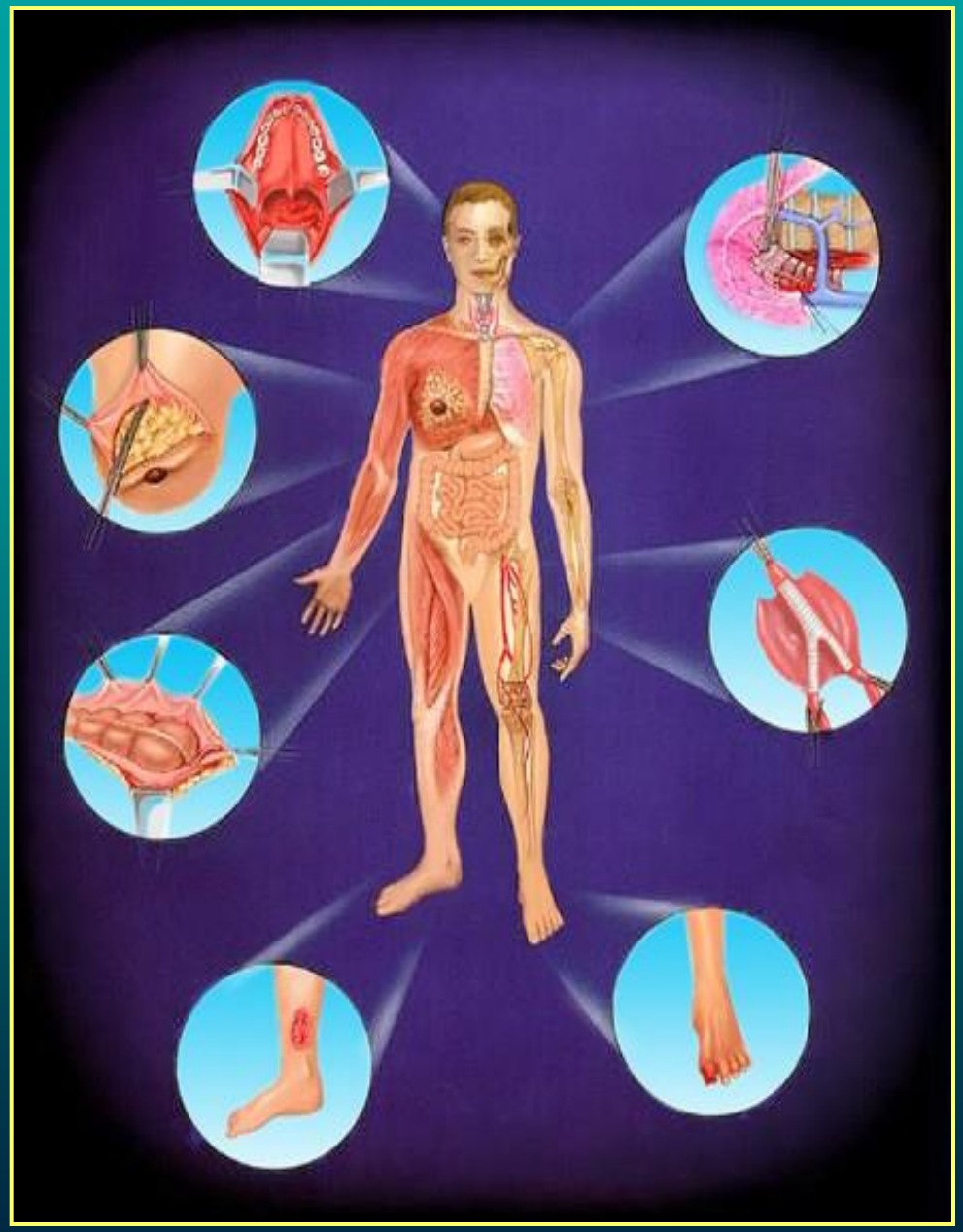

Moving Beyond Surgical Dogma: Development of an Evidence-Based Surgical Care Bundle to Improve Patient Outcomes

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MEDICAL COLLEGE OF WISCONSIN

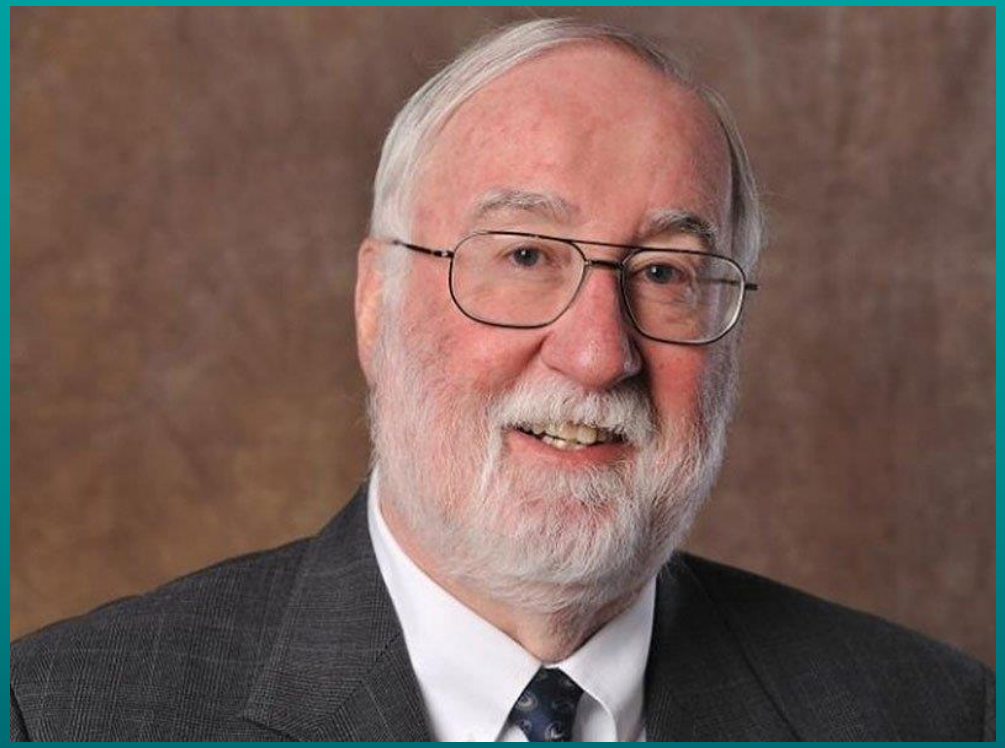
Disclaimer – Caveat

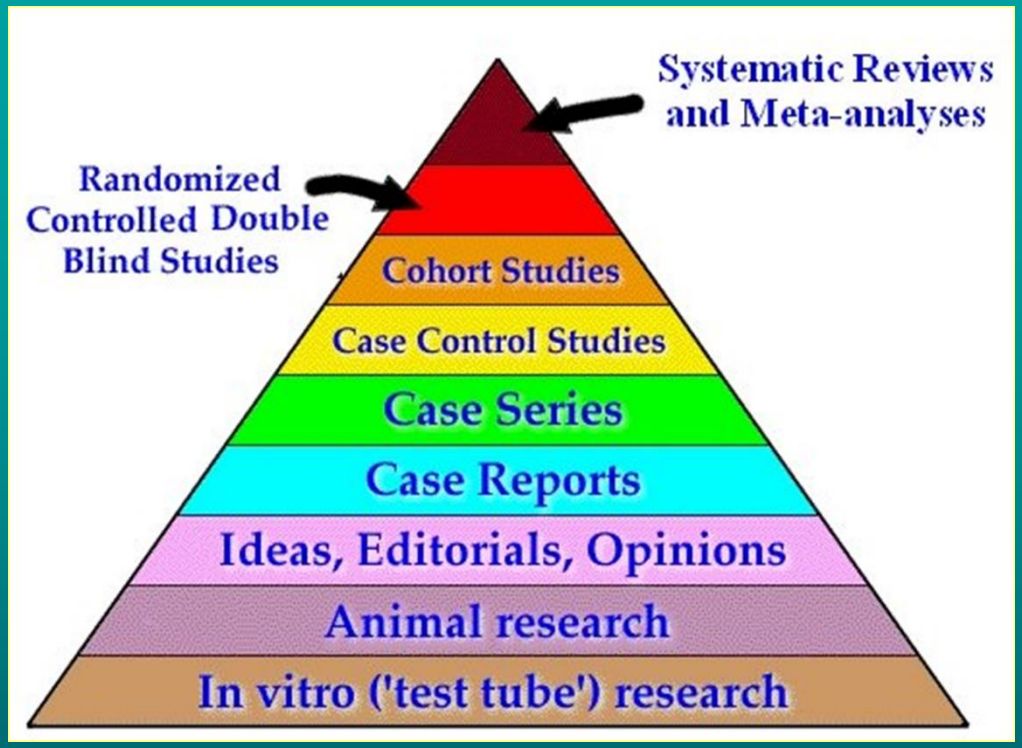
“I DON’T HAVE ALL OF THE ANSWERS”

Surgical Site Infections Often Represent a Complex and Multifactorial Process - the Mechanistic Etiology or the Search for Resolution May be Quite Elusive

Items For Discussion Today

- Evidence-Based Medicine: What it is and What it Isn't
- Complexity of Surgical Site Infections
- SSI Prevention Guidelines – What Do They Say and Are They Helpful?
- Making an Evidence-Based Argument to Improve Patient Outcomes in Surgery – The Era of the Surgical Care Bundle





"The practice of evidence-based medicine means integrating individual clinical expertise with the best external evidence from systematic reviews."

Sackett et al. Evidence-based medicine: what it is and what it isn't. BMJ 1996;312:71-72

CLINICAL

Implementation of a Wisconsin Division of Public Health Surgical Site Infection Prevention Champion Initiative

Gwen Borlaug, MPH, CIC, FAPIC; Charles E. Edmiston, Jr, PhD, CIC, FIDSA, FSHEA, FAPIC

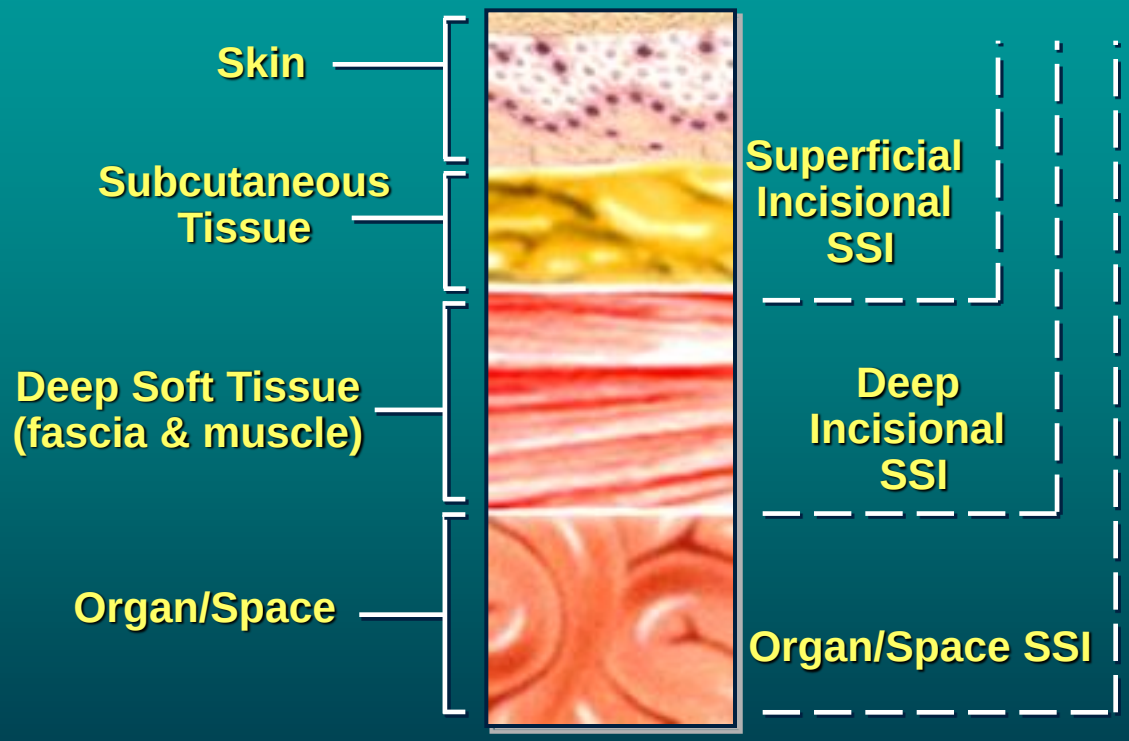
ABSTRACT

Approximately 900 surgical site infections (SSIs) were reported to the Wisconsin Division of Public Health annually from 2013 to 2015, representing the most prevalent reported health care–associated infection in the state. Personnel at the Wisconsin Division of Public Health launched an SSI prevention initiative in May 2015 using a surgical care champion to provide surgical team peer-to-peer guidance through voluntary, nonregulatory, fee-exempt onsite visits that included presentations regarding the evidence-based surgical care bundle, tours of the OR and central processing areas, and one-on-one discussions with surgeons. The surgical care champion visited 10 facilities from August to December 2015, and at those facilities, SSIs decreased from 83 in 2015 to 47 in 2016 and the overall SSI standardized infection ratio decreased by 45% from 1.61 to 0.88 (P = .002), suggesting a statewide SSI prevention champion model can help lead to improved patient outcomes.

