Pediatric Surgical Site Infections: Strategies For Control In Your Practice

Bridget Pearce, M.D.
University of Michigan
Disclosures

• None
Learning Objectives

• Review surgical site infection metrics
• Summarize national accountability in our practice
• Delineate team approach
• Reinforce individual responsibility
Surgical Site Infections: The Metrics
SSI Numbers

- Most common healthcare-associated infection\(^1\)
- Up to 60% of SSIs preventable
- Each SSI is associated with 7–11 additional hospital-days
- Patients with an SSI have a 2–11-times higher risk of death
- 1.9% SSI rate\(^2\)
- 750,000 – 1,000,000 SSI/year
- 2,500,000 hospital days
- $1 billion cost

2. CDC SSI Event 2015
Twitter, 2015

TMZ @TMZ
WATCH: Rob Gronkowski’s EPIC dance battle with Robert Kraft!!! tmz.me/6Y28WZq pic.twitter.com/f5mPQYL0J8

Al Jazeera America @AlJazeera
Watch: Witnesses say victim of Virginia police shooting had hands in the air alj.am/1KnFNIV

The Associated Press
Surgery patients land back in the hospital most often because of infections, new study shows: apne.ws/1Aoy0KL
Brief History of Surgical Infections
Evolution of SSI

- Ancient Greece: Disease as divine punishment
- Hippocrates: Disassociated mysticism and medicine
- Middle ages: Return to religious medicine
  - St. Benedict banned medicine
  - Practice of surgery devolved to barbers
- Renaissance: Intellectual rebirth & move toward science
  - Spread of infection from poor ventilation
  - Prevention - Open the windows, prevent overcrowding

*Surgical site infections were 2nd leading cause of death*

Dr. Ignaz Semmelweis

- Postpartum endometritis infection rates physicians >> midwives
- Anatomy in the morgue, straight to the OR
- **1847 introduced hand-washing rules** –
  Postpartum mortality rates dramatically decreased
- Great resistance to his ideas
  Forced to quit medicine within 2 years
- Died in an asylum for the mentally unstable
- Pasteur – germ theory
- Lister – chemical antisepsis
- Halsted - gloves
- Fleming – Penicillin

1999
Institute of Medicine, November 1999

- Sentinal report on hospital-associated adverse events
  Human and monetary cost
- Establish a national focus to enhance safety
- Identify and learn from errors
- Create a mandatory reporting system
- Raise performance standards with oversight organizations
- Implement safety systems
- PROTECT PATIENTS FROM MEDICAL MISTAKES!
The Federal Response

Executive order by Clinton administration

1. Government agencies overseeing health-care programs must implement techniques for reducing medical errors

2. Create a task force to find new strategies for reducing errors

Congressional hearings on patient safety

December 2000 - appropriated $50 million to the Agency for Healthcare Research and Quality (AHRQ) to reduce medical errors
Roadmap to a Culture of Quality Improvement
How Do We Implement Quality Improvement?
How Do We Implement Quality Improvement?

• Administrative leadership willing to commit energy and financial resources

• Scientific approach to improvement

• Sophisticated understanding of health care delivery systems and behavior
How Do We Implement Quality Improvement?
Joint Commission for the Accreditation of Healthcare Organizations
“To continuously improve the safety and quality of care provided to the public through the provision of health care accreditation and related services that support performance improvement in health care organizations.”

