Infection prevention in the OR: Establishing a safe operating room with a 7S bundle

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Objectives

• Understand the steps in the 7 S Bundle approach to prevent surgical site infections

• Describe two control measures that can be implemented in the operating room to address risks for SSIs

• Identify how to collaborate with vendors who can compliment existing infection prevention initiatives in the operating room
7 “S” bundle to prevent SSI

- **SAFETY** – is your OPERATING ROOM safe?

- **SCREEN** – are you screening for presence of or risks for 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 antibacterial sutures?

- **SKIN CLOSURE** – are you sealing the incision or covering it with an antimicrobial dressing to prevent exogenous contamination?
#1 – Safe operating room
Risks for infection in the 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 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
Surgical attire

- Typically, individuals shed more than 10 million particles from their skin every day.

- Approximately 10% of skin squames carry viable microorganisms, causing a person to shed nearly 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
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 (eg, 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)”
Environmental cleaning and disinfection

- Evaluate and observe between case cleaning procedures
- Bed should be the last thing cleaned – often it is the first!
- Terminal cleaning procedures on evening / night shift
- Sufficient staff to terminally clean all OR rooms?
Contact precautions in the OR

- AORN 2012 –Recommended Practices for Transmissible Infections in Perioperative Services
  - Contact precautions will be initiated in the OR for patients with:
    - MRSA colonization or infection
    - Vancomycin-resistant *Enterococcus* (VRE)
    - CRE
    - *C Difficile*
    - A large amount of wound drainage.
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
#6 – Antibacterial sutures
Rationale for antibacterial sutures

Like all foreign bodies, sutures can be colonized by bacteria:

• Implants provide nidus for attachment of bacteria¹
• Bacterial colonization can lead to biofilm formation¹
• Biofilm formation increases the difficulty of treating an infection²

On an implant, such as a suture, it takes only 100 staphylococci per gram of tissue for an SSI to develop³

Incisions are vulnerable to bacterial contamination during wound closure

OR activities during wound closure

- 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 & visitors might leave room

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


Traditional suture

Antibacterial suture

5 day zone of inhibition

10 day zone of inhibition
Based upon the results of multiple RCTs and evidence-based meta-analyses the CDC has included the use of triclosan antimicrobial sutures in the current HICPAC recommendations for prevention of surgical site infections.
#7 – Skin adhesives
Challenges in the post-op patient

- Incision collects fluid – serum, blood - growth medium for organisms – small dehiscences
- 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
Addressing risk factors associated with SSI

• Provide a flexible microbial barrier with 99% protection *in vitro* for 72 hours against organisms commonly responsible for SSIs\(^1,2,*\)

• Effective microbial barrier that prevents bacteria from entering the incision site\(^1,2,†\)

• Demonstrated *in vitro* inhibition of gram-positive bacteria (MRSA and MRSE\(^†\)) and gram-negative bacteria (*E. coli*)\(^1,2,‡\)

* Staphylococcus epidermidis (S epidermidis)/Escherichia coli (E coli)/
  Staphylococcus aureus (S aureus)/Pseudomonas aeruginosa/Enterococcus faecium
† MRSA=Methicillin-resistant *S. aureus*, MRSE=Methicillin--resistant *S epidermidis*
‡ Clinical significance is unknown

Benefits beyond risk reduction

For hospital staff
• No time spent removing staples or sutures
• May reduce 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
• Wound healing strength
• Shower immediately
• Excellent cosmesis
• Reduced follow-up
• Less pain and anxiety
Adhesive border & healing
6 weeks post-op and beyond
Skin adhesive on total knee
Which would you prefer?
Options when a skin adhesive is not used

Antimicrobial (PHMB) Dressings with Hypoallergenic Fabric Tape

Antimicrobial silver dressings
Collaborating with vendors
The Take Aim program complements a facility’s existing infection prevention initiatives

<table>
<thead>
<tr>
<th>Program objective</th>
<th>Help hospitals implement evidence-based practices to address risks for BSIs &amp; SSIs through the appropriate utilization of Ethicon devices</th>
</tr>
</thead>
</table>
| Potential outcomes | - Address risks for costly infections  
- Reduce variation in clinical practices and purchasing patterns  
- Enhance engagement of patients & staff throughout an episode of care |

| Innovative approach | Risk assessment | Clinician training | Patient education |

The Joint Commission’s National Patient Safety Goals 07.04.01 and 07.05.01 assess a facility’s evidence-based policies and practices aimed at reducing the risk of BSIs and SSIs
The components of Take Aim align closely with the Joint Commission NPSG 07.04.01 and 07.05.01