Key words: *surgical champion, surgical care bundle, SSI prevention, peer collaboration, evidence-based practice.*

Borlaug and Edmiston – AORNJ 2018;107:570-578.

The Complexity of Risk - Classification of Surgical Site Infections (SSI)



Major Barriers to Improvement

- Poor compliance
- Lack of shared goals
- Poor communication
- Less than robust institutional commitment

So what is the weakest link?

Recognition of the surgical locus of infection influences the development of specific interventional strategies

Mangram AJ, et al. Am J Infect Control 1999;27:97-132

JAMA Surgery | Original Investigation

Risk Stratification for Surgical Site Infections in Colon Cancer

Ramzi Amri, MD, PhD; Anne M. Dinaux, BSc; Hiroko Kunitake, MD; Liliana G. Bordeianou, MD; David L. Berger, MD

Invited Commentary
page 690

IMPORTANCE Surgical site infections (SSIs) feature prominently in surgical quality improvement and pay-for-performance measures. Multiple approaches are used to prevent or reduce SSIs, prompted by the heavy toll they take on patients and health care budgets. Surgery for colon cancer is not an exception.

OBJECTIVE To identify a risk stratification score based on baseline and operative characteristics.

DESIGN, SETTING, AND PARTICIPANTS This retrospective cohort study included all patients treated surgically for colon cancer at Massachusetts General Hospital from 2004 through 2014 (n = 1481).

MAIN OUTCOMES AND MEASURES The incidence of SSI stratified over baseline and perioperative factors was compared and compounded in a risk score.

RESULTS Among the 1481 participants, 90 (6.1%) had SSI. Median (IQR) age was 66.9 (55.9-78.1) years. Surgical site infection rates were significantly higher among people who smoked (7.4% vs 4.8%; *P* = .04), people who abused alcohol (10.6% vs 5.7%; *P* = .04), people with type 2 diabetics (8.8% vs 5.5%; *P* = .046), and obese patients (11.7% vs 4.0%; *P* < .001). Surgical site infection rates were also higher among patients with an operation duration longer than 140 minutes (7.5% vs 5.0%; *P* = .05) and in nonlaparoscopic approaches (clinically significant only, 6.7% vs 4.1%; *P* = .07). These risk factors were also associated with an increase in SSI rates as a compounded score (*P* < .001). Patients with 1 or fewer risk factors (n = 427) had an SSI rate of 2.3%, equivalent to a relative risk of 0.4 (95% CI, 0.16-0.57; *P* < .001); patients with 2 risk factors (n = 445) had a 5.2% SSI rate (relative risk, 0.78; 95% CI, 0.49-1.22; *P* = .27); patients with 3 factors (n = 384) had a 7.8% SSI rate (relative risk, 1.38; 95% CI, 0.91-2.11; *P* = .13); and patients with 4 or more risk factors (n = 198) had a 13.6% SSI rate (relative risk, 2.71; 95% CI, 1.77-4.12; *P* < .001).

CONCLUSIONS AND RELEVANCE This SSI risk assessment factor provides a simple tool using readily available characteristics to stratify patients by SSI risk and identify patients at risk during their postoperative admission. Thereby, it can be used to potentially focus frequent monitoring and more aggressive preventive efforts on high-risk patients.

JAMA Surg. 2017;152(7):686-690. doi:10.1001/jamasurg.2017.0505
Published online April 12, 2017.

Author Affiliations: Division of General and Gastrointestinal Surgery, Massachusetts General Hospital, Harvard Medical School, Boston.

Corresponding Author: David. L. Berger, MD, Massachusetts General Hospital, Wang 460 15 Parkman St, Boston, MA 02114 (dberger@mgh

Risk Stratification

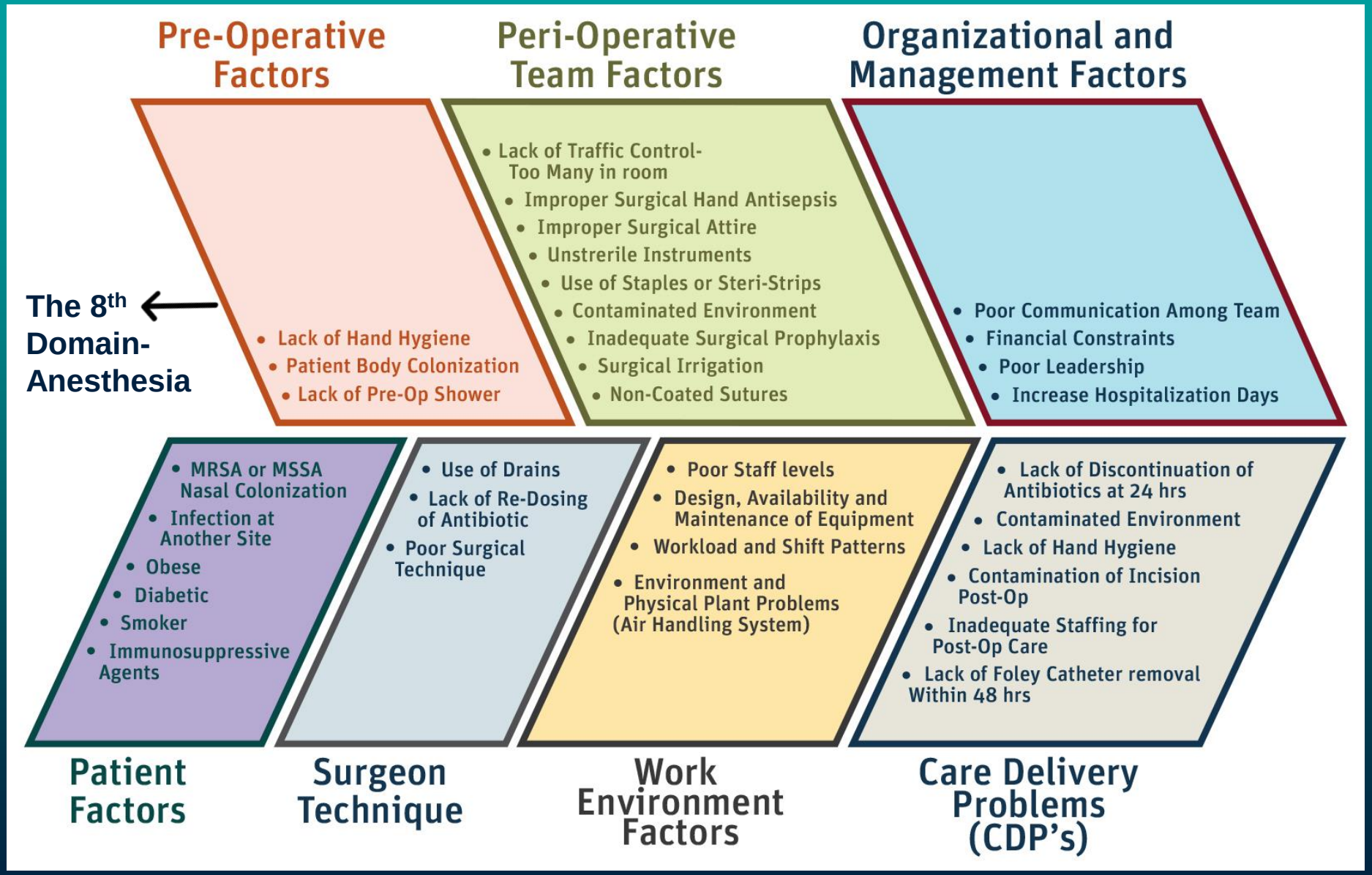
- Patient who smoked (7.4% vs 4.8%; *p = 0.04*),
- Patients who abused alcohol (10.6% vs 5.7%; *p = 0.04*)
- Patients with type 2 diabetics (8.8% vs 5.5%; *p = 0.046*)
- Obese patients (11.7% vs 4.0%; *p< 0.001*).
- Surgical site infection rates higher Operation duration longer than 140 minutes (7.5% vs 5.0%; *p= 0.05*)

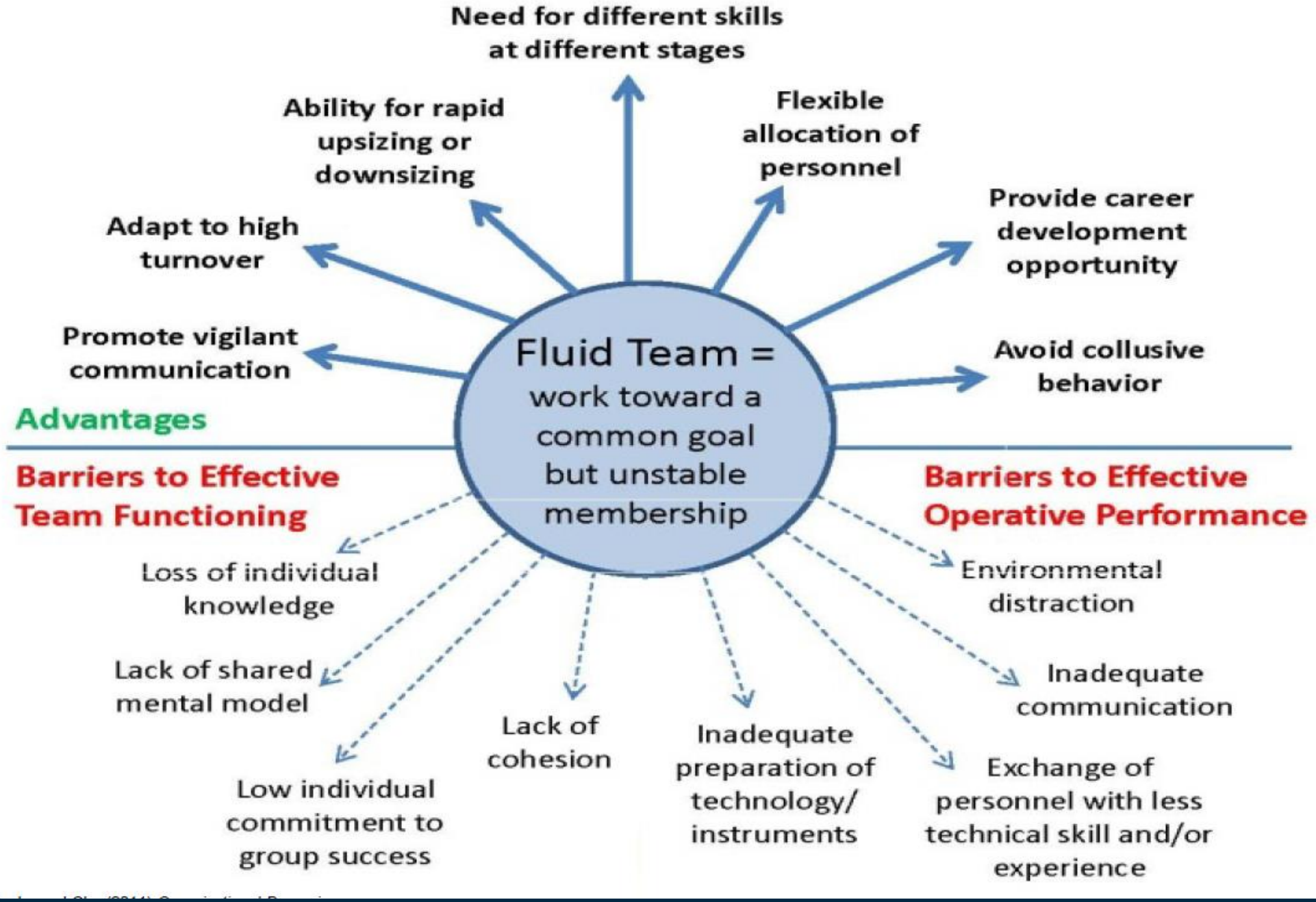
These risk factors were also associated with an increase in SSI rates as a compounded score (*P < 0.001*).