Patient Safety Advisory Group gives input to JCAHO

- Physicians
- Nurses
- Pharmacists
- Risk managers
- Clinical engineers
- Other professionals with experience in addressing patient safety issues
- Chair Dr. Jim Bagian, UMHS

National patient safety goals

**Hospital accreditation is dependent on compliance with NPSGs**
1. Improve the accuracy of patient identification

2. Improve the effectiveness of communication among caregivers

3. Improve the safety of using high-alert medications

4. Improve the safety of using infusion pumps

5. Improve the effectiveness of clinical alarm systems

6. Eliminate wrong-site, wrong patient procedure surgery
The Joint Commission
National Patient Safety Goals Effective
January 1, 2015

1. Improve the accuracy of patient identification

2. Improve the effectiveness of communication among caregivers

3. Improve the safety of using medications

4. Reduce the harm associated with clinical alarm systems

5. Identify patient safety risks

6. Eliminate wrong-site, wrong patient procedure surgery

7. Reduce the risk of health care-associated infections
The Joint Commission
National Patient Safety Goals Effective
January 1, 2015

KEEP CALM & ACHIEVE YOUR GOALS
The Joint Commission
National Patient Safety Goals Effective
January 1, 2015

1. **Improve the accuracy of patient identification**
   - Use at least two patient identifiers when providing care, treatment, and services
   - Eliminate transfusion errors related to patient misidentification

2. **Improve the effectiveness of communication among caregivers**
   - Get important test results to the right staff person on time

3. **Improve the safety of using medications**
   - Label all medications, medication containers, and other solutions on and off the sterile field
   - Reduce the likelihood of patient harm associated with the use of anticoagulant therapy
   - Maintain and communicate accurate patient medication information

4. **Reduce the harm associated with clinical alarm systems**
   - Make improvements to ensure that alarms on medical equipment are heard and responded to on time.
5. **Identify patient safety risks**
   
   - Find out which patients are most likely to try to commit suicide
   - Reduce the risk of falls
   - Prevent health care-associated pressure ulcers

6. **Prevent mistakes in surgery**
   
   - Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery™
     - Conduct a pre-procedure verification process
     - Mark the procedure site
     - A time-out is performed before the procedure

7. **Reduce the risk of health care-associated infections**  
   **Prevent infection**
   
   - Comply with either the current CDC and/or WHO hand hygiene guidelines
   - Implement evidence-based practices for preventing surgical site infections
   - Use proven guidelines to prevent infection of the blood from central lines
   - Use proven guidelines to prevent infections of the urinary tract that are caused by catheters

[http://www.jointcommission.org/assets/1/6/2015_NPSG_H](http://www.jointcommission.org/assets/1/6/2015_NPSG_H)
NPSG: Reducing Hospital Acquired Infections

1. Multidrug Resistant Organisms

2. Central Line-Associated Blood Stream Infections

3. Surgical Site Infections

4. Catheter-Associated Urinary Tract Infections

A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals

Yokoe, DS, et al Infect Control Hosp Epidemiol 2008:29;S12-S21
The Compendium

- JCAHO Joint Commission For Accreditation of Hospitals
- CDC Centers for Disease Control and Prevention
- SHEA Society for Healthcare Epidemiology of America
- IDSA Infectious Diseases Society of America
- IHI Institute for Healthcare Improvement
- PIDS Pediatric Infectious Diseases Society
- SCCM Society for Critical Care Medicine
- SHM Society for Hospital Medicine
- SIS Surgical Infection Society
Literature of Acronyms

- JCAHO
- CDC
- SHEA
- IDSA
- IHI
- PIDS
- SCCM
- SHM
- SIS
Recent SSI History

2008: A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals

Yokoe, DS, et al Infect Control Hosp Epidemiol 2008:29;S12-S21


2011: Centers for Medicare and Medicaid Services –

Require acute care hospital to report specific types of HAI data to CMS through CDC’s National Healthcare Safety Network

**Tied to reimbursement**

CMS Hospital Value-Based Purchasing Program: *UMHS Performance*
If a physician make a large incision with the operating knife, and kills him...his hands shall be cut off.

Principle of *lex talionis* – retaliation

Medicine subject to criminal jurisprudence
Implementing Evidence-Based Practices for Preventing SSIs

1. Educate staff involved in surgical procedures about prevention of SSI.
2. Educate patients and families about SSI.
3. Implement policies and practices to reduce the risk of SSI.
4. Conduct periodic risk assessments for SSIs.
5. Select SSI measures using evidence-based or best practice guidelines.
7. Evaluate the effectiveness of prevention efforts.

http://www.jointcommission.org/assets/1/6/2015_NPSG_HAP.pdf
8. Measure SSI rates for first 30 or 90 days based on National Healthcare Safety Network procedural codes.

