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Organization**



**World Health
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REGIONAL OFFICE FOR THE **Americas**

Webinar

Recommendations:

- Please turn off your microphone.
- There will be 40 minutes of presentation and 1 hour of questions and answers.
- Questions should be in writing, through the Chat or by email to: Infectioncontrol@paho.org
- The presentation will be available on the PAHO website in 48 hours.



Organización
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OFICINA REGIONAL PARA LAS Américas

Surgical Site Infection Preventive Measures

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**No financial
relationships to
disclose**



Riverside University Health System Moreno Valley, California



Riverside University Health System Medical Center, serving the residents of Riverside County since 1893.

Objectives

- Highlight practical recommendations from recent guidelines for SSI prevention efforts
- Review best practices for SSI prevention
- Reinforce the benefit of a bundle approach to SSI prevention

Current SSI Burden

- **USA Burden**
 - 160,000 – 300,000 SSIs per year
 - 2%-5% of patients undergoing inpatient surgery
 - SSIs are the **most common** and most costly type of HAI
- **Mortality**
 - 2-11 fold higher risk of death compared to non-infected operative pte.
 - 77% of deaths among SSI patients are directly attributable to SSI
- **Length of stay**
 - ~7-11 additional postoperative hospital days
- **Cost**
 - Up to \$3.5 to \$10 billion annually

Anderson DJ, et.al., Strategies to prevent surgical site infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol.* 2014; 35:S66-S88.

Most important!

- **60%** of SSIs are considered to be preventable

Factors Affecting Rates of SSI

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Factors Affecting Rates of Surgical Site Infections

- age
- morbid obesity
- malnutrition
- prolonged preoperative stay
- infection at distal sites
- cancer
- diabetes
- immuno-suppression
- ASA score
- disease severity
- prior operations, revision vs primary
- nasal/skin carriage
- virulence
- adherence
- inoculum

- abdominal site
- wound classification
- procedure duration
- poor hemostasis
- drains/foreign bodies
- dead space
- urgency of surgery

- razor shaves
- intraoperative contamination
- prophylactic antibiotic timing, selection and duration
- preoperative cleansing with chlorhexidine
- pre-operative screening for resistant organisms and decolonization
- surgeon's skill
- surgical volume

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Observations about SSI

- All surgical wounds are contaminated by bacteria, but only a minority get infection
- Different operations have different inoculums of contamination, and have different rates of infection
- Similar operations performed by the same surgeon in different patient populations have different rates of infections
- Wound infections have varying degrees of severity

Bacteria get into the wound most of the time

PowerPoint Presentation 8 / 62

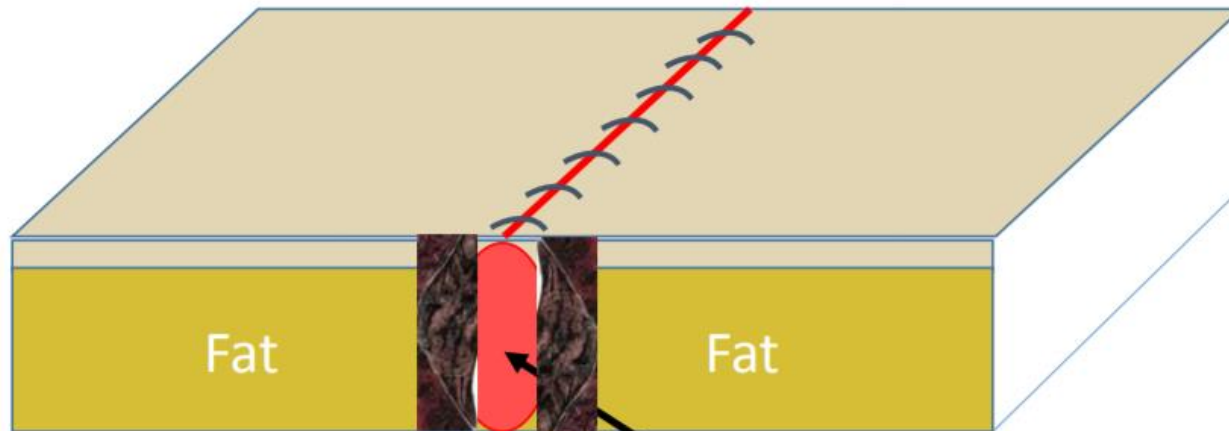
Loftus RW, et al. Hand contamination of anesthesia providers is an important risk factor for intraoperative bacterial transmission. *Anesth Analg*. 2011; 112:98-105.

Bacteria get into the wound most of the time!

APIC 2017 June 14-16, Portland, OR #APIC2017

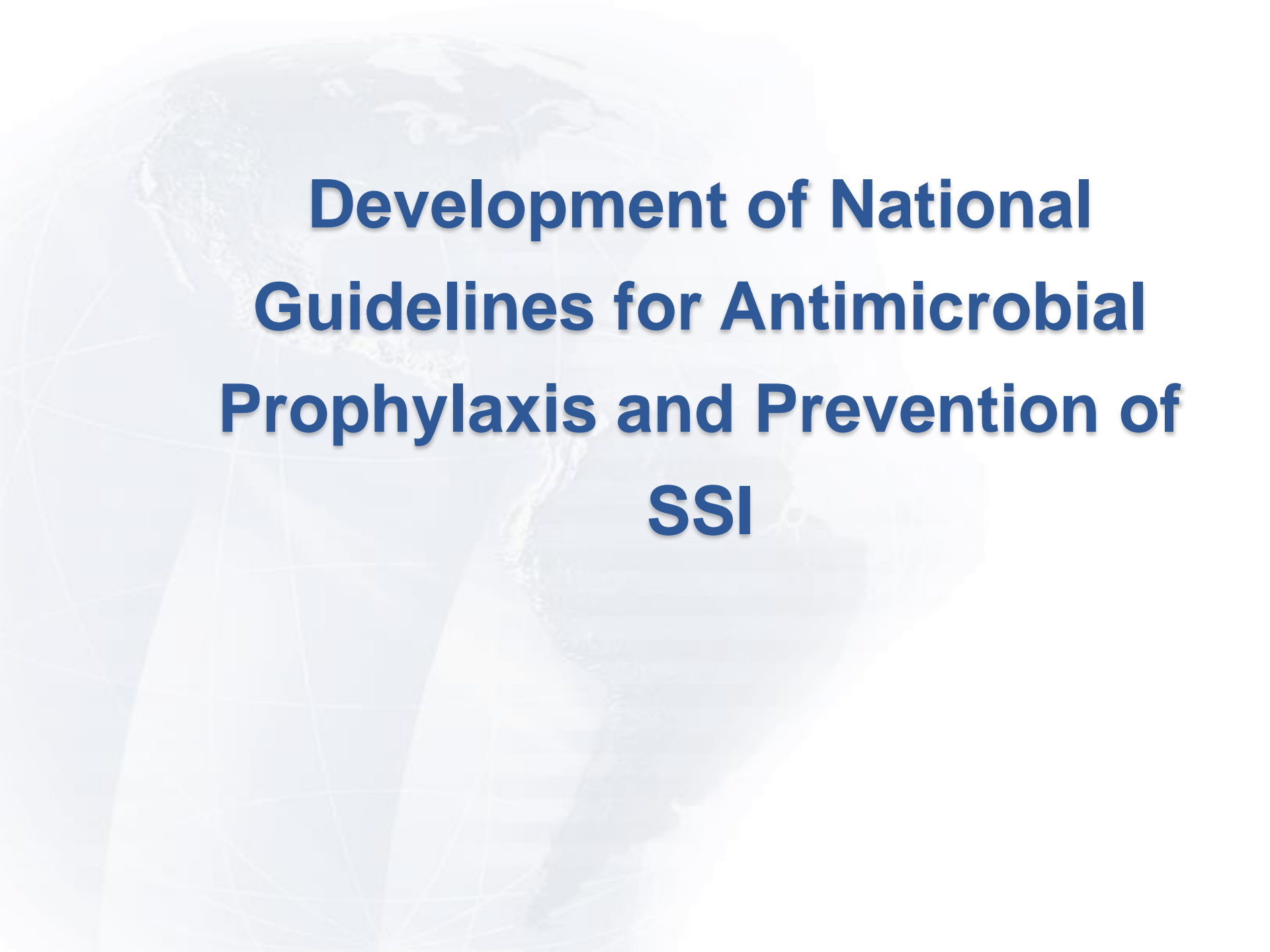
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The Wound Space



Wound space

- Avascular
- Hypoxic
- Contents – interstitial fluid, glucose, blood.....

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Development of National Guidelines for Antimicrobial Prophylaxis and Prevention of SSI

ASHP Therapeutic Guidelines on Antimicrobial Prophylaxis in Surgery

The ASHP Therapeutic Guidelines on Antimicrobial Prophylaxis in Surgery,¹ which have provided practitioners with standardized effective regimens for the rational use of prophylactic antimicrobials, have been revised as described in this document on the basis of new clinical evidence and additional concerns. Recommendations are provided for adult and pediatric patients (1 to 21 years of age), including infants (one month to 2 years of age), Geriatric patients, newborns (premature and full-term), and patients with renal or hepatic dysfunction are not specifically addressed. Therefore, the guidelines may not be applicable to these patients, or certain adjustments to the recommendations may be necessary. The higher occurrence of resistant organisms and the importance of controlling health care costs are also considered.