- Patients with 1 or fewer risk factors (n = 427) - SSI rate of 2.3%
- Patients with 2 risk factors (n = 445) – SSI rate 5.2%
- Patients with 3 factors (n = 384) had a 7.8% SSI rate
- Patients with 4 or more risk factors (n = 198) > 13.5%

JAMA Surg 2017;152:686-690

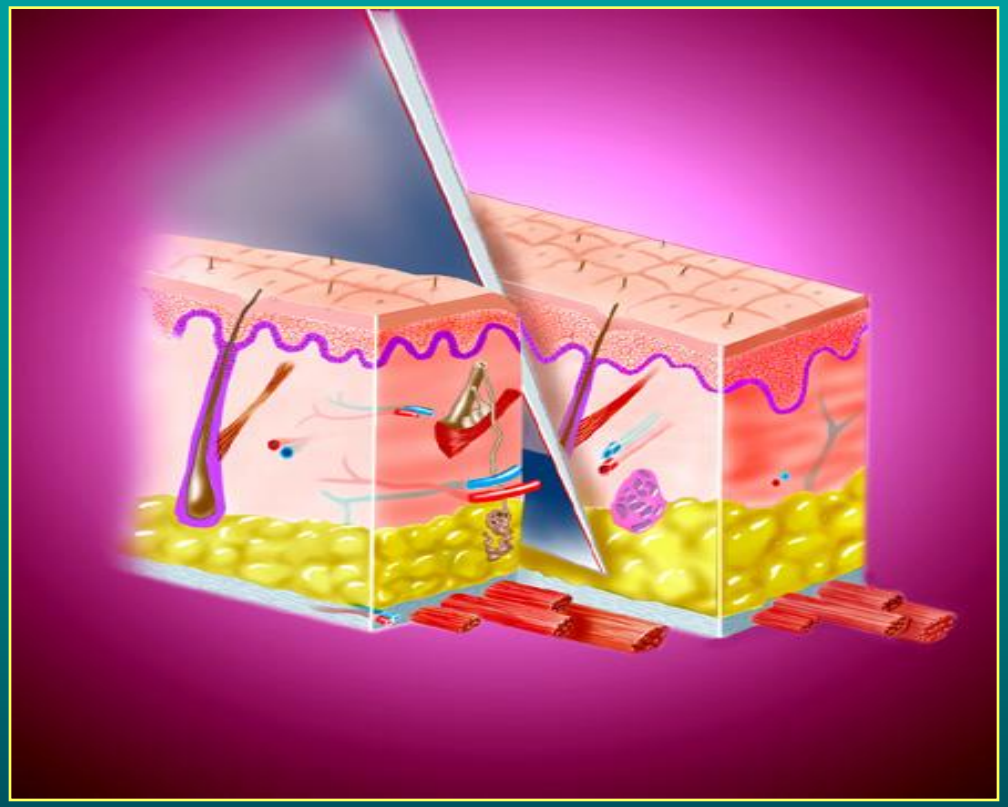
Risk is a Myriad of Events - SSI Fishbone Diagram




Need for different skills at different stages
Ability for rapid upsizing or downsizing
Flexible allocation of personnel
Adapt to high turnover
Provide career development opportunity
Promote vigilant communication
Avoid collusive behavior
Fluid Team = work toward a common goal but unstable membership
Advantages
Barriers to Effective Team Functioning
Barriers to Effective Operative Performance
Loss of individual knowledge
Lack of shared mental model
Low individual commitment to group success
Lack of cohesion
Inadequate preparation of technology/ instruments
Environmental distraction
Inadequate communication
Exchange of personnel with less technical skill and/or experience

Risk Reduction Requires an Understanding of the Mechanistic Factors which Potentiate the Risk of Infection in the Surgical Patient Population

The Fundamental Problem



"It's all about the surgical wound"

"….all surgical wounds are contaminated to some degree at closure – the primary determinant of whether the contamination is established as a clinical infection is related to host (wound) defense"

Belda et al., JAMA 2005;294:2035-2042

Comparative Analysis of WHO, Proposed CDC, ACS and Wisconsin SSI Prevention Guidelines

INTERVENTION	WHO Guidelines	CDC Guidelines	ACS Guidelines	WISCONSIN SSI Prevention
Normothermia	Maintain normothermia	Maintain normothermia	Maintain normothermia	Maintain normothermia - FAW reduces incidence of SSI – 1A
Wound Irrigation	No recommendation	Intraoperative irrigation recommended - povidone iodine	No recommendation	Recommend – 0.05% CHG (Professional Expertise)
Antimicrobial Prophylaxis	Short durational	Short durational	Short durational	Short durational – Follow ASHP weight-based dosing – 1A
Glycemic Control	Recommended	Recommended – No recommendation for HA1c	Highly beneficial	Highly beneficial HA1c $\leq$7 (<154) <8 (<183) – 1A
Perioperative Oxygenation	Recommended	Administer increased FIO_2 during surgery after extubation, immediate postop period	Recommended	Recommended – Strongest (High – 1A) for colorectal surgery
Preadmission Showers	Advised patients to bathe or shower with soap	Advise patients to bathe or shower with soap or antiseptic agent –at least night before surgery	Advise patients to shower with CHG	Two standardized shower/cleansing with 4% or 2% CHG night before/morning (High)
Antimicrobial Sutures	Use antimicrobial sutures independent of type of surgery	Consider use of triclosan-coated sutures for prevention of SSI	Recommended for clean and clean-contaminated abdominal procedures	The use of triclosan sutures represents 1A clinical evidence

Making an Evidence-Based Argument: Antimicrobial Prophylaxis - Weight-Based Dosing

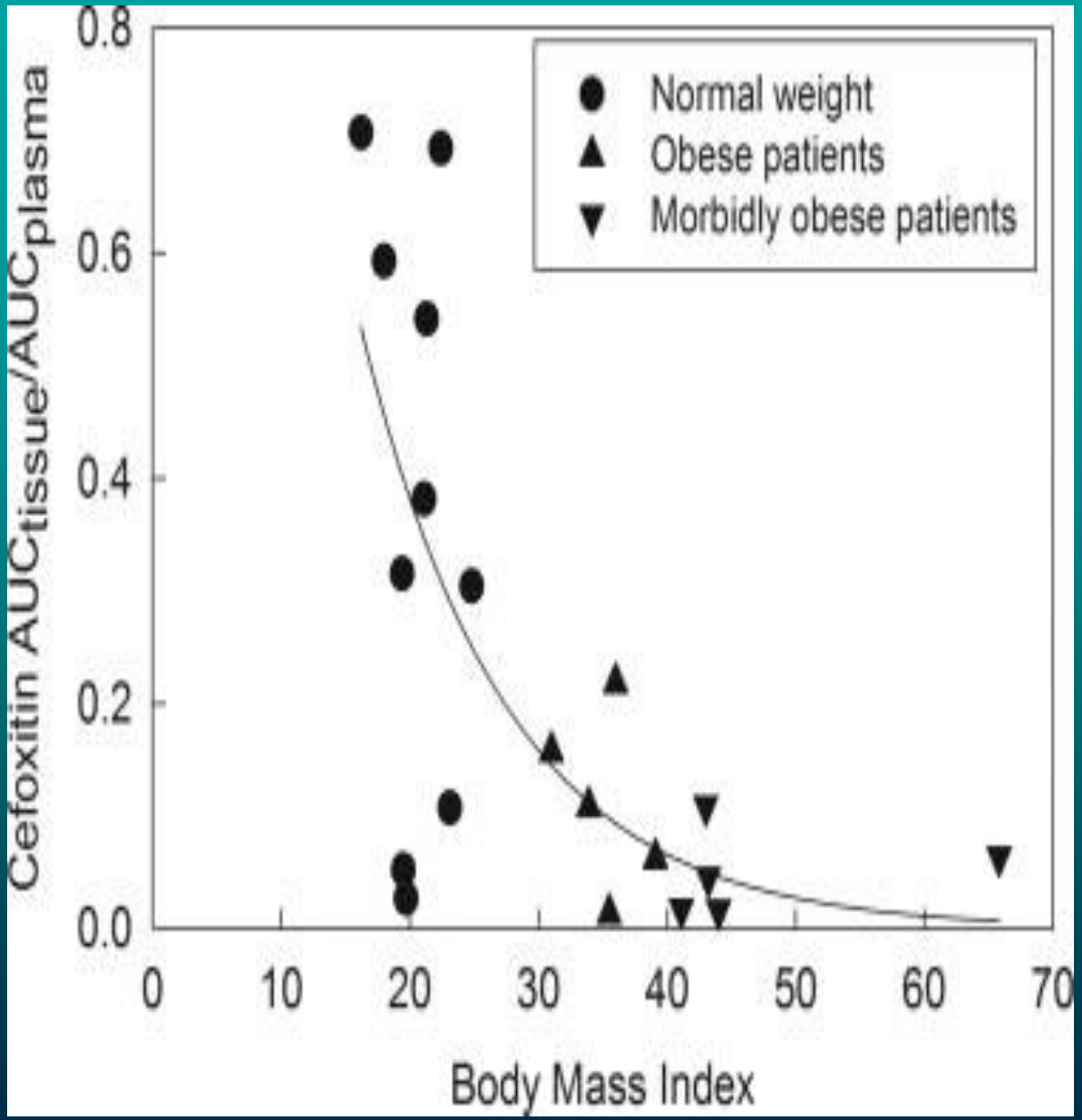
Does BMI Increase Risk?

Perioperative Antimicrobial Prophylaxis in Higher BMI (>40) Patients: Do We Achieve Therapeutic Levels?

Percent Therapeutic Activity of Serum / Tissue Concentrations Compared to Surgical Isolate (2002-2004) Susceptibility to Cefazolin Following 2-gm Perioperative Dose

Organisms	n	Serum	Tissues
Staphylococcus aureus	70	68.6%	27.1%
Staphylococcus epidermidis	110	34.5%	10.9%
E. coli	85	75.3%	56.4%
Klebsiella pneumoniae	55	80%	65.4%

Edmiston et al, Surgery 2004;136:738-747



Toma et al., Anesthesia Analgesia 2011;113:730-737

- **"Measured and dose-normalized subcutaneous cefoxitin concentrations and AUCs in the obese patients were significantly lower than in the normal-weight subjects.**

- **There was an inverse relationship between cefoxitin tissue penetration (AUC tissue/ AUC plasma ratio) and body mass index.**

❖ **Tissue penetration was substantially lower in the obese patients compared to normal weight controls (*p = 0.05*)."**

- **"This occurred despite 2-fold-higher cefoxitin dosage (1 to 2 gms).**

❖ **Diminished tissue antibiotic concentrations in morbid obesity may influence the incidence of SSIs."**

Effects of Maternal Obesity on Tissue Concentrations of Prophylactic Cefazolin During Cesarean Delivery

Leo Pevzner, MD, Morgan Swank, MD, Candace Krepel, MS, Deborah A. Wing, MD, Kenneth Chan, MD, and Charles E. Edmiston Jr, PhD

OBJECTIVE: To estimate the adequacy of antimicrobial activity of preoperative antibiotics at the time of cesarean delivery as a function of maternal obesity.

METHODS: Twenty-nine patients scheduled for cesarean delivery were stratified according to body mass index (BMI) category, with 10 study participants classified as lean (BMI less than 30), 10 as obese (BMI 30–39.9), and nine as extremely obese (BMI 40 or higher). All patients were given a dose of 2 g cefazolin 30–60 minutes before skin incision. Antibiotic concentrations from adipose samples, collected after skin incision and before skin closure, along with myometrial and serum samples, were analyzed with microbiological agar diffusion assay.