9. Provide process and outcome measure results to key stakeholders.

10. Administer antimicrobial agents for prophylaxis for particular procedure or disease according to methods cited in scientific literature or endorsed by professional organizations.

11. When hair removal is necessary, use a method cited in scientific literature or endorsed by professional organizations.
How are we doing relative to peer institutions?

- **2008**  
  American Pediatric Surgery Association + NSQIP  
  Alpha phase - 4 academic institutions

- **2010**  
  ACS - NSQIP-Pediatrics  
  Beta phase - 29 institutions  
  Thirty day outcomes of mortality, SSI, pneumonia, renal failure  
  Compare institutional outcomes with peers

- **2011**  
  National Anesthesia Clinical Outcomes Registry (NACOR) formed
Pediatric Surgical Site Infections

Children

SSI = 1.8%

Neonates:

SSI = 3%

Risk Factors for Pediatric SSI

- Failure to deliver surgical antimicrobial prophylaxis within 60 minutes prior to incision
- Failure to use an appropriate antiseptic agent to prepare skin at incision site
- Shaving to remove hair
- **Younger age**
- Cardiac surgery
- Duration of central venous access
- Cyanotic heart disease
Neonates and SSIs

- Host risk factor – National Nosocomial Infections Surveillance System

- Neonates are immune naïve, susceptible to infection

- Defects in toll-like receptors and neutrophil activation predispose to infectious disease

- Med/social factors – decreased breast milk consumptions which is protective

- Age = immunodeficiency


- Bucher BT et al Risk Factors and Outcomes of Surgical Site Infection in Children j of Am Coll Surgeons 212(6) 2011: 1033-1038
Risk Factors for Pediatric SSI

- *Failure to deliver surgical antimicrobial prophylaxis within 60 minutes prior to incision*
- Failure to use an appropriate antiseptic agent to prepare skin at incision site
- Shaving to remove hair
- Younger age
- Cardiac surgery
- Duration of central venous access
- Cyanotic heart disease
Why do we fail to deliver surgical antimicrobial prophylaxis within 60 minutes prior to incision?

- Not ordered
- Not realized they’re needed
- Forgot to administer
- Poor communication
Teamwork

“The team, the team, the team”

- Bo Schembechler
Association Between Implementation of a Medical Team Training Program and Surgical Mortality

Julia Neily, RN, MS, MPH
Peter D. Mills, PhD, MS
Yinong Young-Xu, ScD, MA, MS
Brian T. Carney, MD
Priscilla West, MPH
David H. Berger, MD, MHCM
Lisa M. Mazzia, MD
Douglas E. Paull, MD
James P. Bagian, MD, PE

Context There is insufficient information about the effectiveness of medical team training on surgical outcomes. The Veterans Health Administration (VHA) implemented a formalized medical team training program for operating room personnel on a national level.

Objective To determine whether an association existed between the VHA Medical Team Training program and surgical outcomes.

Design, Setting, and Participants A retrospective health services study with a contemporaneous control group was conducted. Outcome data were obtained from the VHA Surgical Quality Improvement Program (VASQIP) and from structured interviews in fiscal years 2006 to 2008. The analysis included 182,409 sampled procedures from 108 VHA facilities that provided care to veterans. The VHA’s nationwide training program required briefings and debriefings in the operating room and included checklists as an integral part of this process. The training included 2 months of preparation, a 1-day conference, and 1 year of quarterly coaching interviews.

Main Outcome Measure The rate of change in the mortality rate 1 year after facilities enrolled in the training program compared with the year before and with non-training sites.