Elements of performance

• Educate staff and licensed independent practitioners
• Educate patients, and their families, as needed
• Implement policies and procedures to reduce risk of SSIs
• Conduct periodic risk assessments
• Select evidence-based SSI measures
• Monitor compliance with guidelines
• Evaluate effectiveness of efforts
The Take Aim program can help hospitals identify infection risks & variation in clinical practices

Example of risk assessment focus areas

<table>
<thead>
<tr>
<th>Surgical Specialty</th>
<th># of incisions observed</th>
<th>Absorbable (antibacterial) Sutures</th>
<th>Absorbable (non-antibacterial) Sutures</th>
<th>non-absorbable Sutures</th>
<th>Topical Skin Adhesive</th>
<th>Skin Staples</th>
<th>Dry wound dressing applied?</th>
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</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>10</td>
<td>93%</td>
<td>2%</td>
<td>5%</td>
<td>90%</td>
<td>10%</td>
<td>40%</td>
</tr>
<tr>
<td>General</td>
<td>166</td>
<td>75%</td>
<td>15%</td>
<td>10%</td>
<td>59%</td>
<td>10%</td>
<td>33%</td>
</tr>
<tr>
<td>Neuro</td>
<td>7</td>
<td>83%</td>
<td>15%</td>
<td>17%</td>
<td>14%</td>
<td>14%</td>
<td>57%</td>
</tr>
<tr>
<td>OB/GYN</td>
<td>79</td>
<td>78%</td>
<td>20%</td>
<td>2%</td>
<td>54%</td>
<td>25%</td>
<td>46%</td>
</tr>
<tr>
<td>Oncology</td>
<td>3</td>
<td>67%</td>
<td>33%</td>
<td>33%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ortho</td>
<td>27</td>
<td>71%</td>
<td>14%</td>
<td>15%</td>
<td>30%</td>
<td>37%</td>
<td>81%</td>
</tr>
<tr>
<td>Plastic</td>
<td>13</td>
<td>49%</td>
<td>29%</td>
<td>22%</td>
<td>54%</td>
<td></td>
<td>92%</td>
</tr>
<tr>
<td>Urology</td>
<td>18</td>
<td>92%</td>
<td>5%</td>
<td>3%</td>
<td>89%</td>
<td></td>
<td>11%</td>
</tr>
<tr>
<td>Vascular</td>
<td>7</td>
<td>100%</td>
<td></td>
<td></td>
<td>86%</td>
<td>14%</td>
<td>29%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>330</td>
<td>74%</td>
<td>16%</td>
<td>10%</td>
<td>57%</td>
<td>15%</td>
<td>42%</td>
</tr>
</tbody>
</table>
The Take Aim program can help hospitals identify infection risks & variation in clinical practices.

Example of risk assessment focus areas

<table>
<thead>
<tr>
<th>Incision size</th>
<th># of incisions observed</th>
<th>Hemostasis achieved?</th>
<th>Skin dry?</th>
<th>Wound in horizontal position?</th>
<th>Wound edges approximated?</th>
<th>Correct # of adhesive layers applied?</th>
<th>Dry wound dressing applied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4cm</td>
<td>140</td>
<td>100%</td>
<td>94%</td>
<td>99%</td>
<td>100%</td>
<td>69%</td>
<td>11%</td>
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<tr>
<td>5-9cm</td>
<td>24</td>
<td>100%</td>
<td>75%</td>
<td>88%</td>
<td>100%</td>
<td>75%</td>
<td>50%</td>
</tr>
<tr>
<td>10-14cm</td>
<td>5</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>80%</td>
<td>60%</td>
</tr>
<tr>
<td>15+ cm</td>
<td>20</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>90%</td>
<td>75%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>189</td>
<td>100%</td>
<td>92%</td>
<td>98%</td>
<td>100%</td>
<td>72%</td>
<td>24%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surgical Specialty</th>
<th># of drains observed</th>
<th>BIOPATCH® Disc used</th>
<th>Placed printed side up</th>
<th>360 skin contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>7</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>General</td>
<td>15</td>
<td>13%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>Neuro</td>
<td>3</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Oncology</td>
<td>1</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Ortho</td>
<td>8</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Plastic</td>
<td>9</td>
<td>44%</td>
<td>44%</td>
<td>11%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>43</td>
<td>14%</td>
<td>14%</td>
<td>2%</td>
</tr>
</tbody>
</table>
UHS case study: 25-hospital health care system

**IDN goals**
- Standardize practices across facilities
- Implement evidence-based infection control practices
- Identify potential risks for infection

Assessed wound closure practices in 12 different hospitals

Hospital system reported a drop in SSI rates for 37.5% of categories tracked*

Reduced IDN inventory by 106 SKUs

* hip, knee, colon, and hysterectomy procedures are tracked.

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Conclusion
Many risk factors influence SSI
Surgical infection prevention team

- 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)
Thank you