RESULTS: Cefazolin concentrations within adipose tissue obtained at skin incision were inversely proportional to maternal BMI ($r=-0.67$, $P<.001$). The mean adipose concentration was 9.4 plus or minus 2.7 micrograms/g in the lean group of women compared with 6.4 plus or minus 2.3 micrograms/g in the obese group ($P=.009$) and 4.4 plus or minus 1.2 micrograms/g in the extremely obese group ($P<.001$). Although all specimens demonstrated therapeutic cefazolin levels for gram-positive cocci (greater than 1 microgram/g), a considerable portion of obese and extremely obese did not achieve minimal inhibitory concentrations of greater than 4 micrograms/g for Gram-negative rods in adipose samples at skin incision (20% and 33.3%, respectively) or closure (20.0% and 44.4%, respectively). No significant difference in cefazolin concentration was observed in mean closure adipose, myometrial, or serum specimens across the BMI categories.

CONCLUSION: Pharmacokinetic analysis suggests that present antibiotic prophylaxis dosing may fail to provide adequate antimicrobial coverage in obese patients during cesarean delivery.

CLINICAL TRIAL REGISTRATION: ClinicalTrials.gov, www.clinicaltrials.gov, NCT00980486.

(Obstet Gynecol 2011;117:877–82)

DOI: 10.1097/AOG.0b013e31820b95e4

LEVEL OF EVIDENCE: II

Patients who develop surgical infections are 60% more likely to spend time in an intensive care unit and five times more likely to be readmitted to the hospital, and are likely to have twice the mortality rate of patients without infections.[1] Perioperative antimicrobial prophylaxis has been shown to reduce the probability of postoperative surgical site infections.[2] The derived effectiveness of antimicrobial prophylaxis must incorporate three basic principles: the agent selected must cover the spectrum of anticipated microbial contamination at the surgical locus, the agent must be given in a timely fashion such that tissue concentration in the wound (tissue) exceeds the minimum inhibitory concentration of potential microbial pathogens, and a sufficient therapeutic concentration of the antimicrobial agents should persist in the tissues for the duration of the operative procedure.

The majority of information regarding pharmacokinetics and pharmacodynamics of antibiotics is based on measurements of the serum and plasma concentrations. Despite implementation of guidelines for surgical prophylaxis that have confirmed thera-

From the Department of Obstetrics and Gynecology, University of California, Irvine, Orange, California; Surgical Microbiology Research Laboratory, Department of Surgery, Medical College of Wisconsin, Milwaukee, Wisconsin; and the Department of Obstetrics and Gynecology, Long Beach Memorial Medical Center, Long Beach, California.

Supported by a grant from the Memorial Medical Center Foundation, Long Beach, California.

Corresponding author: Leo Pevzner, MD, Department of Obstetrics and Gynecology, University of California, Irvine, 101 The City Drive South, Building 56, Suite 800, Orange, CA 92868; e-mail: mfm@uci.edu.

Financial Disclosure

The authors did not report any potential conflicts of interest.

ISSN: 0029-7844/11

Increased 3-gram cefazolin dosing for cesarean delivery prophylaxis in obese women

Morgan L. Swank, MD; Deborah A. Wing, MD; David P. Nicolau, PharmD; Jennifer A. McNulty, MD

OBJECTIVE: The purpose of this study was to determine tissue concentrations of cefazolin after the administration of a 3-g prophylactic dose for cesarean delivery in obese women (body mass index [BMI] >30 kg/m^2) and to compare these data with data for historic control subjects who received 2-g doses. *Acceptable coverage* was defined as the ability to reach the minimal inhibitory concentration (MIC) of 8 μg/mL for cefazolin.

STUDY DESIGN: We conducted a 2-phase investigation. The current phase is a prospective cohort study of the effects of obesity on tissue concentrations after prophylactic 3-g cefazolin doses at the time of cesarean delivery. Concentration data after 3-g were compared with data for historic control subjects who had received 2-g. Three grams of parenteral cefazolin was given 30-60 minutes before skin incision. Adipose samples were collected at both skin incision and closure. Cefazolin concentrations were determined with the use of a validated high-performance liquid chromatography assay.

RESULTS: Twenty-eight obese women were enrolled in the current study; 29 women were enrolled in the historic cohort. BMI had a proportionally inverse relationship on antibiotic concentrations. An increase of the cefazolin dose dampened this effect and improved the probability of reaching the recommended MIC of ≥8 μg/mL. Subjects with a BMI of 30-40 kg/m^2 had a median concentration of 6.5 μg/g (interquartile range [IQR], 4.18–7.18) after receiving 2-g vs 22.4 μg/g (IQR, 20.29–34.36) after receiving 3-g. Women with a BMI of >40 kg/m^2 had a median concentration of 4.7 μg/g (IQR, 3.11–4.97) and 9.6 μg/g (IQR, 7.62–15.82) after receiving 2- and 3-g, respectively. With 2 g of cefazolin, only 20% of the cohort with a BMI of 30-40 kg/m^2 and none of the cohort with a BMI of >40 kg/m^2 reached an MIC of ≥8 μg/mL. With 3-g, all women with a BMI of 30-40 kg/m^2 reached target MIC values; 71% of the women with a BMI of >40 kg/m^2 attained this cutoff.

CONCLUSION: Higher adipose concentrations of cefazolin were observed after the administration of an increased prophylactic dose. This concentration-based pharmacology study supports the use of 3 g of cefazolin at the time of cesarean delivery in obese women. Normal and overweight women (BMI <30 kg/m^2) reach adequate cefazolin concentrations with the standard 2-g dosing.

Key words: cefazolin, cesarean delivery, minimal inhibitory concentration (MIC), obesity, prophylaxis

Cite this article as: Swank ML, Wing DA, Nicolau DP, et al. Increased 3-gram cefazolin dosing for cesarean delivery prophylaxis in obese women. Am J Obstet Gynecol 2015;213:415.e1-8.

ASHP REPORT

Clinical practice guidelines for antimicrobial prophylaxis in surgery

DALE W. BRATZLER, E. PATCHEN DELLINGER, KEITH M. OLSEN, TRISH M. PERL, PAUL G. AUWAERTER, MAUREEN K. BOLON, DOUGLAS N. FISH, LENA M. NAPOLITANO, ROBERT G. SAWYER, DOUGLAS SLAIN, JAMES P. STEINBERG, AND ROBERT A. WEINSTEIN

Am J Health-Syst Pharm. 2013; 70:195–283

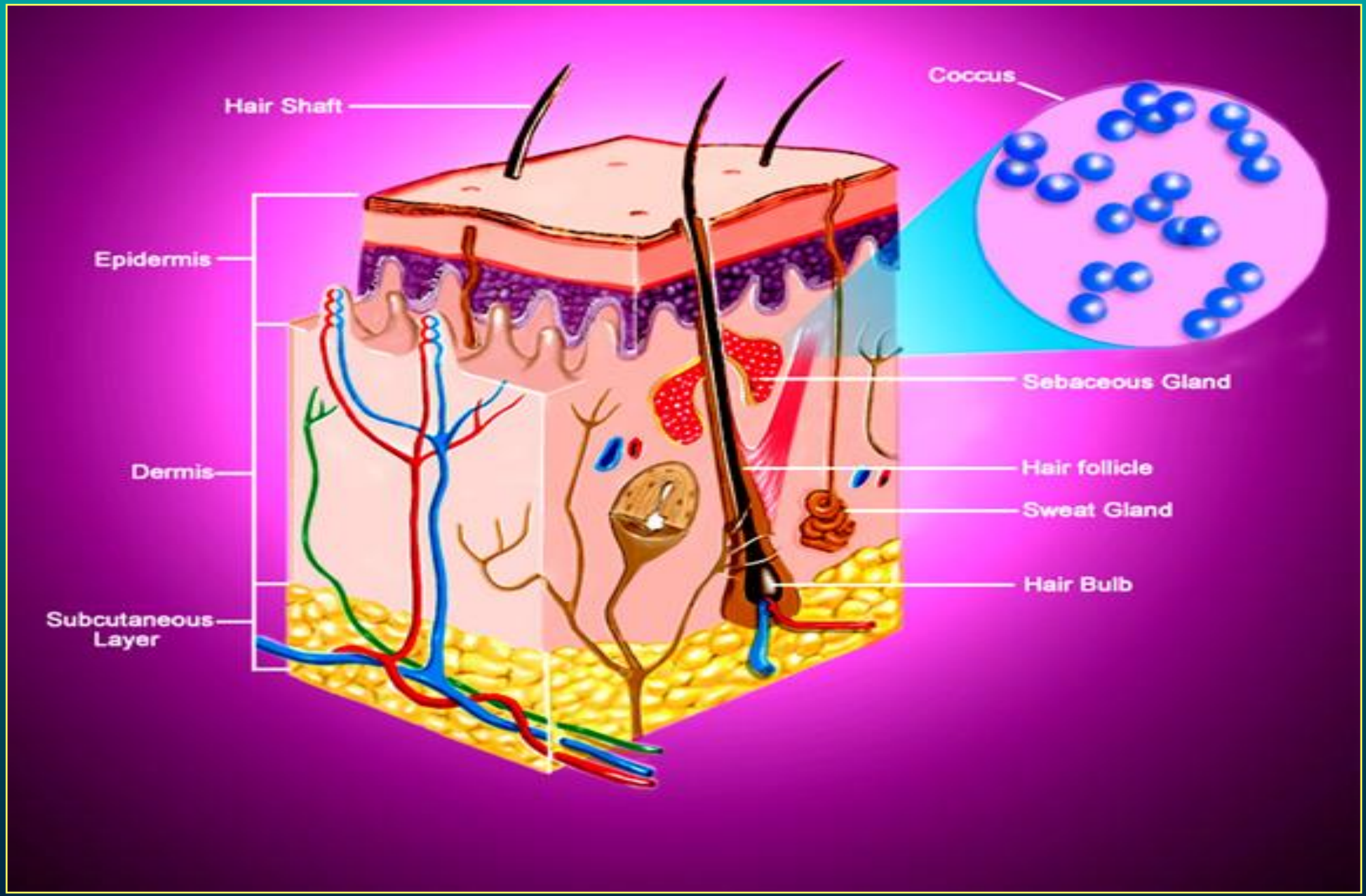
These guidelines were developed jointly by the American Society of Health-System Pharmacists (ASHP), the Infectious Diseases Society of America (IDSA), the Surgical Infection Society (SIS), and the Society for Healthcare Epidemiology of America (SHEA). This work represents an update to the previously published ASHP Therapeutic Guidelines on Antimicrobial Prophylaxis in Surgery,[1] as well as guidelines from IDSA and SIS.[2,3] The guidelines are intended to provide practitioners with a standardized approach to the rational, safe, and effective use of antimicrobial agents for the prevention of surgical-site infections (SSIs) based on currently available clinical evidence and emerging issues.

Prophylaxis refers to the prevention of an infection and can be characterized as primary prophylaxis, secondary prophylaxis, or eradication. Primary prophylaxis refers to the prevention of an initial infection. Secondary prophylaxis refers to the prevention of recurrence or reactivation of a preexisting infection. Eradication refers to the elimination of a colonized organism to prevent the development of an infection. These guidelines focus on primary perioperative prophylaxis.