Results The 74 facilities in the training program experienced an 18% reduction in annual mortality (rate ratio [RR], 0.82; 95% confidence interval [CI], 0.76-0.91; \( P = .01 \)) compared with a 7% decrease among the 34 facilities that had not yet undergone training (RR, 0.93; 95% CI, 0.80-1.06; \( P = .59 \)). The risk-adjusted mortality rates at baseline were 0.65. In 2009, the risk-adjusted mortality rates for the 74 trained facilities were 0.56.
Crew Resource Management

Pre-Flight Check

- Straighten Main and Tail Blades
- Check for Free Head Rotation
- Mount Battery and Strap down
- Turn On Transmitter
- Select Correct Model
- Turn On Throttle Hold and Lower Throttle Stick
- Set All Switches to Normal
- Plug In Battery
- Listen For ESC Initialization
- Check Receiver and Gyro Light
- Mount Canopy, Add Rubber Grommets
- Check Cyclic Movements
- Check Rudder Movement in HH and Rate Mode
- Leave Rudder Switch to HH Mode
- Check Collective Pitch Movement
- Place Model For Take-Off
- Preform Range Check
- Set Timer Switch for Countdown
# 2008 WHO

## Surgical Safety Checklist (First Edition)

### Before induction of anaesthesia

<table>
<thead>
<tr>
<th>SIGN IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ PATIENT HAS CONFIRMED</td>
</tr>
<tr>
<td>- IDENTITY</td>
</tr>
<tr>
<td>- SITE</td>
</tr>
<tr>
<td>- PROCEDURE</td>
</tr>
<tr>
<td>- CONSENT</td>
</tr>
<tr>
<td>□ SITE MARKED/NOT APPLICABLE</td>
</tr>
<tr>
<td>□ ANAESTHESIA SAFETY CHECK COMPLETED</td>
</tr>
<tr>
<td>□ PULSE OXIMETER ON PATIENT AND FUNCTIONING</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>□ DOES PATIENT HAVE A:</td>
</tr>
<tr>
<td>- KNOWN ALLERGY?</td>
</tr>
<tr>
<td>□ NO</td>
</tr>
<tr>
<td>□ YES</td>
</tr>
<tr>
<td>- DIFFICULT AIRWAY/ASPIRATION RISK?</td>
</tr>
<tr>
<td>□ NO</td>
</tr>
<tr>
<td>□ YES, AND EQUIPMENT/ASSISTANCE AVAILABLE</td>
</tr>
<tr>
<td>- RISK OF &gt;500ML BLOOD LOSS (7ML/KG IN CHILDREN)?</td>
</tr>
<tr>
<td>□ NO</td>
</tr>
<tr>
<td>□ YES, AND ADEQUATE INTRAVENOUS ACCESS AND FLUIDS PLANNED</td>
</tr>
</tbody>
</table>

### TIME OUT

- CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE

### Anticipated Critical Events

- SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?
- ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?
- NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?

### Before skin incision

- HAS ANTIBiotic PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES?
  - □ YES
  - □ NOT APPLICABLE
  - IS ESSENTIAL IMAGING DISPLAYED?
  - □ YES
  - □ NOT APPLICABLE

### Before patient leaves operating room

- NURSE VERBALLY CONFIRMS WITH THE TEAM:
  - □ THE NAME OF THE PROCEDURE RECORDED
  - □ THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)
  - □ HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)
  - □ WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED
  - □ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT

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This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.
Pre-Induction Verification

1. Introductions
2. Patient identifiers
   Procedure, Surgical, Blood, Special Research Consents
3. Side and Site Marked
4. Diagnostic & Radiology Test Results Displayed
5. Allergy Review
6. **Antibiotics Discussed**
7. Special Drugs Discussed – heparin, depolarizing relaxants
8. Special Equipment/Implants/Instruments/Irrigation Pumps
9. Patient Positioning

End Checklist
Pre-Induction Verification

LED BY ANESTHESIA (Faculty, Resident or CRNA)
1. Introductions
2. Patient Identifiers/Procedure/Surgical, Blood & Special Research Consents
3. Side and Site Marked
4. Diagnostic & Radiology Test Results Displayed
5. Allergy Review