Prophylaxis refers to the prevention of an infection

Strength of Evidence for Recommendations. The primary literature from the previous ASHP Therapeutic Guidelines on Antimicrobial Prophylaxis in Surgery¹ was reviewed together with the primary literature between the date of the previous guidelines and August 1997, identified by a MEDLINE search. Particular attention was paid to study design, with greatest credence given to randomized, controlled, double-blind studies. Established recommendations by experts in the area (i.e., Centers for Disease Control and Prevention [CDC], American College of Obstetricians and Gynecologists [ACOG]) were also considered.

Guideline development included consideration of the following characteristics: validity, reliability, clinical applicability, flexibility, clarity, and a multidisciplinary nature as consistent with ASHP's philosophy on therapeutic guidelines.² Recommendations on the use of an antimicrobial are

Treatment Guidelines

from The Medical Letter®

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Volume 7 (Issue 82) June 2009
www.medicalletter.org

Table
1. Antimicrobial Prophylaxis for Surgery Pages 48-49

Antimicrobial Prophylaxis for Surgery

Antimicrobial prophylaxis can decrease the incidence of infection, particularly surgical site infection, after certain procedures. Recommendations for prevention of surgical site infection are listed in the table that begins on page 48. Antimicrobial prophylaxis for dental procedures to prevent endocarditis is discussed in The Medical Letter.

rate of post-operative infections with MRSA in some patients who were colonized before surgery.^{5,6} The Society of Thoracic Surgeons recommends decolonization with mupirocin prior to cardiac surgery for all patients without documented negative testing (via nasopharyngeal swab and culture or PCR) for

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INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY

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GUIDELINE FOR PREVENTION OF SURGICAL SITE INFECTION, 1999

Alicia J. Mangram, MD; Teresa C. Horan, MPH, CIC; Michele L. Pearson, MD; Leah Christine Silver, BS; William R. Jarvis, MD;
The Hospital Infection Control Practices Advisory Committee

Hospital Infections Program
National Center for Infectious Diseases
Centers for Disease Control and Prevention
Public Health Service
US Department of Health and Human Services

Best Practice Policy Statement on

Urologic Surgery Antimicrobial Prophylaxis



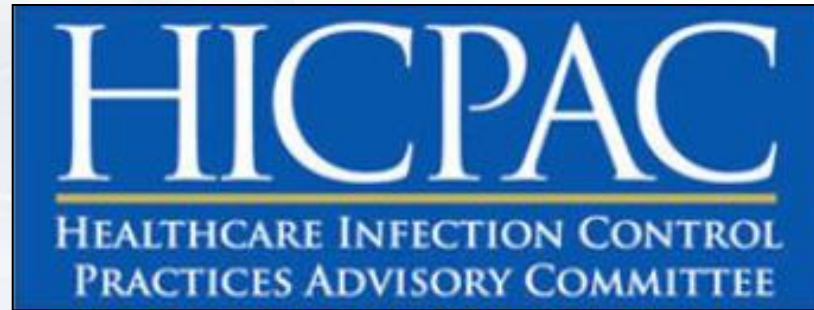
ACOG PRACTICE BULLETIN

CLINICAL MANAGEMENT GUIDELINES FOR
OBSTETRICIAN-GYNECOLOGISTS
NUMBER 74, JULY 2006

(Replaces Practice Bulletin Number 23, January 2001)

This Practice Bulletin was

Antibiotic Prophylaxis for Gynecologic



- Update of the 1999 HICPAC guideline on Prevention of Surgical Site Infections
 - Core section
 - Arthroplasty section
- Effort started in 2010
- Published online May 3, 2017

Centers for Disease Control and Prevention Guideline for
the Prevention of Surgical Site Infection 2017

JAMA Surgery | Special Communication

Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017

Sandra I. Berríos-Torres, MD; Craig A. Umscheid, MD, MSCE; Dale W. Bratzler, DO, MPH; Brian Leas, MA, MS; Erin C. Stone, MA; Rachel R. Kelz, MD, MSCE; Caroline E. Reinke, MD, MSHP; Sherry Morgan, RN, MLS, PhD; Joseph S. Solomkin, MD; John E. Mazuski, MD, PhD; E. Patchen Dellinger, MD; Kamal M. F. Itani, MD; Elie F. Berbari, MD; John Segreti, MD; Javad Parvizi, MD; Joan Blanchard, MSS, BSN, RN, CNOR, CIC; George Allen, PhD, CIC, CNOR; Jan A. J. W. Kluytmans, MD; Rodney Donlan, PhD; William P. Schechter, MD; for the Healthcare Infection Control Practices Advisory Committee

IMPORTANCE The human and financial costs of treating surgical site infections (SSIs) are increasing. The number of surgical procedures performed in the United States continues to rise, and surgical patients are initially seen with increasingly complex comorbidities. It is estimated that approximately half of SSIs are deemed preventable using evidence-based strategies.

 [Invited Commentary](#)

 [Supplemental content](#)