Guidelines development and use

Members of ASHP, IDSA, SIS, and SHEA were appointed to serve on an expert panel established to ensure the validity, reliability, and utility of the revised guidelines. The work of the panel was facilitated by faculty of the University of Pittsburgh School of Pharmacy and University of Pittsburgh Medical Center Drug Use and Disease State Management Program who served as contract researchers and writers for the project. Panel members and contractors were required to disclose any possible conflicts of interest before their appointment and throughout the guideline development process. Drafted documents for each surgical procedural section were reviewed by the expert panel and, once revised, were available for public comment on the ASHP website. After additional revisions were made to address reviewer comments, the final document was

Making an Evidence-Based Argument: The Preadmission Showering/Cleansing


Hair Shaft
Epidermis
Dermis
Subcutaneous Layer
Coccus
Sebaceous Gland
Hair follicle
Sweat Gland
Hair Bulb

Microbial Ecology of Skin Surface

- Scalp 6.0 Log_{10} cfu/cm^2
- Axilla 5.5 Log_{10} cfu/cm^2
- Abdomen 4.3 Log_{10} cfu/cm^2
- Forearm 4.0 Log_{10} cfu/cm^2
- Hands 4.0-6.6 Log_{10} cfu/cm^2
- Perineum 7.0-11.0 Log_{10} cfu/cm^2

Mean Chlorhexidine Gluconate (CHG) Skin Surface Concentrations (µg/ml±SD) Compared to MIC_{90} (5 µg/ml) for Staphylococcal Surgical Isolates Including MRSA[a]

	Subgroups (mean C, µg/ml)			
Groups	**Pilot[b] (4%)**	**1 (4% Aqueous)**	**2 (2% Cloths**	***p-value***
Group A (20)				
evening (1X)	3.7±2.5	24.4±5.9	436.1±91.2	*<0.001*
Group B (20)				
morning (1X)	7.8±5.6	79.2±26.5	991.3±58.2	*<0.0001*
Group C (20)				
both (2X)	9.9±7.1	126.4±19.4	1745.5±204.3	*<0.0001*

[a] N = 90
[b] Pilot group N = 30

Edmiston et al, J Am Coll Surg 2008;207:233-239
Edmiston et al, AORNJ 2010;92:509-518

To Maximize Skin Surface Concentrations of CHG – A Standardize Process Should Include:

4% Aqueous CHG

- An SMS, text or voicemail reminder to shower
- A standardized regimen – instructions – Oral and written
- TWO SHOWERS (CLEANSINGS) – NIGHT BEFORE/MORNING OF SURGERY
- A 1-minute pause before rinsing (4% CHG)
- A total volume of 4-ozs. for each shower

CHG conc ≥1000 µg/ml

Remember the devil is always in the details

Edmiston et al. JAMA Surg 2015;150:1027-1033

Clin Orthop Relat Res
DOI 10.1007/s11999-016-4767-6

Clinical Orthopaedics and Related Research®
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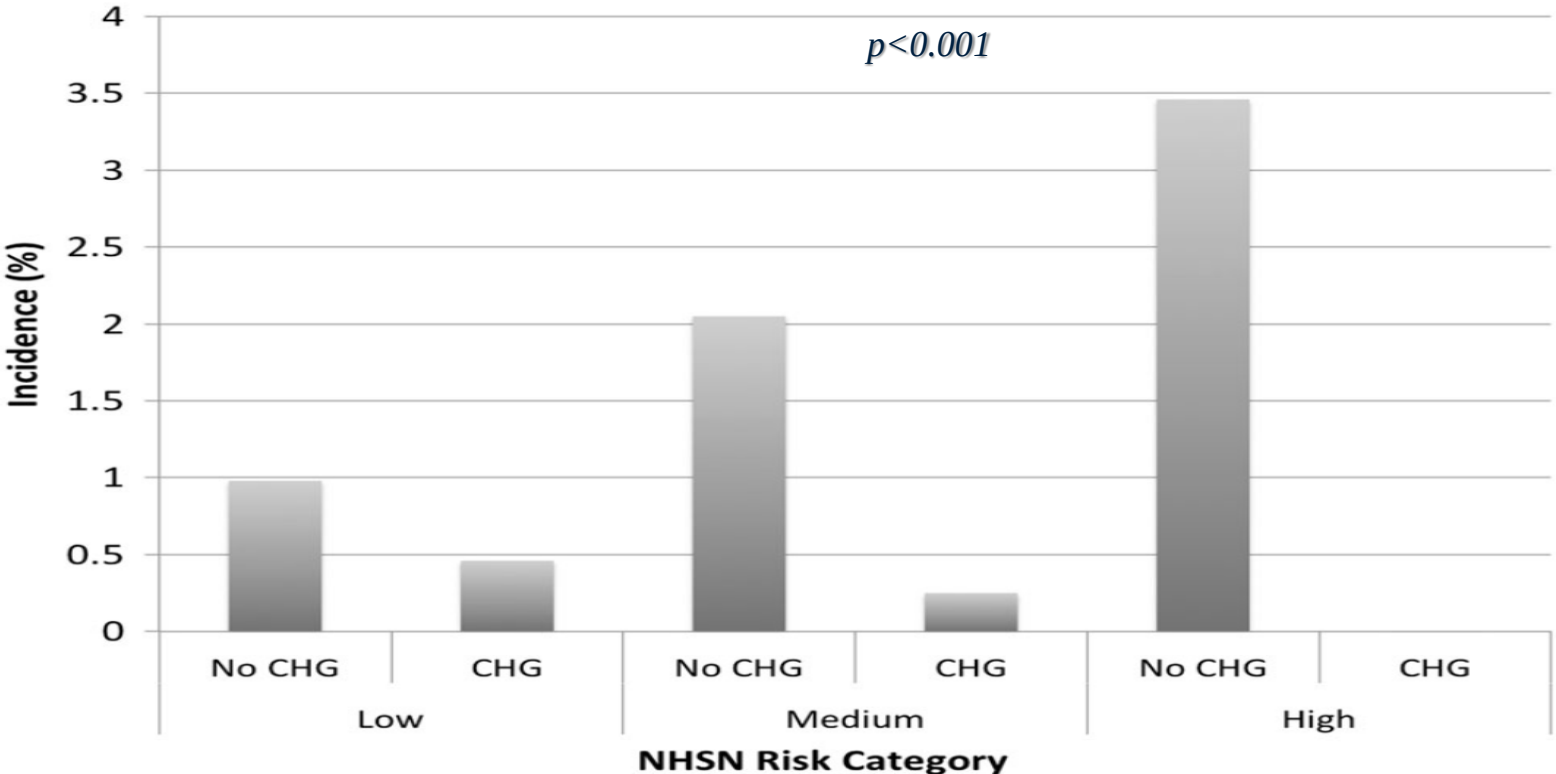
SYMPOSIUM: PROCEEDINGS OF THE 2015 MUSCULOSKELETAL INFECTION SOCIETY

Does Preadmission Cutaneous Chlorhexidine Preparation Reduce Surgical Site Infections After Total Knee Arthroplasty?

Bhaveen H. Kapadia MD, Peter L. Zhou BA, Julio J. Jauregui MD,
Michael A. Mont MD



Is CHG Safe for OB/GYN?

American Journal of Infection Control ■■ (2016) ■■-■■

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Safety and tolerability of chlorhexidine gluconate (2%) as a vaginal operative preparation in patients undergoing gynecologic surgery

Ahmed Al-Niaimi MD [a], Laurel W. Rice MD [a], Uppal Shitanshu MD [b], Bonnie Garvens MD [a], Megan Fitzgerald NP [a], Sara Zerbel MS [a], Nasia Safdar MD, PhD [a,c,*]

[a] School and Public Health, University of Wisconsin Medical, Madison, WI
[b] Universtity of Michigan, Ann Arbor, MI
[c] William S. Middleton Memorial Veterans Hospital, Madison, WI

Key Words:
Gynecologic surgery
chlorhexidine 2%
vaginal irritation
patient safety

Background: The use of chlorhexidine gluconate (CHG) as an intraoperative vaginal preparation has been shown to be more effective than vaginal povidone-iodine (PI) in decreasing vaginal bacterial colony counts. However, PI remains the standard vaginal preparation because of concerns of CHG's potential for vaginal irritation. The primary outcome of this study is a comparison of the rate of patient-reported vaginal irritation between 2% CHG and PI.

Methods: Consecutive patients were enrolled in a pre-post study. Group 1 consisted of consecutive patients who received PI as a vaginal preparation. Group 2 consisted of consecutive patients who received 2% CHG as a vaginal preparation. Patients used a standardized instrument to report irritation to trained nurse practitioners 1 day after surgery.

Results: A total of 117 patients received vaginal operative preparation during the course of the study, with 64 patients in group 1 and 53 patients in group 2. Of the patients in group 1, 60 (93.7%) reported no vaginal irritation, 3 (4.69%) reported mild irritation, and 1 (1.56%) reported moderate irritation. In group 2 (2% CHG vaginal preparation), all of the patients (100%) reported no vaginal irritation ($P = .38$).

Conclusions: The use of 2% CHG as a vaginal operative preparation is not associated with increased vaginal irritation compared with PI in gynecologic surgery. It can safely be used, taking advantage of its efficacy in reducing vaginal bacterial colony counts.

Published by Elsevier Inc. on behalf of Association for Professionals in Infection Control and

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial Comparing Skin Antiseptic Agents at Cesarean Delivery

Methodius G. Tuuli, M.D., M.P.H., Jingxia Liu, Ph.D., Molly J. Stout, M.D., M.S.C.I., Shannon Martin, R.N., Alison G. Cahill, M.D., M.S.C.I., Anthony O. Odibo, M.D., M.S.C.E., Graham A. Colditz, M.D., Dr.P.H., and George A. Macones, M.D., M.S.C.E.

ABSTRACT

BACKGROUND

Preoperative skin antisepsis has the potential to decrease the risk of surgical-site infection. However, evidence is limited to guide the choice of antiseptic agent at cesarean delivery, which is the most common major surgical procedure among women in the United States.

METHODS

In this single-center, randomized, controlled trial, we evaluated whether the use of chlorhexidine–alcohol for preoperative skin antisepsis was superior to the use of iodine–alcohol for the prevention of surgical-site infection after cesarean delivery. We randomly assigned patients undergoing cesarean delivery to skin preparation with either chlorhexidine–alcohol or iodine–alcohol. The primary outcome was superficial or deep surgical-site infection within 30 days after cesarean delivery, on the basis of definitions from the Centers for Disease Control and Prevention.

RESULTS

From September 2011 through June 2015, a total of 1147 patients were enrolled; 572 patients were assigned to chlorhexidine–alcohol and 575 to iodine–alcohol. In an intention-to-treat analysis, surgical-site infection was diagnosed in 23 patients (4.0%) in the chlorhexidine–alcohol group and in 42 (7.3%) in the iodine–alcohol group (relative risk, 0.55; 95% confidence interval, 0.34 to 0.90; P=0.02). The rate of superficial surgical-site infection was 3.0% in the chlorhexidine–alcohol group and 4.9% in the iodine–alcohol group (P=0.10); the rate of deep infection was 1.0% and 2.4%, respectively (P=0.07). The frequency of adverse skin reactions was similar in the two groups.

CONCLUSIONS

The use of chlorhexidine–alcohol for preoperative skin antisepsis resulted in a significantly lower risk of surgical-site infection after cesarean delivery than did the use of iodine–alcohol. (Funded by the National Institutes of Health and Washington University School of Medicine in St. Louis; ClinicalTrials.gov number, NCT01472549.)

From the Department of Obstetrics and Gynecology (M.G.T., M.J.S., S.M., A.G.C., G.A.M.) and the Division of Public Health Sciences (J.L., G.A.C.), Washington University School of Medicine in St. Louis, St. Louis; and the Department of Obstetrics and Gynecology, University of South Florida, Tampa (A.O.O.). Address reprint requests to Dr. Tuuli at the Department of Obstetrics and Gynecology, Washington University School of Medicine in St. Louis, 4566 Scott Ave., Campus Box 8064, St. Louis, MO 63110, or at tuulim@wudosis.wustl.edu.

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The American College of Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

COMMITTEE OPINION

Number 571 • September 2013

Committee on Gynecologic Practice

This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.

Solutions for Surgical Preparation of the Vagina

ABSTRACT: Currently, only povidone-iodine preparations are approved for vaginal surgical-site antisepsis. However, there are compelling reasons to consider chlorhexidine gluconate solutions for off-label use in surgical preparation of the vagina, especially in women with allergies to iodine. Although chlorhexidine gluconate solutions with high concentrations of alcohol are contraindicated for surgical preparation of the vagina, solutions with low concentrations of alcohol (eg, 4%) are both safe and effective for off-label use as vaginal surgical preparations and may be used as an alternative to iodine-based preparations in cases of allergy or when preferred by the surgeon.

Surgical-site antisepsis is an important step in preventing surgical-site infections, which occur in 300,000–500,000 patients who undergo surgery in the United States each year (1). Iodine-based preparations and alcohol skin preparations were approved decades ago by the U.S. Food and Drug Administration, but newer agents are gaining popularity. Chlorhexidine products have considerable advantages over other preparations by reducing a greater number of microflora and achieving longer residual activity. Solutions with high concentrations of alcohol are contraindicated for surgical preparation of the vagina. Currently, only povidone-iodine (PVP-I) preparations are approved for use in the vagina. There are compelling reasons to consider chlorhexidine gluconate solutions for off-label use in surgical preparation of the vagina, especially in women with allergies to iodine. The purpose of this Committee Opinion is to review what is known about the use of these preparations in vaginal surgery to guide their use by obstetrician–gynecologists.