Continued →

6. Antibiotics Discussed
7. Special Drugs Discussed (heparin, depolarizing, non-depolarizing)
8. Special Equipment/Implants/Instruments/Irrigation Pumps/Additives In Room
9. Patient Positioning

END CHECKLIST
Pre-Incision Time Out

1. Introductions: Name/Role/Experience
2. Patient Identifiers/Procedure/ Surgical, Blood & Research Consents
3. Side, Side, Laterality, Spine Level
4. Allergy Review
5. **Correct Antibiotics Administered**
6. Special Drugs (e.g. Heparin) Discussed
7. Special Equipment/Implants/Instruments/ Irrigation Pumps in Room
8. Specimen & Explant Handling
9. EBL & Transfusion Trigger
10. Patient Correctly Positioned
11. Fire Risk and Safety Precautions
12. Concerns About Case
# Checklist Results

<table>
<thead>
<tr>
<th>Surgical Outcome</th>
<th>Before Checklist</th>
<th>After Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>1.5%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Any Complication</td>
<td>11.0%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Surgical Site Infection</td>
<td>6.2%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Unplanned Return to OR</td>
<td>2.4%</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

Individual Responsibility
What is the compliance rate for hand washing by physicians at Mott Children’s Hospital OR in June, 2015?
Answer:

20%
Why Don’t We Wash Our Hands?

• Old school thinking/Outmoded education

• Logistical issues/Access to sink

• Dry skin

• Systems problem but ultimately personal responsibility
World Health Organization

Centers for Disease Control and Prevention
# Your 5 Moments for Hand Hygiene

<table>
<thead>
<tr>
<th>Moment</th>
<th>WHEN?</th>
<th>WHY?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BEFORE TOUCHING A PATIENT</td>
<td>Clean your hands before touching a patient when approaching him/her.</td>
<td>To protect the patient against harmful germs carried on your hands.</td>
</tr>
<tr>
<td>2. BEFORE CLEAN/ASEPTIC PROCEDURE</td>
<td>Clean your hands immediately before performing a clean/aseptic procedure.</td>
<td>To protect the patient against harmful germs, including the patient’s own, from entering his/her body.</td>
</tr>
<tr>
<td>3. AFTER BODY FLUID EXPOSURE RISK</td>
<td>Clean your hands immediately after an exposure risk to body fluids (and after glove removal).</td>
<td>To protect yourself and the health-care environment from harmful patient germs.</td>
</tr>
<tr>
<td>4. AFTER TOUCHING A PATIENT</td>
<td>Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient’s side.</td>
<td>To protect yourself and the health-care environment from harmful patient germs.</td>
</tr>
<tr>
<td>5. AFTER TOUCHING PATIENT SURROUNDINGS</td>
<td>Clean your hands after touching any object or furniture in the patient’s immediate surroundings, when leaving — even if the patient has not been touched.</td>
<td>To protect yourself and the health-care environment from harmful patient germs.</td>
</tr>
</tbody>
</table>

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**World Health Organization**  
**Patient Safety**  
A World Alliance for Safer Health Care  
**SAVE LIVES**  
Clean Your Hands

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WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.
Joint Commission Targeted Solutions Tool

- JCAHO provides standards & let’s us know what we’re not doing correctly

*How do we improve?*

- Joint Commission Center for Transforming Healthcare (CTH)

- Targeted Solutions Tool (TST™) offers strategies to improve patient safety

- Provides improvement measures, tools to allow organizations to create safety processes
  1. Measures magnitude of the problem
  2. Identify why the process fails
  3. Create solutions to eliminate barriers to success
Ignaz Semmelweis

1847: Introduced hand washing
Learning Objectives

- Review surgical site infection metrics
- Summarize national accountability in our practice
- Delineate team approach
- Reinforce individual responsibility
The End