Participants

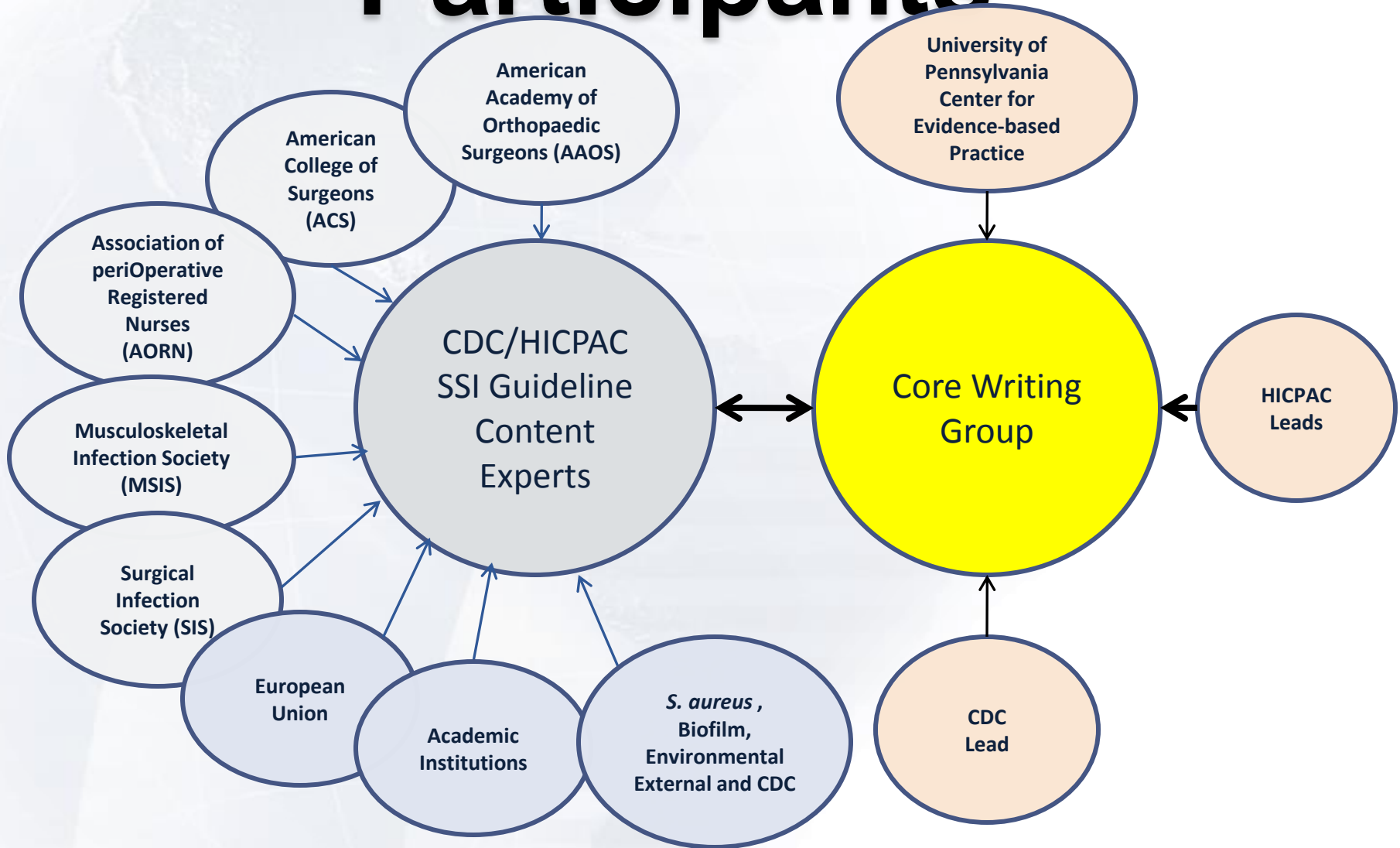
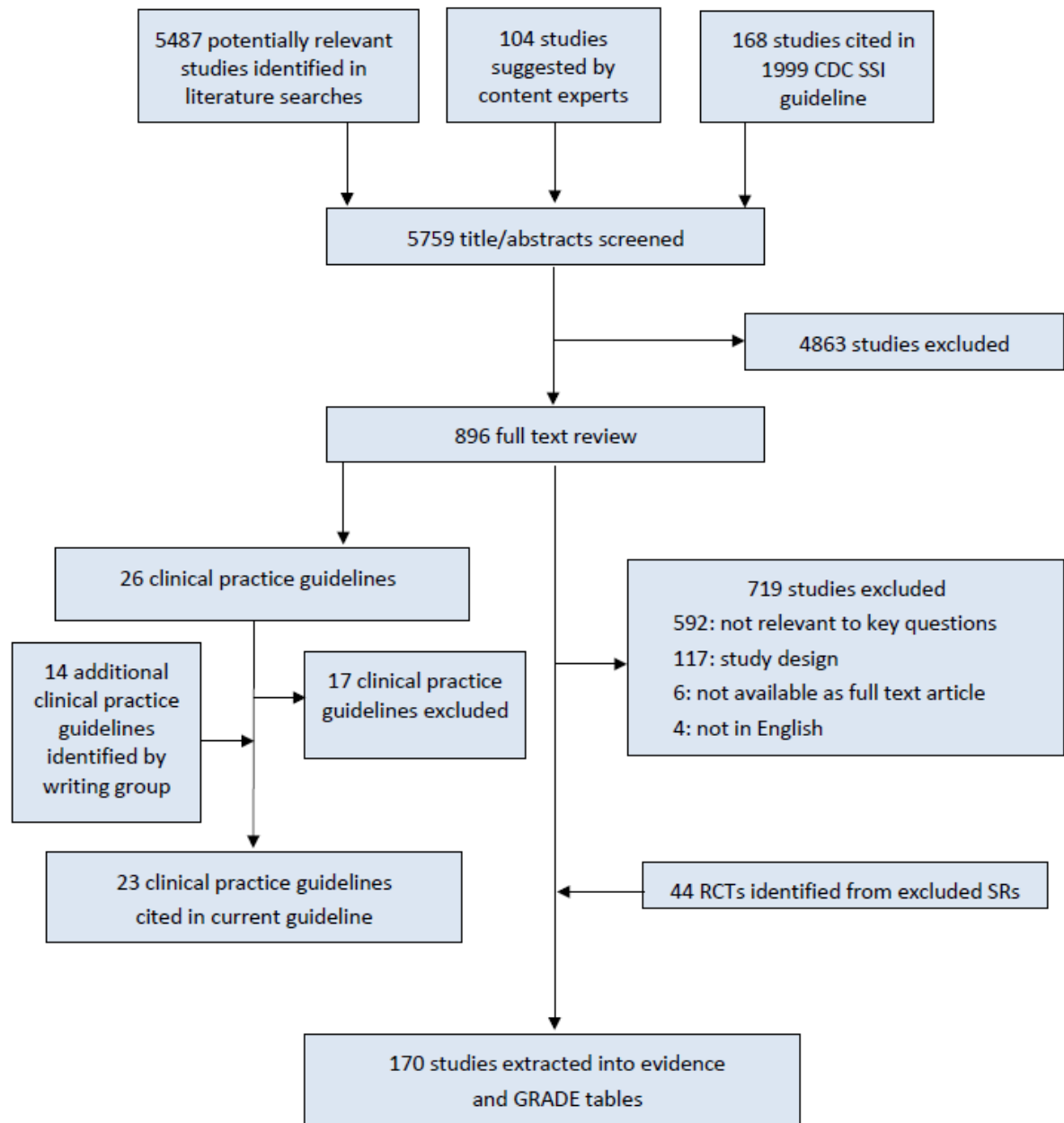


Figure 1. Results of the Study Selection Process





Updating the Guideline Methodology of the Healthcare Infection Control Practices Advisory Committee (HICPAC)

Craig A. Umscheid, MD, MSCE¹; Rajender K. Agarwal, MD, MPH¹; and Patrick J. Brennan, MD¹; for the Healthcare Infection Control Practices Advisory Committee (HICPAC)²

¹ Center for Evidence-based Practice
University of Pennsylvania Health System
Philadelphia, PA



- **Category IA.** Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.
- **Category IB.** Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and a strong theoretical rationale; or an accepted practice (e.g., aseptic technique) supported by limited evidence.
- **Category IC.** Required by state or federal regulations, rules, or standards.
- **Category II.** Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.
- **Unresolved issue.** Represents an unresolved issue for which evidence is insufficient or no consensus regarding efficacy exists.

Key Topics - Final

CORE

- Antimicrobial Prophylaxis
 - Parenteral
 - Topical antimicrobials/antiseptics
- Glycemic Control
- Normothermia
- Tissue Oxygenation
- Skin Preparation

ARTHROPLASTY

- Transfusion
- Immunosuppressive therapy
- Anticoagulation
- Orthopedic exhaust (space) suits
- Antimicrobial prophylaxis duration with drains
- Biofilm



Strong Recommendations:
*Based on Randomized
Controlled Trials (RCTs)
only*

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Core Section:

includes recommendations for the prevention of SSI that are generalizable across surgical procedures

Parenteral Antimicrobial Prophylaxis

- 1A.1. Administer preoperative antimicrobial agent(s) only when indicated, based on published clinical practice guidelines and timed such that a bactericidal concentration of the agent(s) is established in the serum and tissues when the incision is made. (**Category IB**)
- 1B. Administer the appropriate parenteral prophylactic antimicrobial agent(s) prior to skin incision in all cesarean sections. (**Category IA**)

Parenteral Antimicrobial Prophylaxis

- 1.E. In clean and clean-contaminated procedures, do not administer additional prophylactic antimicrobial agent doses after the surgical incision is closed in the operating room, even in the presence of a drain. **(Category IA)**

Nonparenteral Antimicrobial Prophylaxis

- 2B.1. Do not apply antimicrobial agents (ie, ointments, solutions, or powders) to the surgical incision for the prevention of SSI. **(Category IB)**

Glycemic Control

- 3A.1. Implement perioperative glycemic control and use blood glucose target levels less than 200 mg/dL in patients with and without diabetes. **(Category 1A)**

Normothermia

- 1. Maintain perioperative normothermia **(Category 1A)**

Oxygenation

- 6.B. For patients with normal pulmonary function undergoing general anesthesia with endotracheal intubation, administer increased fraction of inspired oxygen (FiO_2) both intraoperatively and post-extubation in the immediate postoperative period. To optimize tissue oxygen delivery, maintain perioperative normothermia and adequate volume replacement. (**Category IA**)

Antiseptic Prophylaxis

- 8.A.1. Advise patients to shower or bathe (full body) with either soap (antimicrobial or non-antimicrobial) or an antiseptic agent on at least the night before the operative day. **(Category 1B)**
- 8.B. Perform intraoperative skin preparation with an alcohol-based antiseptic agent unless contraindicated. **(Category IA)**

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***Prosthetic Joint Arthroplasty
Section:***

**contains recommendations that are
applicable to these procedures**

Blood Transfusion

- 11B. Do not withhold transfusion of necessary blood products from surgical patients as a means to prevent SSI. **(Category IB)**

Immunosuppressive Therapy

- For prosthetic joint arthroplasty patients receiving systemic corticosteroid or other immunosuppressive therapy, recommendation 1E applies: In clean and clean-contaminated procedures, do not administer additional antimicrobial prophylaxis doses after the surgical incision is closed in the operating room, even in the presence of a drain. **(Category IA)**

Antimicrobial Prophylaxis Duration with Drain Use

- 1. In prosthetic joint arthroplasty, recommendation 1E applies: in clean and clean-contaminated procedures, do not administer additional antimicrobial prophylaxis doses after the surgical incision is closed in the operating room, even in the presence of a drain.
(Category IA)



Weak Recommendations:
Moderate-quality evidence

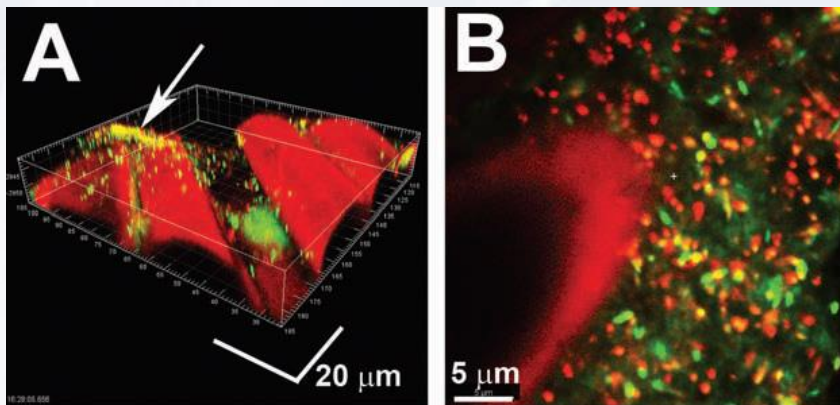
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Core Section:

includes recommendations for the prevention of SSI that are generalizable across surgical procedures

Nonparenteral Antimicrobial Prophylaxis

- 2B.2. Application of autologous platelet-rich plasma is not necessary for the prevention of SSI. **(Category II)**
- 2C. Consider the use of triclosan-coated sutures for the prevention of SSI. **(Category II)**



Kathju S, et al. *Surg Infect.* 2009; 10:457-461.