Povidone-Iodine

Povidone-iodine is the most commonly used antiseptic for surgical preparation of the vagina in the United States. However, this is not the case in other countries. Of 43 hospitals that participated in the Swedish National Register for Gynecologic Surgery between 2000 and 2008, none used PVP-I to prepare the vagina, and chlorhexidine gluconate was preferred (2). Iodine is a recognized antibacterial agent, but local skin irritation and skin staining limited its use, which was overcome by the introduction of a stabilizing moiety, povidone. Povidone, which is water soluble, does not require a dissolvent such as alcohol and, thus, is less irritating to skin and mucosal surfaces. Unlike other surgical antiseptics, PVP-I is nonsensitizing and does not cause irritation or pain when applied to skin and mucous membranes (3); nonetheless, some patients may still develop sensitivity.

Povidone-iodine is not the ideal solution for surgical preparation of the vagina. Safety concerns include incorporation of iodine in body cavities unprotected by a keratinized epithelium, such as the vagina. A 2-minute vaginal preparation with 10% PVP-I can result in absorption of iodine (4). Because of the risk of iodine absorption, PVP-I solutions should not be used in patients with severe iodine allergy. In normal vaginal pH (3.8–4.5), iodine's disinfecting properties are somewhat diminished. In addition, iodophors are inactivated in the presence of blood (5).

Chlorhexidine Gluconate

Chlorhexidine gluconate acts by causing destruction of bacterial cell membranes, leading to the leakage of cellular components and a decrease in bacterial counts (6). Some studies show greater reduction in skin flora after application of chlorhexidine (0.5% and 4%) compared with iodine agents (5). Also, chlorhexidine gluconate may have a greater residual activity after application than other preparations and, unlike iodine, is not inactivated in the presence of blood (5, 7).

A recent committee opinion of the American College of Obstetricians and Gynecologist Committee on Gynecologic Practices states that, "Chlorhexidine gluconate (CHG) solutions with low concentrations of alcohol are safe and effective for use as vaginal operative preparations and may be used as an alternative to iodine-based preparation."

American College of Obstetricians and Gynecologist Women's Health Care Practice Committee Opinion No. 571: Solutions for surgical preparation of the vagina. Obstetric Gynecology 2013;122:718-720

Burnham et al, AAC 2016;60:7303-7312

AMERICAN SOCIETY FOR MICROBIOLOGY | Antimicrobial Agents and Chemotherapy

Topical Decolonization Does Not Eradicate the Skin Microbiota of Community-Dwelling or Hospitalized Adults

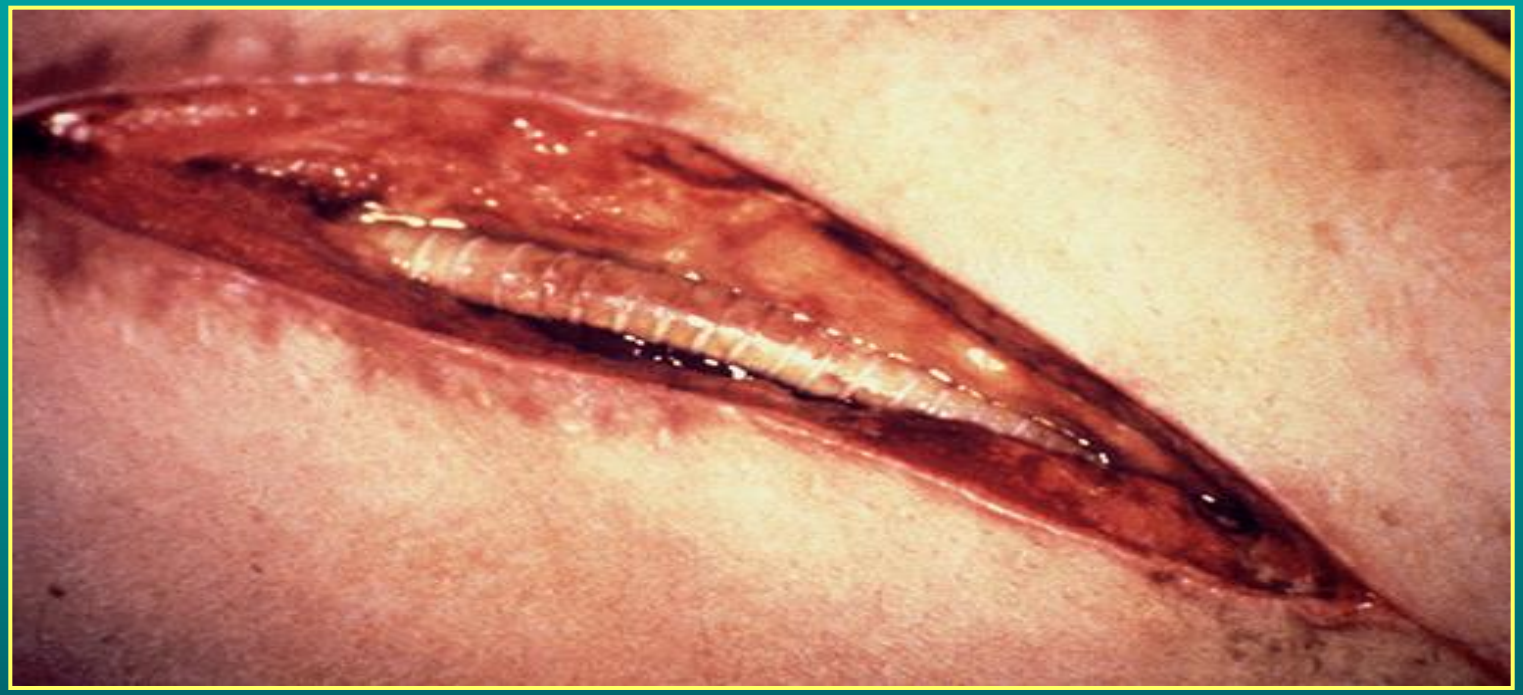
Carey-Ann D. Burnham,[a,b] Patrick G. Hogan,[a] Meghan A. Wallace,[b] Elena Deych,[c*] William Shannon,[c*] David K. Warren,[c] Stephanie A. Fritz[a]

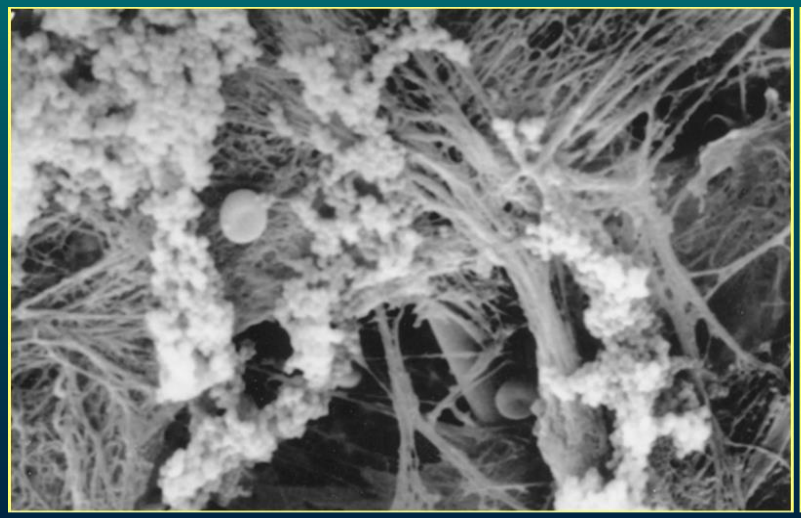
Departments of Pediatrics,[a] Pathology & Immunology,[b] and Medicine,[c] Washington University School of Medicine, St. Louis, Missouri, USA

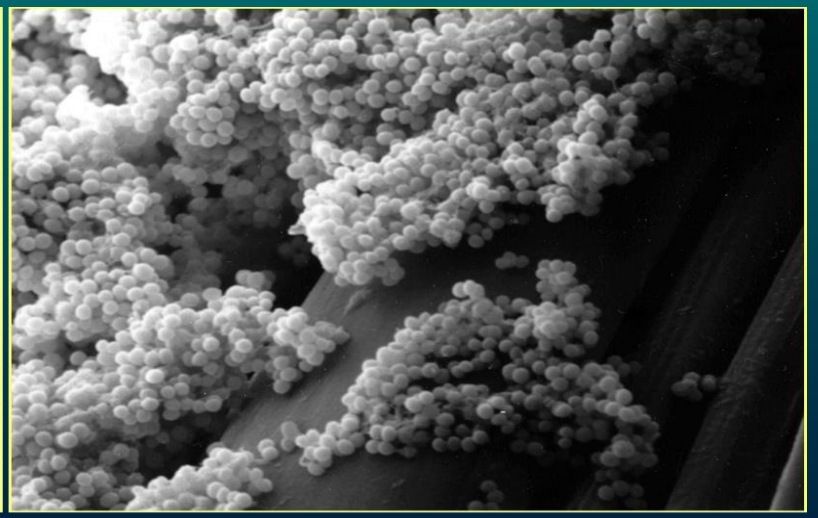
Topical antimicrobials are often employed for decolonization and infection prevention and may alter the endogenous microbiota of the skin. The objective of this study was to compare the microbial communities and levels of richness and diversity in community-dwelling subjects and intensive care unit (ICU) patients before and after the use of topical decolonization protocols. We enrolled 15 adults at risk for *Staphylococcus aureus* infection. Community subjects ($n = 8$) underwent a 5-day decolonization protocol (twice daily intranasal mupirocin and daily dilute bleach-water baths), and ICU patients ($n = 7$) received daily chlorhexidine baths. Swab samples were collected from 5 anatomic sites immediately before and again after decolonization. A variety of culture media and incubation environments were used to recover bacteria and fungi; isolates were identified using matrix-assisted laser desorption ionization–time of flight mass spectrometry. Overall, 174 unique organisms were recovered. Unique communities of organisms were recovered from the community-dwelling and hospitalized cohorts. In the community-dwelling cohort, microbial richness and diversity did not differ significantly between collections across time points, although the number of body sites colonized with *S. aureus* decreased significantly over time ($P = 0.004$). Within the hospitalized cohort, richness and diversity decreased over time compared to those for the enrollment sampling (from enrollment to final sampling, $P = 0.01$ for both richness and diversity). Topical antimicrobials reduced the burden of *S. aureus* while preserving other components of the skin and nasal microbiota.

