- Scrub Technician preparing instruments for Central Processing
- Instrument reps near table to sort instrument trays
- Anesthesia move in and out of room
- Visitors, students may leave room
Potential for Contamination of Sutures at End of Case

Suture with Staphylococcus colonies

Air settling plates in the operating room at the last hour of a total joint case from the anesthesia

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

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

Z. X. Wang¹,², C. P. Jiang¹,², Y. Cao¹,² and Y. T. Ding¹,²

¹Department of Hepatobiliary Surgery, Affiliated Drum Tower Hospital, School of Medicine, Nanjing University, and ²Jiangsu 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,² Frederic C. Daoud, MD,² and David Leaper, MD, FACS,² Milwaukee, WI, Paris, France, and London, UK

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

CDC Draft SSI Guideline 2014
2A.1. No recommendation can be made regarding the safety and effectiveness of intraoperative antimicrobial irrigation (e.g., intra-abdominal, deep or subcutaneous tissues) for the prevention of surgical site infection. (No recommendation/unresolved issue)
Practice forum

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

Sue Barnes RN, BSN, CIC, Maureen Spencer RN, MEd, CIC, Denise Graham, Helen Boehm Johnson MD

- 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.
Chlorhexidine 0.05% Irrigation

- 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: OR airborne contaminants can be flushed out before closure

CHG Irrigant leaves an antimicrobial effect for 2 weeks in the tissue
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.
#7 Skin Adhesive – Care of the Incision

## Wound Healing Phases

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

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

**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/commodes
- 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

• 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 NOT USED
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
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

Working Toward Zero Teams

- 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)
Conclusions

• Key Opinion Leaders in Healthcare: HAIs deserve our attention NOW
• Reducing variability in healthcare system improves quality of care
• Standardization of skin related preparation may aid quality initiatives in surgical care
• “Evaluate, engage, educate and execute” (4 E’s) is the key process for quality culture change
• We should leverage resources available for 4 E’s in standardizing pre-op, intra-op and post-op infection prevention measures
Additional References


Thank you