Antiseptic Prophylaxis

- 8.C. Application of a microbial sealant following intraoperative skin preparation is not necessary for the prevention of a surgical site infection. (**Category II**)
- 8.D. The use of plastic adhesive drapes with or without antimicrobial properties is not necessary for the prevention of SSI. (**Category II**)
- 9.A. Consider intraoperative irrigation of deep or subcutaneous tissues with aqueous iodophor solution (but not for contaminated or dirty abdominal procedures). (**Category II**)



No Recommendations:
Unresolved Issue

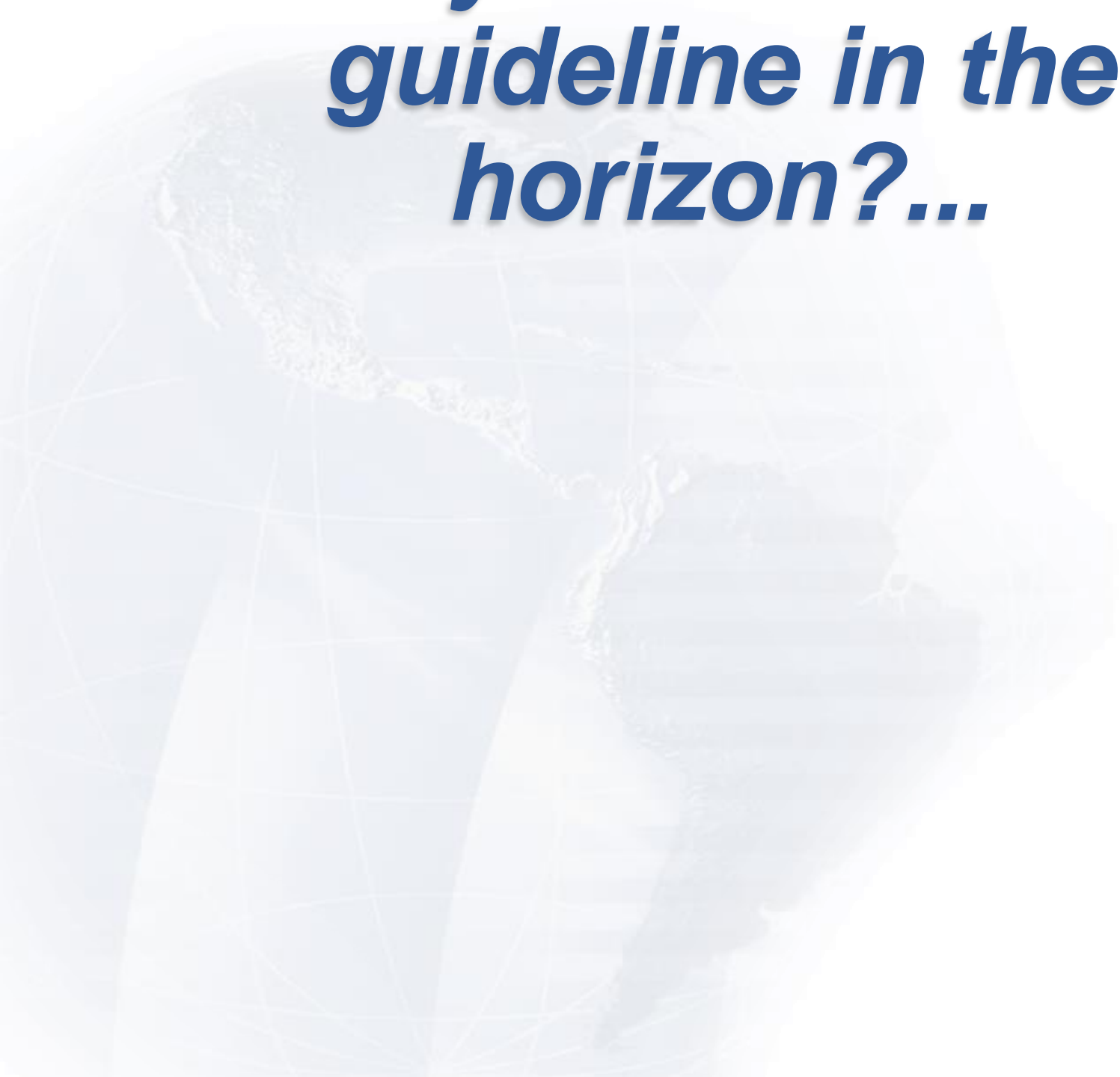
Recommendation/Unresolved Issues

- Weight-based antimicrobial dosing
- Intraoperative antimicrobial redosing
- Intraoperative antimicrobial irrigation
- Antimicrobial soaking of prosthetic devices
- Antimicrobial dressings applied to surgical incisions
- Optimal target for blood glucose control
- Value of the HbA1c for predicting SSI
- Best strategy for maintaining normothermia
- Oxygenation in non-endotracheal intubation surgery
- Best mechanism to deliver postoperative oxygen and the optimal FiO_2
- Optimal timing of preoperative bathing
- Application of antiseptics to the skin before closing

Prosthetic Joint Arthroplasty Section : **No Recommendation/Unresolved Issues**

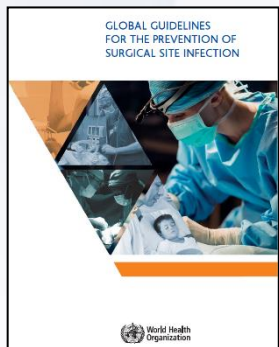
- Use systemic corticosteroid or other immunosuppressive therapies on the risk of SSI in prosthetic joint arthroplasty.
- Use and timing of preoperative intra-articular corticosteroid injection
- Venous thromboembolism prophylaxis on the incidence of SSI
- Orthopedic space suits or the health care personnel who should wear them for the prevention of SSI
- Cement modifications and the prevention of biofilm formation or SSI
- Prosthesis modifications for the prevention of biofilm formation or SSI
- Evaluating vaccines for the prevention of biofilm formation or SSI
- Evaluating biofilm control agents, such as biofilm dispersants, quorum sensing inhibitors, or novel antimicrobial agents, for the prevention of biofilm formation or SSI

***guideline in the
horizon?...***



For those “*No Recommendation/Unresolved Issues*”
HICPAC did not identify randomized controlled trials (RCTs).

However, other organizations have made recommendations based on the existing evidence, observational studies, and pharmacokinetic studies.



AMERICAN COLLEGE OF SURGEONS
*Inspiring Quality:
Highest Standards, Better Outcomes*



AORN



More Incentives: No CMS \$ Reimbursement for SSI

- Centers for Medicare and Medicaid Services no longer pays additional amounts for the cost of treating conditions acquired in a hospital
- SSIs have been targeted not only to improve clinical quality, but also to protect hospital reimbursement





**What are we implementing
at Riverside University
Health System?**

1. Monitoring Surgical Site Infections

- SSI monitoring requires:
 - active,
 - patient-based,
 - prospective surveillance
- Post-discharge and ante-discharge surveillance methods are been used to detect SSIs ***following inpatient surgeries***
- Post-discharge surveillance method are been used to detect SSIs for ***outpatient operative procedures***

Creation of a bundle based on the risk factors that affect SSI

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Factors Affecting Rates of Surgical Site Infections

- age
- morbid obesity
- malnutrition
- prolonged preoperative stay
- infection at distal sites
- cancer
- diabetes
- immunosuppression
- ASA score
- disease severity
- prior operations, revision vs primary
- nasal/skin carriage
- virulence
- adherence
- inoculum

- abdominal site
- wound classification
- procedure duration
- poor hemostasis
- drains/foreign bodies
- dead space
- urgency of surgery

- razor shaves
- intraoperative contamination
- prophylactic antibiotic timing, selection and duration
- preoperative cleansing with chlorhexidine
- pre-operative screening for resistant organisms and decolonization
- surgeon's skill
- surgical volume

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2.a. Intrinsic, patient related (preoperative)

- **Modifiable**

- **Glucose control, diabetes:** control serum blood glucose levels; reduce glycosylated hemoglobin A1c levels to <7% before surgery, if possible
- **NEW: Blood glucose control** is now recommended for **all patients**, regardless of diabetic status, ≤ 180 mg/dL
- **Obesity:** increase dosing of prophylactic antimicrobial agent for morbidly obese patients
- **Smoking cessation:** encourage smoking cessation 4 to 6 weeks before a procedure
- **Hypoalbuminemia:** serum albumin level is the surrogate marker most commonly used to classify nutritional status, with a normal range considered to be 3.5 to 5.5 g/dL