Making an Evidence-Based Argument: Antimicrobial (Triclosan-Coated) Sutures

Acute/Late-Onset Vascular Graft Infection

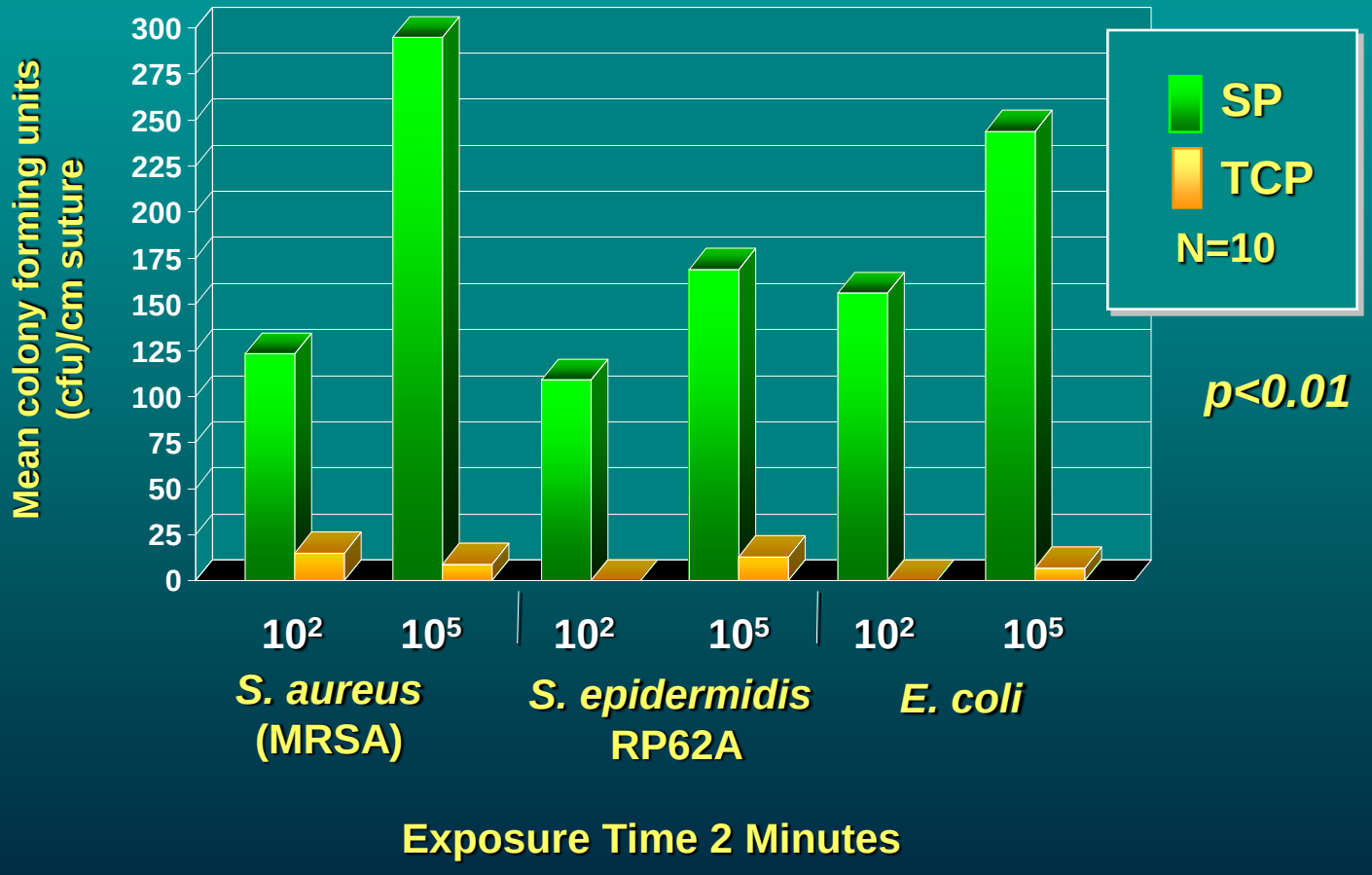


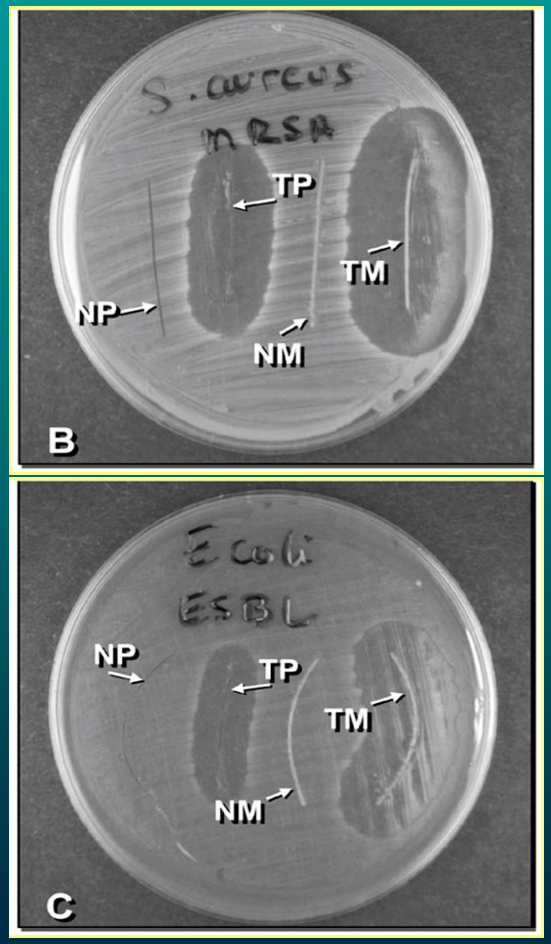




Surgical Microbiology Research Laboratory, Milwaukee - 2005

Mean Microbial Recovery from Standard Polyglactin Sutures Compared to Triclosan (Antimicrobial)-Coated Polyglactin Closure Devices





Edmiston et al, J Am Coll Surg 2006;203:481-489

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,[a] **Frederic C. Daoud, MD,**[b] *and* **David Leaper, MD, FACS,**[c] *Milwaukee, WI, Paris, France, and London, UK*

Background. *It has been estimated that 750,000 to 1 million surgical-site infections (SSIs) occur in the United States each year, causing substantial morbidity and mortality. Triclosan-coated sutures were developed as an adjunctive strategy for SSI risk reduction, but a recently published systematic literature review and meta-analysis suggested that no clinical benefit is associated with this technology. However, that study was hampered by poor selection of available randomized controlled trials (RCTs) and low patient numbers. The current systematic review involves 13 randomized, international RCTs, totaling 3,568 surgical patients.*

Methods. *A systematic literature search was performed on PubMed, Embase/Medline, Cochrane database group (Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Health Economic Evaluations Database/Database of Health Technology Assessments), and www.clinicaltrials.gov to identify RCTs of triclosan-coated sutures compared with conventional sutures and assessing the clinical effectiveness of antimicrobial sutures to decrease the risk for SSIs. A fixed- and random-effects model was developed, and pooled estimates reported as risk ratio (RR) with a corresponding 95% confidence interval (CI). Publication bias was assessed by analyzing a funnel plot of individual studies and testing the Egger regression intercept.*

Results. *The meta-analysis (13 RCTs, 3,568 patients) found that use of triclosan antimicrobial-coated sutures was associated with a decrease in SSIs in selected patient populations (fixed effect: RR = 0.734; 95% CI: 0.590–0.913; P = .005; random-effect: RR = 0.693; 95% CI: 0.533–0.920; P = .011). No publication bias was detected (Egger intercept test: P = .145).*

Conclusion. *Decreasing the risk for SSIs requires a multifaceted "care bundle" approach, and this meta-analysis of current, pooled, peer-reviewed, randomized controlled trials suggests a clinical effectiveness of antimicrobial-coated sutures (triclosan) in the prevention of SSIs, representing Center for Evidence-Based Medicine level 1a evidence. (Surgery 2013;154:89-100.)*

Edmiston et al., Surgery 2013;154;89-100

Meta-analysis

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

Z. X. Wang[1,2], C. P. Jiang[1,2], Y. Cao[1,2] and Y. T. Ding[1,2]

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Correspondence to: Professor Y. T. Ding, 321 Zhong Shan Road, Nanjing, Jiangsu Province, China 210008 (e-mail: dingyitao@yahoo.com.cn)

Background: Surgical-site infections (SSIs) increase morbidity and mortality in surgical patients and represent an economic burden to healthcare systems. Experiments have shown that triclosan-coated sutures (TCS) are beneficial in the prevention of SSI, although the results from individual randomized controlled trials (RCTs) are inconclusive. A meta-analysis of available RCTs was performed to evaluate the efficacy of TCS in the prevention of SSI.

Methods: A systematic search of PubMed, Embase, MEDLINE, Web of Science®, the Cochrane Central Register of Controlled Trials and internet-based trial registries for RCTs comparing the effect of TCS and conventional uncoated sutures on SSIs was conducted until June 2012. The primary outcome investigated was the incidence of SSI. Pooled relative risks with 95 per cent confidence interval (c.i.) were estimated with RevMan 5.1.6.

Results: Seventeen RCTs involving 3720 participants were included. No heterogeneity of statistical significance across studies was observed. TCS showed a significant advantage in reducing the rate of SSI by 30 per cent (relative risk 0·70, 95 per cent c.i. 0·57 to 0·85; $P < 0·001$). Subgroup analyses revealed consistent results in favour of TCS in adult patients, abdominal procedures, and clean or clean-contaminated surgical wounds.

Conclusion: TCS demonstrated a significant beneficial effect in the prevention of SSI after surgery.

Wang et al., British J Surg 2013;100;465-473

What Do the Various Meta-Analyses Tell Us About Triclosan Suture as a Risk Reduction Strategy?

- ***Wang et al, BJS 2013;100-465: 17 RCT (3720 patients) – 30% decrease in risk of SSI (p<0.001)***
- ***Edmiston et al, Surgery 2013;154:89-100: 13 RCT (3568 patients) – 27% to 33% decrease in risk of SSI (p<0.005)***
- ***Sajid et al, Gastroenterol Report 2013:42-50: 7 RCT (1631 patients) – Odds of SSI 56% less in triclosan suture group compared to controls (p<0.04)***
- ***Daoud et al, Surg Infect 2014;15:165-181: 15 RCT (4800 patients) – 20% to 50% decreased risk of SSI (p<0.001)***
- ***Apisarnthanarak et al. Infect Cont Hosp Epidemiol 2015;36:1-11: 29 studies (11,900 patients) – 26% reduction in SSI (p<0.01)***
- ***Guo et al, Surg Research 2016; doi:10.1016/j.jss.2015.10.015 – 13RCT (5256 patients) (risk ratio [RR] 0.76, 95% confidence interval [CI] 0.65e0.88, P < 0.001)***

How Does One Evaluate An Antimicrobial Risk - Reduction Technology – The Triclosan Suture Story?

Safety (>1-million strands)

- No MAUDE (FDA) reports (15 years) documenting significant evidence linking triclosan to adverse impact in surgical wounds; No evidence of pediatric toxicity, *Renko et al. Lancet Infectious Disease 2016;17:50–57;* No evidence of human toxicity following oral or dermal exposure, *Roidricks et al. Crit. Rev. Toxicol. 2010;40:422. doi: 10.3109/10408441003667514*.

Microbicidal Activity (Spectrum)

- Gram-positive and Gram-negative antimicrobial activity - No published studies have demonstrated that use of triclosan coated sutures are associated with the emergence of resistant surgical pathogens.

Evidence-based Clinical Effectiveness (Meta-Analysis)

- Currently 13 meta-analysis in the peer-literature document clinical efficacy of triclosan (antimicrobial) suture technology.

Cost-Effectiveness

- Two recent studies, [*Singh et al. Infect Control Hosp Epidemiol 2014;35:1013; Leaper and Edmiston. British Journal Surgery 2017;104:e134-e144]* document that use of triclosan-coated sutures provides significant fiscal benefit to hospital, third party-payer and patient.