2.b. Extrinsic, procedure related (perioperative): Preparation of patient

- **Preoperative infections**
 - Identify and treat infections (e.g., UTI) remote to the surgical site before elective surgery
- **Skin contamination: CHG Showers**
 - Chlorhexidine preop showers (3 nights before and morning of surgery)
 - Additionally: CHG cloth before surgery
- **Hair removal**
 - Do not remove unless hair will interfere with the operation; if necessary, remove by clipping (a.m. of surgery, outside the OR), and do not use razors

2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Surgical scrub (surgical team members' hands and forearms)**
 - Use appropriate antiseptic agent to:
 - Perform 5 minute preoperative surgical scrub before the first procedure
 - Perform 2-5 minute preoperative surgical scrub between cases
 - Or use an alcohol based surgical hand antiseptis product between cases
 - Surgeon's nails short
 - **Do NOT use jewelry in hand or arms**



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Skin preparation**

- Wash and clean skin around incision site
- Use 2% CHG/70% alcohol (tinted orange)
- Utilize proper aseptic technique during application, long sleeves and gloves to contain shedding



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Antimicrobial prophylaxis: administer only when indicated**
 - **Timing:** administer within 30 min before incision to maximize bactericidal tissue & serum levels at time of skin incision. Redose if > 1 hour prior to incision.
 - **Choice:** select appropriate agents based on procedure (Cefazolin). If PCN/Beta lactam allergy, Clindamycin or Vancomycin.
 - **Duration of therapy:** stop prophylaxis within 24 hours after the anesthesia end time
 - **New:** With some exceptions, *prophylactic antibiotics* should be stopped at the time of incision closure (ACS - 2017)

2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Surgeon skill technique**

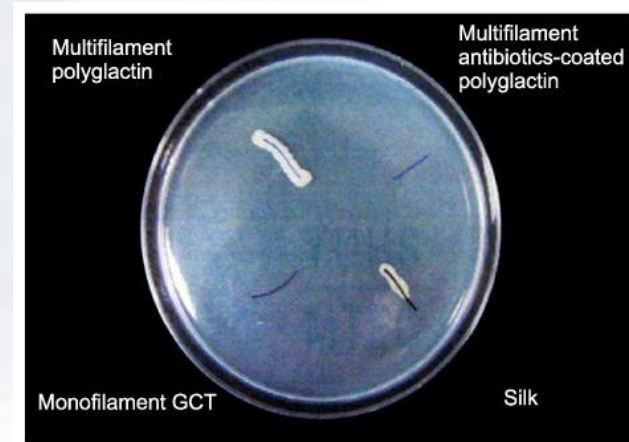
- Remove devitalized tissue
- Maintain effective hemostasis
- Gently handle tissues
- Eradicate dead space
- Avoid inadvertent entries into a viscus
- Use closed drains and suture material appropriately



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Antibiotic sutures:**

- Historically, guidelines have not recommended using antibiotic sutures to decrease SSIs, but there now is moderate evidence to support their use.



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Asepsis**
 - Adhere to standard principles of operating room asepsis
 - Source of SSI pathogens:
 - Endogenous flora of the patient
 - Operating room environment
 - Hospital personnel (MDs/RNs/staff/ancillary personnel/students/others)
 - Seeding of the operative site from distant focus of infection (prosthetic device, implants)
 - The **number one source**: people (**People = Shedding**)
 - 4000-10000 particles per minute
 - Carried by wind current to the sterile field which results in wound contamination



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Surgical Attire:**
- *“The use of barriers seems prudent to minimize a patient’s exposure to the **skin cells** or **hair of surgical team members**, as well as to protect surgical team members from exposure to blood and bloodborne pathogens.” **CDC***



Surgeons vs. Association periOperative RN

Organizations debate: Should surgeons wear skullcaps in the OR?

by Paige Minemyer | Aug 26, 2016 11:30am



CMS.gov
Centers for Medicare & Medicaid Services

(?)

2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Asepsis**

- Surgical attire: cover hair, mask, gloves, gowns, scrubs
- Cloth cap use: must be covered when in surgery, and total hair covered
- Human skin and hair is naturally colonized with many bacteria, and perioperative personnel shed microorganisms into the air around them.
- Airborne bacteria in the OR can fall into the operative field, contribute to the overall air contamination of the OR, and place patients at risk of surgical site infections



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Surgical Attire:**

- Surgical gloves can contain or develop defects
- Double gloving decreases the risk of holes to the inner glove, so routine double gloving is recommended to protect the surgeon and the patient
- Masks should not be worn dangling at any time



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Surgical Attire:**

- OR scrubs should not be worn in the hospital facility outside of the OR area without a clean lab coat or appropriate cover up over them
- If one chooses to wear a lab coat it should be laundered in a healthcare accredited laundry facility after each daily use and sooner when contaminated, or should be single use

2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Surgical Attire:**
 - OR scrubs should not be worn at any time outside of the hospital perimeter
 - OR scrubs should be changed at least daily
 - To facilitate enforcement of the guideline on wearing scrubs only within the perimeter of the hospital, the ACS also suggests the adoption of distinctive, colored scrub suits for OR personnel

2.c. Extrinsic, procedure related (perioperative): Operative characteristics

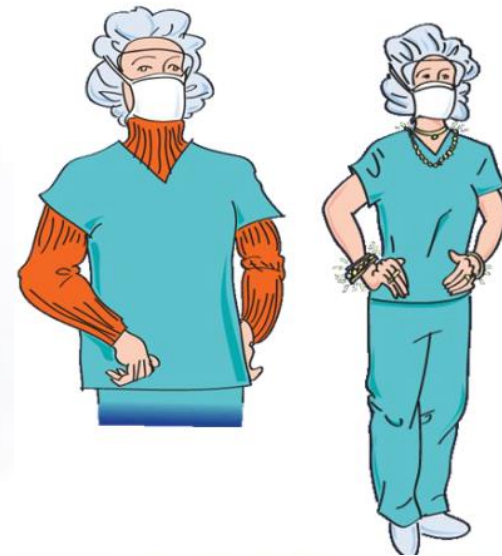
- **Surgical Attire:**

- **Dedicated shoes / Shoes covers:**
- Dedicated shoes are only for the OR area. They should not be worn in other areas of the hospital either.
- Soiled shoes contribute to environmental contamination.
- A study showed: shoes worn outdoors 98% contaminated with CNS, coliforms and bacillus species vs. 56% shoes worn only in OR.
- Bacteria on the floor may contribute up to 15% of CFUs dispersed into the air by walking.
- Dedicated shoes: closed toes and backs, low heels.
- OSHA regulations: employees wear shoes covers to provide protection from identified potential hazards (e.g. splashing from blood or other possible infectious materials)

2.c. Extrinsic, procedure related (perioperative): Operative characteristics

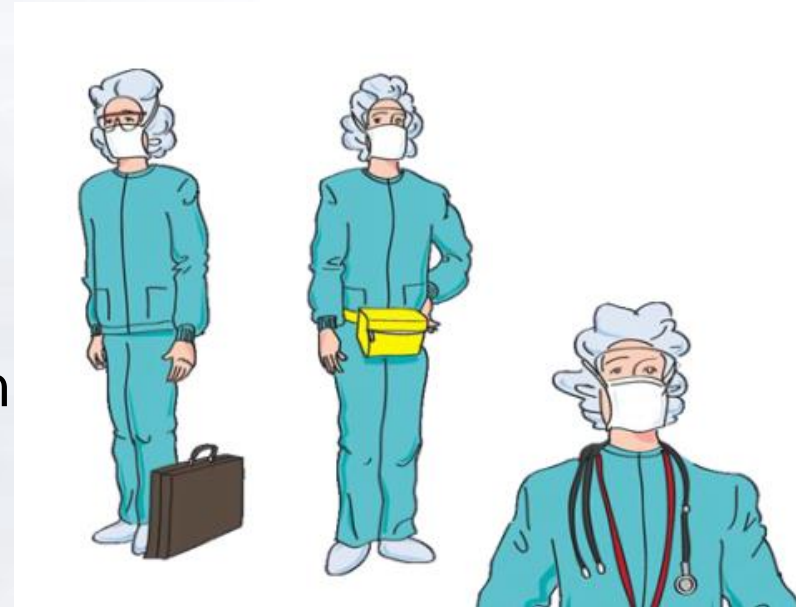
- **Surgical Attire:**

- Earrings and jewelry worn on the head or neck might fall into or contaminate the sterile field, should all be removed or appropriately covered during procedures
- Wearing jewelry increases bacterial counts on skin surfaces: (a) when jewelry is in place and (b) after removal
- Removing watches and bracelets allows for more thorough hand washing
- Personal clothing should be completely covered by surgical attire



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Surgical Attire:**
- **Personal items do not belong in the OR:**
 - Items may harbor pathogens and be difficult to clean or disinfect adequately
 - Pathogens have been shown to survive on fabrics and plastics
 - Microorganisms may be transported from one location to another



2.c. Extrinsic, procedure related (perioperative): Operative characteristics

- **Asepsis**
 - Requires strict adherence to the principles of aseptic technique by all team members for every patient on every case: ***do not talk, do not chew gum, do not use cell phone***
 - OR's that value these principles create a patient centered culture.
 - Sterile dressing 24-48 h.

2.c. Extrinsic, procedure related (perioperative): Operative characteristics

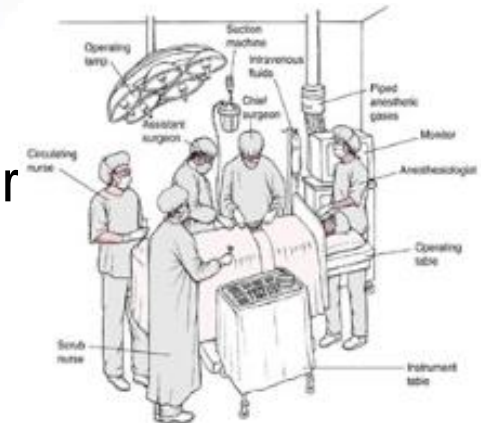
- **Operative time**
 - Minimize as much as possible
- **Normothermia – Perioperative temperature management**
 - Active warming intraoperatively
 - One body temperature $> 36^{\circ}\text{C}$ recorded 30 minutes prior to and immediately after anesthesia end time



2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

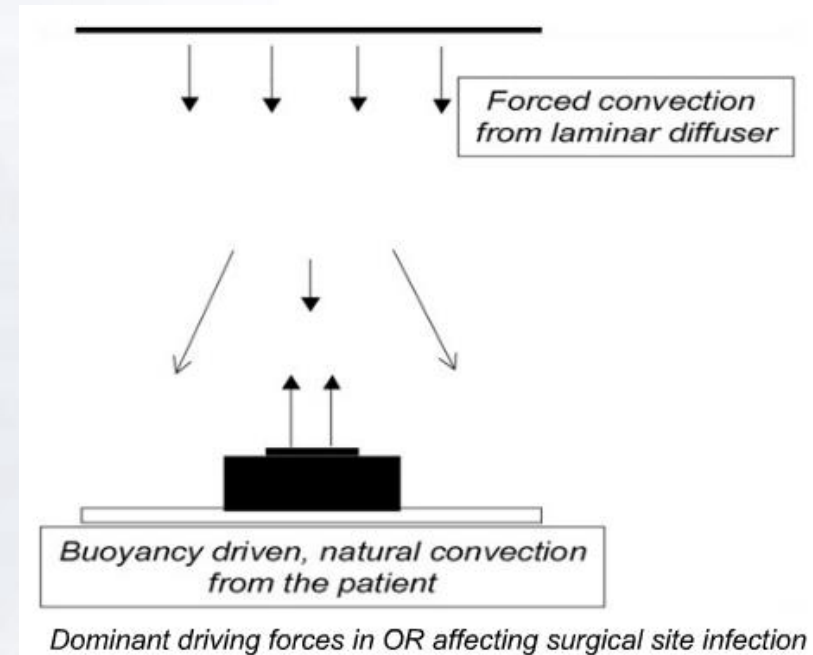
- **Ventilation**

- Follow American Institute of Architect's recommendations
- Parameters for Operating Room Ventilation:
- **Temperature:** 68° - 73°F, depending on normal ambient temp
- **Relative humidity:** 20%-60%
- **Air movement:** Positive pressure and from "clean to less clean" areas
- **Air changes:** >15 total per hour
>3 outdoor air per



2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

- **Air handling systems:**
 - ▶ HVAC system delivers air from the ceiling and exhausts in rooms corners
 - ▶ Positive pressure to outside rooms
 - ▶ All ductwork insulated on the exterior to minimize surfaces where moulds and bacteria can grow.



2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

- **Air handling systems:**
 - ▶ The main routes of microbial entry into an open clean surgical wound are:
 - from the **patient's skin**, from the **surgeon's hand** or by **airborne** microbes setting into the wound or onto instruments that will be used in the wound.
 - ▶ Most microbes in OR air are from staff and few from the patient; ***microbial dispersion increases with movement.***
 - ▶ Control of movement in, and entry into, the OR environment is important in reducing the airborne contamination routes.
 - ▶ Operating room doors need to be kept closed during procedures to optimize the efficacy of the ventilation system

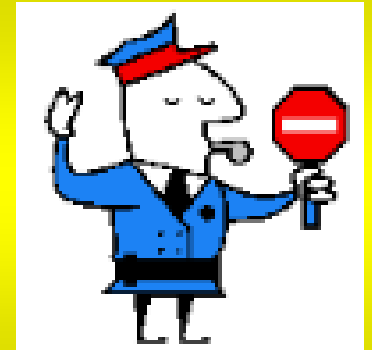
2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

• Traffic

- Minimize operation room traffic
- Closed doors all the time
- Shedding plus wind currents:
 - Requires the control of:
 - Amount of traffic
 - Traffic patterns
- Traffic control
 - Essential personnel only
 - One foot (min) perimeter around sterile field
 - Sterile fields should be a destination, not a thoroughfare
 - Limit students and observers
 - Student's right to learn vs. patient's right to receive safe patient care
 - Utilize alternative methods of communication



STOP



Restricted Access

*If you are not involved in this case
PLEASE refrain from entering.*

Thank You

2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

- **Environmental surfaces**

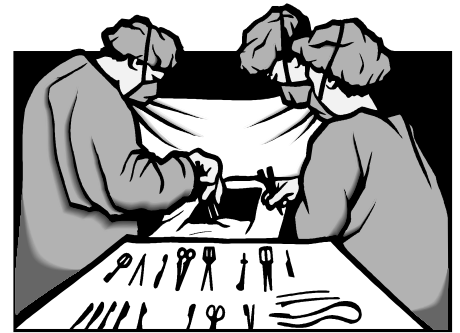
- Use a US EPA approved hospital disinfectant to clean surfaces and equipment
- Room cleaning:
 - Between cases
 - Cleaning schedule for OR's and rooms
 - Terminal room cleaning procedures on night shift
 - Single use micro fiber mop (eliminate mop/ bucket)
 - Daily check sheet for room cleaning and precaution cases
- Types of construction materials



2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

- **Sterilization of surgical equipment**

- Sterilize all surgical equipment according to published guidelines
- Proper sterilization processes
- Minimize the use of IUSS
 - Utilized for:
 - Dropped instruments
 - Poorly designed work processes
 - Surgeon scheduling
 - Results in contamination due to:
 - Poor cleaning due to lack of time
 - Methods of delivery to the sterile field
 - A closed container is best practice
 - TJC will be looking for them



2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

- **Sterilization of surgical equipment:**

Inspection of Instruments

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

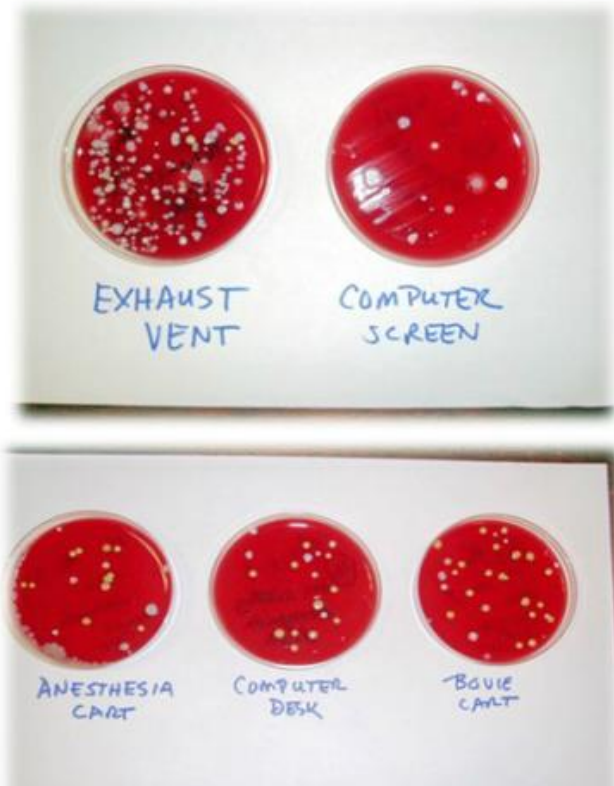
Pre-soaking and rinsing of tissue and blood from the instruments in the operating room before decontamination



Tosh et al. Outbreak of Pseudomonas aeruginosa Surgical Site Infections after Arthroscopic Procedures: Texas, 2009 Infect Control Hosp Epidemiol 2011;32(12):1179-1186

2.d. Extrinsic, procedure related (perioperative): Operating Room Characteristics

- ***Why irrigation?:*** Environmental contaminants in the OR and at the end of ca



Chlorhexidine Gluconate 0.05% Irrigation Solution

- Meets American College of Emergency Physicians (ACEP) guidelines for wound irrigation volume and pressure
- Proprietary SplatterGuard protects healthcare workers, patients and the environment from biohazard contamination
- CHG 0.05% 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



Hypochlorous Acid (HOCl) 0.01% Irrigation Solution

- Effective against bacteria, fungi and viruses
- Does not generate resistance
- Fast acting
- Effectively disrupts bacterial biofilms
- Good therapeutic index
- Stabilized pH range from 3.5 to 6.5
- Pure HOCl formulation achieved through a complex compounding process versus electrolysis
- Non-toxic to tissue; has preservative effectiveness in solution against microorganisms

2.e. Extrinsic, post-operative

- **Sterile dressing:**
 - Protect closed incision with sterile dressing for 24-48 hours postoperatively



3. Reporting

- Create a report of:
 - a) SIR SSI by procedure
 - b) SIR SSI by surgeon
 - c) Compliance (%) to the bundle created (NPSG)
- Present the reports to:
 - Infection and Prevention and Control Committee Meeting
 - Performance Improvement Committee Meeting
 - Medical Executive Committee Meeting
 - OR Committee Meeting

SIR for All Surgical Site Infection Data - RUHS – 2009-2016

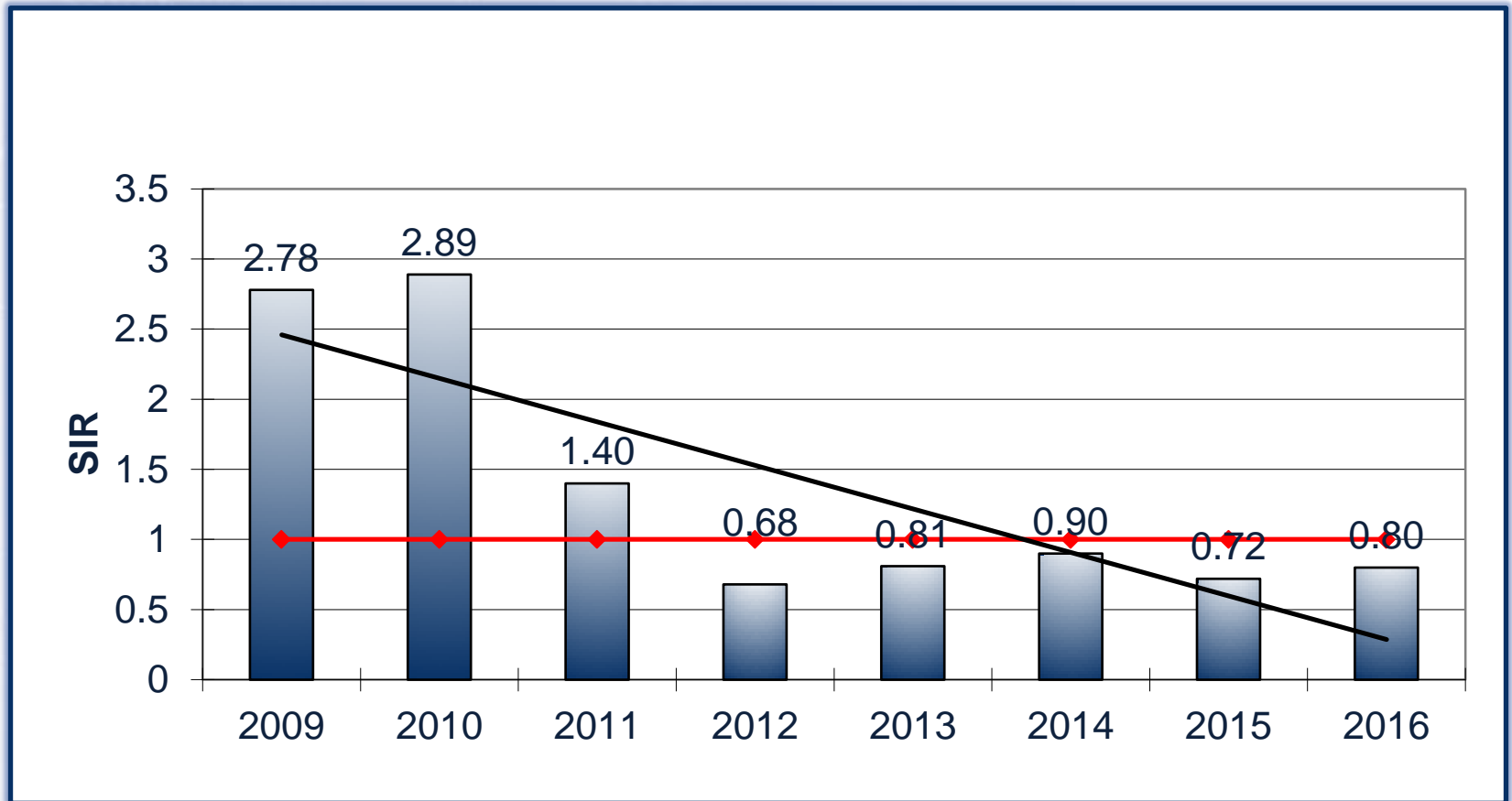


Fig. 1. SIR for All Surgical Site Infection Data at RUHS, 2009 – 2016

SIR: SSI By Surgeon (199 Surgeons are coded)

Specialty: General Surgery		Y. 2014	Y. 2015	Y. 2016	Y. 2017 (YTD)
Surgeon Code ##	SIR	2.95	1.07	1.81	0
	Procedures	85	92	66	39
	SSI	2	2	2	0
	Goal	≤ 1	≤ 1	≤ 1	≤ 1

SIR for All Adult Inpatients SSI Data by Procedure – RUHS – 2015-2017 (03/17)

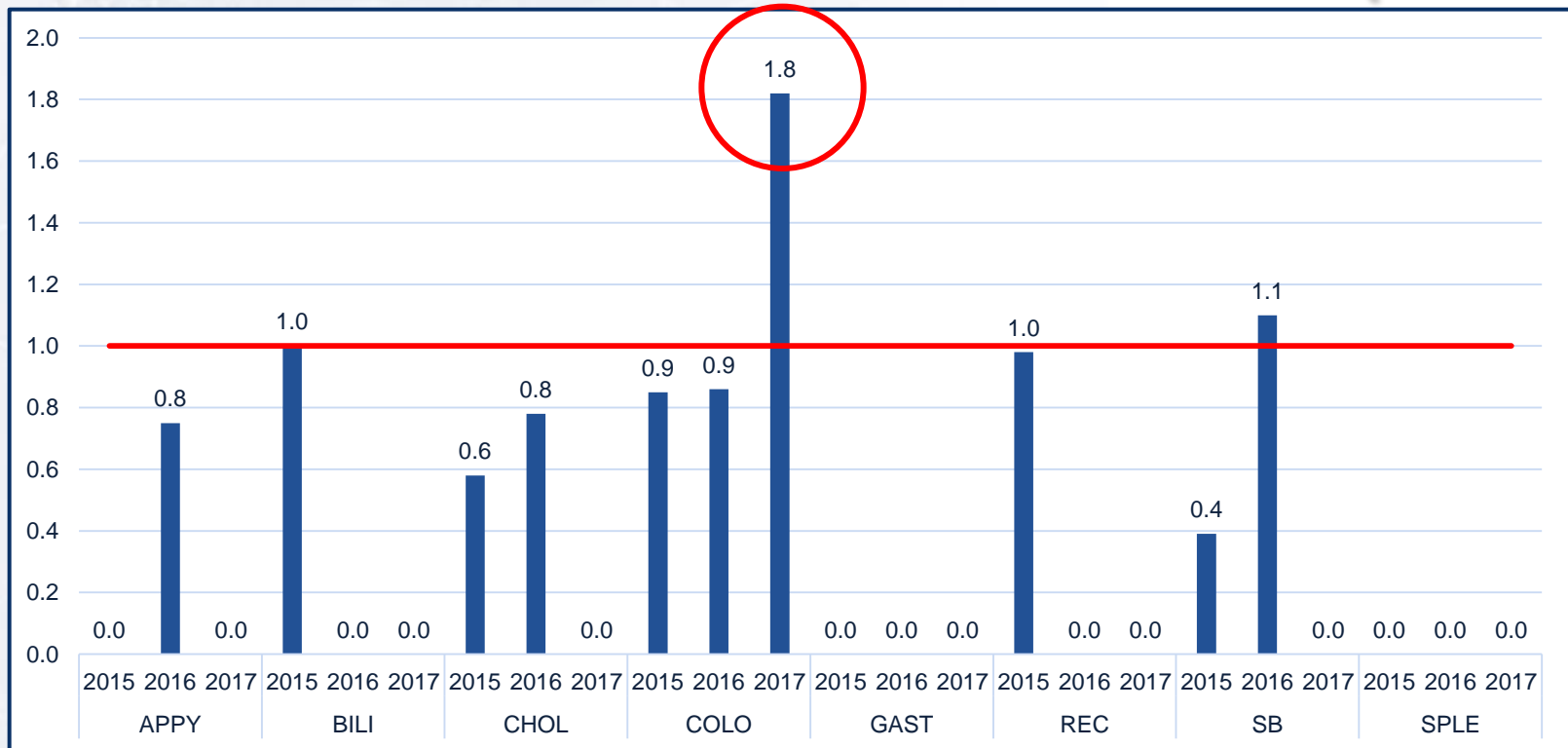


Fig. 2. SIR for All Surgical Site Infection Data by Procedure, at RUHS, 2015 – 2017 (03/17)

Since January 2017 we are using **2015 Baseline** (Source of aggregated data is: 2015 NHSN SSI Data).

Procedure to Monitor Closely

- COLON Surgeries

For reducing SSI



Creation of Task Forces (Multidisciplinary)

- Task force for reduction of Breast Surgeries SSI in 2014
- Task force for reduction of Joint Prosthesis SSI in 2016
- Task force for reduction of Colon Surgeries SSI in 2017

Task force for reduction of Colon Surgeries

SSI in 2017: Colon Surgeries Study

- All colon surgical procedures performed in RUHS, during 2016
- Case-Control study, creating line listings of colon procedures performed during 2016, with and without SSIs
- Collected all risk factors data, including: 1) *Perioperative patient's temperature at the time of surgery, and 2) Patient's serum albumin level from the day before or the day of surgery*
- Calculate **OR** for SSI with hypothermia and hypoalbuminemia
- We considered normothermia if the body's core temperature is 36° C-38° C, and hypothermia if the body's core temperature is below 36° C
- We used serum albumin level to classify nutritional status. A normal range was considered to be 3.5 to 5.5 g/dL. Malnutrition was considered to be below 3.0 g/dL

Task force for reduction of Colon Surgeries SSI in 2017: Hypoalbuminemia

- RUHS patients for Colon surgery have **3 more chances to develop SSI** if their level of albumin in serum is below 3.0 g/dL.
- **Action Plan:**
 - If Alb is low (< 3g/dL), order pre-albumin level, and complement with clear liquid supplement /boost 3 times a day for 7 days, re-assess weight and pre-albumin in 1 week
 - Arrange for diet counseling with a RD
 - Depending on the surgical urgency, delay of surgery until patient's nutritional status improves
 - Preoperative and postoperative fasting should be kept at a minimum for these patients, as even short-term deprivation may exacerbate risks
 - Control serum albumin level in all surgical patients

Task force for reduction of Colon Surgeries SSI in 2017: Normothermia

- RUHS patients for Colon surgery have 7.9 more chances to develop SSI if he/she is hypothermic at the time of the surgery ($< 36^{\circ}$ C)
- Action Plan:
 - Pre-warm patient in pre-op area for a minimum of 30 minutes before surgery
 - Use forced air warming blanket during the surgery

Task force for reduction of Colon Surgeries SSI in 2017: Before Surgery

- **Patient Optimization**

- Nutrition

- Malnutrition is common
 - Clear liquid supplement (237 mL): protein (8 g) and carbohydrates (52 g)

- Smoking reduction/cessation – 4 weeks prior to surgery

- Glycemic control

- Prior diabetes diagnosis, Hb A1c < 7.0%
 - Diabetes management referral
 - > 45 years old, BMI >30 noted to be at risk for undiagnosed diabetes

- Other co-morbidities addressed

- Patient education before surgery

Task force for reduction of Colon Surgeries SSI in 2017: Day of Surgery

- **Pre-op: the regular things (clipping, warming, antibiotic-weight based) PLUS:**
 - CHG wipes (again)
 - Iodine nares swabs
 - Oral pain control
 - Glucose testing: > 180 mg/dL, conversation for control
 - Prophylaxis against thromboembolism
- **Intra-op:**
 - CHG-Alcohol scrub
 - Re-dosing antibiotic (> 3 hours)
 - Hyperglycemic control
 - Control fluid therapy – reduce fluid load
 - Micro-perf/perfusion detection instrument for anastomosis
 - New clean closure kit, clean gloves
 - Silver dressings, micro negative pressure dressing for high risk patients

Task force for reduction of Colon Surgeries SSI in 2017: Post Surgery

- Post surgery
 - Patient education / expectations met
 - Wound care
 - Feed the patient!
 - Pain management
 - Ambulate!
 - Schedule post-op visit before discharge
 - Glucose control < 180 mg/dL
 - Get the urinary catheter out! (< 48 hours)

SIR-SSI, Colon Surgery, Adults Patients – RUHS – 2015-2017 (June 2017)

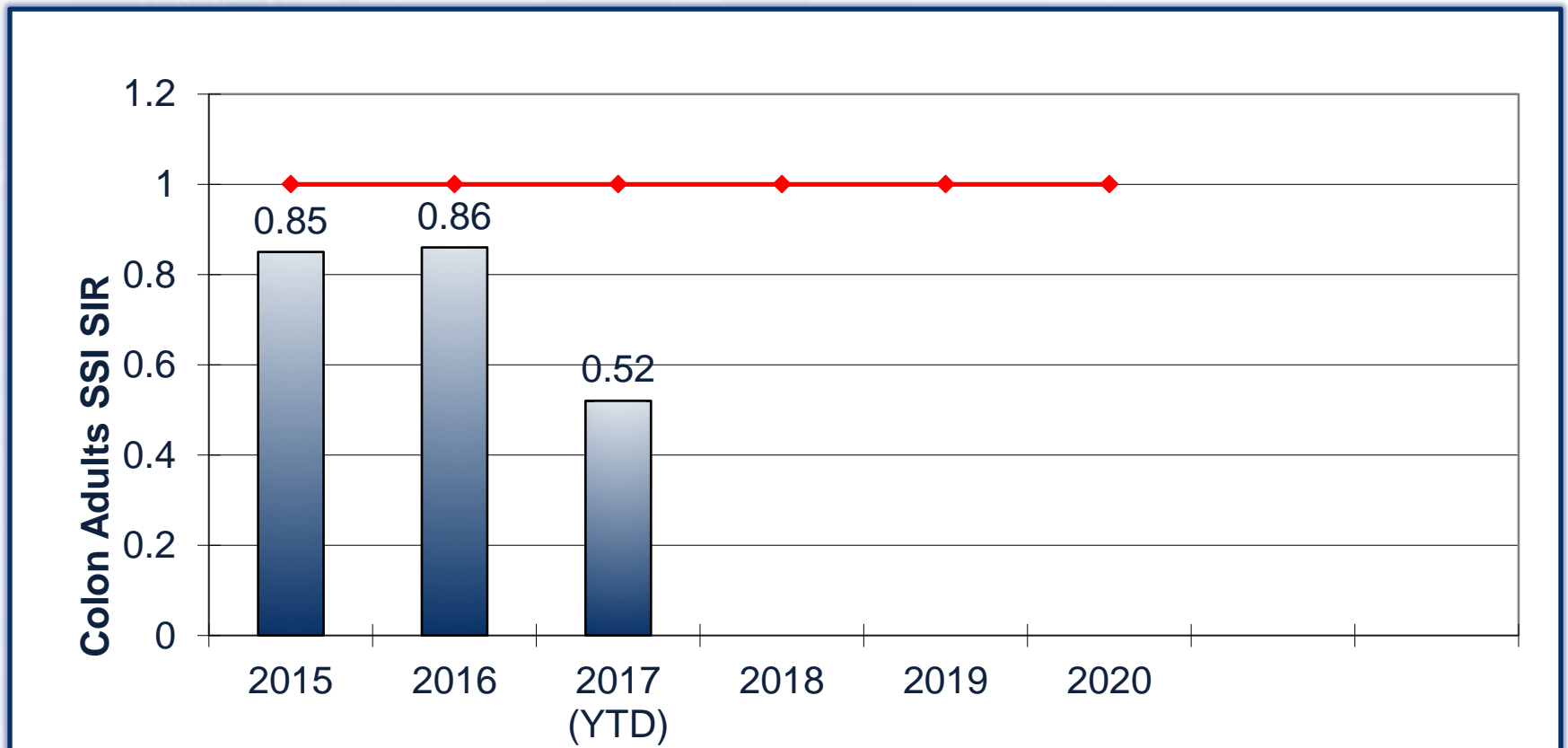


Fig. 3. SIR-SSI, Colon Surgeries, at RUHS, 2015 – 2017 (06/17)

Since January 2017 we are using **2015 Baseline** (Source of aggregated data is: 2015 NHSN SSI Data).

IP: Partners with the Surgical Team

- Infection Preventionists may partner with the surgical team to ensure compliance with the guidelines
- The process starts with ***everyone being at the table to identify the barriers which preclude compliance***
- If surgeons feel that IP and administration are dictating compliance from afar, it will always be problematic
- They have to feel like everyone is “**in it together**”



Conclusions

- Surgical site infections are the most frequent healthcare-associated infection reported in hospitals
 - Probably far more common than voluntary reporting to NHSN suggests
- Risk of SSI varies by operation type
- ***There are multiple factors that contribute to the development of SSIs***
 - **No single intervention is going to be sufficient to prevent SSIs**



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Next Webinar

Due to activities of Regional IPC Team at V Seminar in HAls, Brazil in August 2017, **next webinar will have to be postponed until September 11, 2017**



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