The FDA Position Has Always Been That Triclosan Is Safe For Humans

Embracing a Surgical Care Bundle

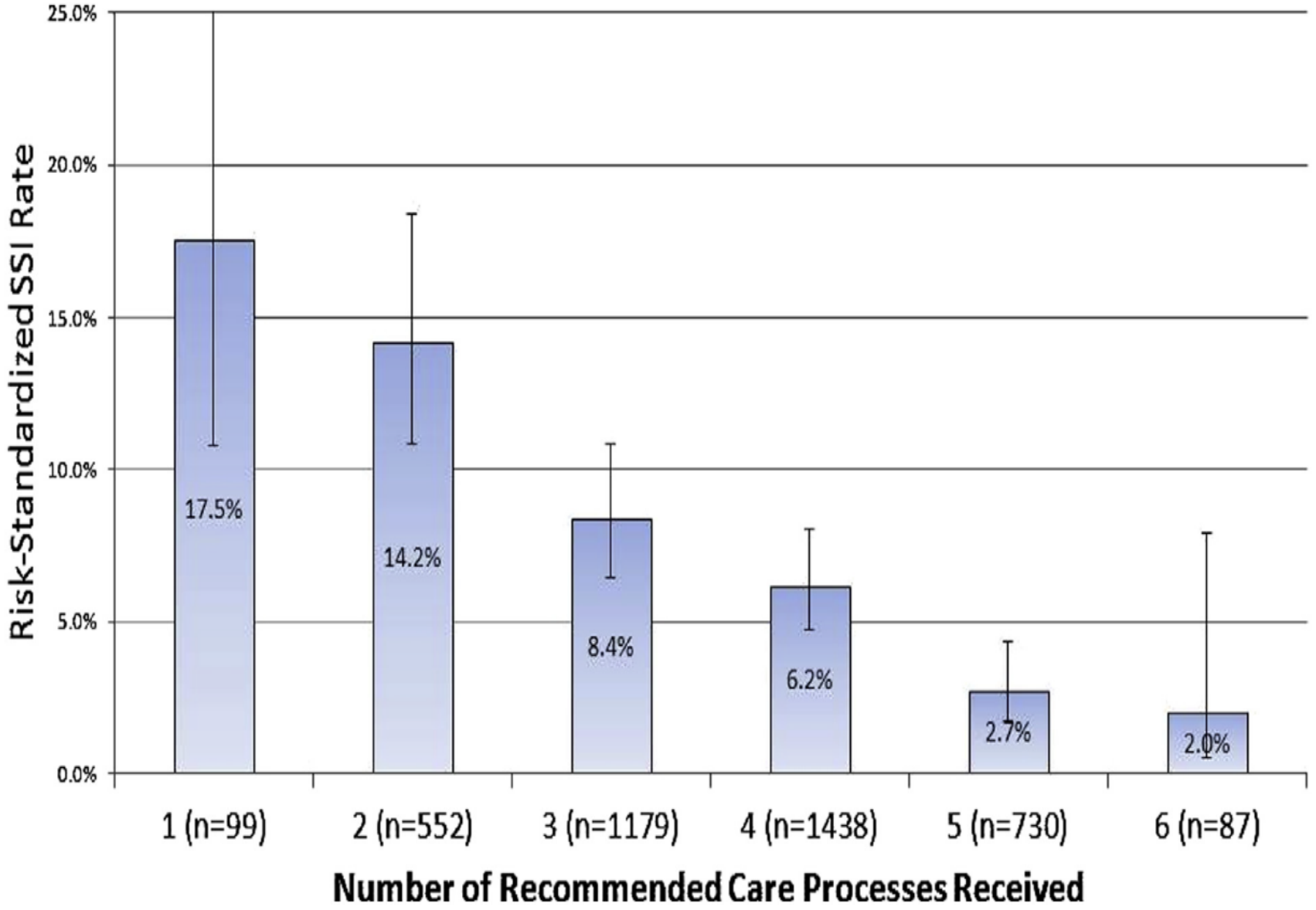
Developing an argument for bundled interventions to reduce surgical site infection in colorectal surgery

Seth A. Waits, MD,[a] Danielle Fritze, MD,[a] Mousumi Banerjee, PhD,[a,b] Wenying Zhang, MA,[a] James Kubus, MS,[a] Michael J. Englesbe, MD,[a] Darrell A. Campbell, Jr, MD,[a] *and* **Samantha Hendren, MD, MPH,[a]** *Ann Arbor, MI*

Background. *Surgical site infection (SSI) remains a costly and morbid complication after colectomy. The primary objective of this study was to investigate whether a group of perioperative care measures previously shown to be associated with reduced SSI would have an additive effect in SSI reduction. If so, this would support the use of an "SSI prevention bundle" as a quality improvement intervention.*
Methods. *Data from 24 hospitals participating in the Michigan Surgical Quality Collaborative were included in the study. The main outcome measure was SSI. Hierarchical logistic regression was used to account for clustering of patients within hospitals.*
Results. *In total, 4,085 operations fulfilled inclusion criteria for the study (Current Procedural Terminology codes 44140, 44160, 44204, and 44205). A "bundle score" was assigned to each operation, based on the number of perioperative care measures followed (appropriate Surgical Care Improvement Project-2 antibiotics, postoperative normothermia, oral antibiotics with bowel preparation, perioperative glycemic control, minimally invasive surgery, and short operative duration). There was a strong stepwise inverse association between bundle score and incidence of SSI. Patients who received all 6 bundle elements had risk-adjusted SSI rates of 2.0% (95% confidence interval [CI], 7.9–0.5%), whereas patients who received only 1 bundle measure had SSI rates of 17.5% (95% CI, 27.1–10.8%).*
Conclusion. *This multi-institutional study shows that patients who received all 6 perioperative care measures attained a very low, risk-adjusted SSI rate of 2.0%. These results suggest the promise of an SSI reduction intervention for quality improvement; however, prospective research are required to confirm this finding. (Surgery 2014;155:602-6.)*

From the Departments of Surgery[a] and Biostatistics,[b] University of Michigan, Ann Arbor, MI

Waits et al, Surgery 2014;155:602



Waits et al, Surgery 2014;155:602

Do surgical care bundles reduce the risk of surgical site infections in patients undergoing colorectal surgery? A systematic review and cohort meta-analysis of 8,515 patients

Judith Tanner, PhD,[a] **Wendy Padley, MSc,**[b] **Ojan Assadian, MD,**[c] **David Leaper, MD,**[c] **Martin Kiernan, MPH,**[d] *and* **Charles Edmiston, PhD,**[e] *Nottingham, Leicester, Huddersfield, and London, UK, and Milwaukee, WI*

Background. *Care bundles are a strategy that can be used to reduce the risk of surgical site infection (SSI), but individual studies of care bundles report conflicting outcomes. This study assesses the effectiveness of care bundles to reduce SSI among patients undergoing colorectal surgery.*

Methods. *We performed a systematic review and meta-analysis of randomized controlled trials, quasi-experimental studies, and cohort studies of care bundles to reduce SSI. The search strategy included database and clinical trials register searches from 2012 until June 2014, searching reference lists of retrieved studies and contacting study authors to obtain missing data. The Downs and Black checklist was used to assess the quality of all studies. Raw data were used to calculate pooled relative risk (RR) estimates using Cochrane Review Manager. The* I^2 *statistic and funnel plots were performed to identify publication bias. Sensitivity analysis was carried out to examine the influence of individual data sets on pooled RRs.*

Results. *Sixteen studies were included in the analysis, with 13 providing sufficient data for a meta-analysis. Most study bundles included core interventions such as antibiotic administration, appropriate hair removal, glycemic control, and normothermia. The SSI rate in the bundle group was 7.0% (328/4,649) compared with 15.1% (585/3,866) in a standard care group. The pooled effect of 13 studies with a total sample of 8,515 patients shows that surgical care bundles have a clinically important impact on reducing the risk of SSI compared to standard care with a CI of 0.55 (0.39–0.77;* $P = .0005$*).*

Conclusion. *The systematic review and meta-analysis documents that use of an evidence-based, surgical care bundle in patients undergoing colorectal surgery significantly reduced the risk of SSI. (Surgery 2015;158:66-77.)*

From the School of Health Sciences,[a] *University of Nottingham, Nottingham; Faculty of Health and Life Sciences,*[b] *De Montfort University, Leicester; Institute of Skin Integrity and Infection Prevention,*[c] *University of Huddersfield, Huddersfield; Richard Wells Research Centre,*[d] *University of West London, London, UK; and Department of Surgery,*[e] *Medical College of Wisconsin, Milwaukee, WI*

Surgery 2015;158:66-77

Original Research

Using Bundled Interventions to Reduce Surgical Site Infection After Major Gynecologic Cancer Surgery

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OBJECTIVE: To investigate whether implementing a bundle, defined as a set of evidence-based practices performed collectively, can reduce 30-day surgical site infections.

METHODS: Baseline surgical site infection rates were determined retrospectively for cases of open uterine cancer, ovarian cancer without bowel resection, and ovarian cancer with bowel resection between January 1, 2010, and December 31, 2012, at an academic center. A perioperative bundle was prospectively implemented during the intervention period (August 1, 2013, to September 30, 2014). Prior established elements were: patient education, 4% chlorhexidine gluconate shower before surgery, antibiotic administration, 2% chlorhexidine gluconate and 70% isopropyl alcohol coverage of incisional area, and cefazolin redosing 3–4 hours after incision. New elements initiated were: sterile closing tray and staff glove change for fascia and skin closure, dressing removal at 24–48 hours, dismissal with 4% chlorhexidine gluconate, and follow-up nursing phone call. Surgical site infection rates were examined using control charts, compared between periods using χ^2 or Fisher exact test, and validated against the American College of Surgeons National Surgical Quality Improvement Program decile ranking.

RESULTS: The overall 30-day surgical site infection rate was 38 of 635 (6.0%) among all cases in the preintervention period, with 11 superficial (1.7%), two deep (0.3%), and 25 organ or space infections (3.9%). In the intervention period, the overall rate was 2 of 190 (1.1%), with two organ or space infections (1.1%). Overall, the relative risk reduction in surgical site infection was 82.4% (P=.01). The surgical site infection relative risk reduction was 77.6% among ovarian cancer with bowel resection, 79.3% among ovarian cancer without bowel resection, and 100% among uterine cancer. The American College of Surgeons National Surgical Quality Improvement Program decile ranking improved from the 10th decile to first decile; risk-adjusted odds ratio for surgical site infection decreased from 1.6 (95% confidence interval 1.0–2.6) to 0.6 (0.3–1.1).

CONCLUSION: Implementation of an evidence-based surgical site infection reduction bundle was associated with substantial reductions in surgical site infection in high-risk cancer procedures.

(Obstet Gynecol 2016;127:1135–44)

DOI: 10.1097/AOG.0000000000001449

From the Department of Obstetrics and Gynecology, Division of Gynecologic Surgery, the Division of Healthcare Policy and Research, Infection Prevention and Control, the Department of Nursing, the Surgery Research Office, the Division of Biomedical Statistics and Informatics, and the Department of General Surgery, Division of Colorectal Surgery, Mayo Clinic, and Mayo Medical School, Mayo Clinic, Minnesota.

Presented at the American College of Surgeons National Surgical Quality Improvement Program Annual Meeting, July 25–28, 2015, Chicago, Illinois.

The authors thank Karen Rucker and Cory Hiatt of the Mayo Clinic Revenue Cycle for their expert technical help with International Classification of Diseases, 9th Revision and Current Procedural Terminology code identification as well as Whitney Bergquist, PharmD, MBA, BCPS, for her assistance with pharmacy measure audits.

Corresponding author: Jamie N. Bakkum-Gamez, MD, Department of Obstetrics

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AAHKS Symposium

Prevention of Periprosthetic Joint Infection: Examining the Recent Guidelines

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ABSTRACT

Background: The global rise in infectious disease has led the Center for Disease Control and Prevention and the World Health Organization to release new guidelines for the prevention of surgical site infection.
Methods: In this article, we summarize current recommendations based on level of evidence, review unresolved and unaddressed issues, and supplement them with new literature.
Results: Although the guidelines discuss major issues in reducing surgical site infection, many questions remain unanswered.
Conclusion: These guidelines will hopefully help in setting a standard of care based on best evidence available and focus investigators on areas where evidence is lacking.

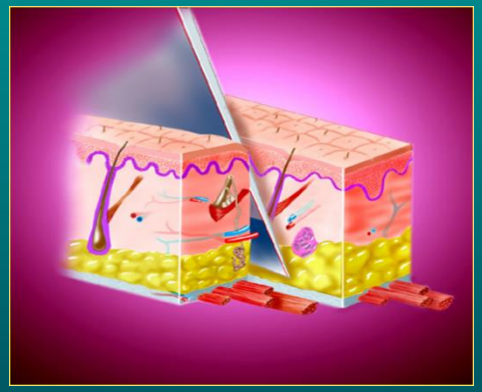
Developing An Orthopedic Care Bundle

★ Fully Vetted – Evidence-Based

- Weight-based dosing prophylaxis
- Standardized shower (2X) before surgery
- Hair removal not necessary
- Alcohol/CHG perioperative skin prep
- Maintain normothermia
- Triclosan coated sutures
- Nasal decolonization – Povidone Iodine swabs (5% or 10%)

Putting it all Together

Selecting Evidence-Based (EB) Surgical Care Bundle



- Antimicrobial Prophylaxis – Weight-based ★
- Normothermia ★
- Glycemic Control ★
- Limit OR Traffic ★
- Mechanical Bowel Prep Oral Antibiotics ★
- Triclosan Sutures Fascia/ Sub-cuticular closure ★
- 0.05% CHG Irrigation of Surgical Wound ★
- Staphylococccal Decolonization ★
- 2% / 4% CHG Preadmission Shower/cleansing ★

- Wound Edge Protector ★
- Supplemental Oxygen ★
- Smoking Cessation ★
- Separate Wound Closure Tray ★
- Glove Change Prior to Fascia / Subcuticular Closure ★
- 70% alc / 2% CHG Skin Antisepsis ★
- Postoperative Wound Care? Where Does it Fit in?

★ Moderate to High (1A) Level of Evidence-Based Documentation

Building an Effective Surgical Care Bundle*

Baseline Evidence-Based Interventions – Designated High-1A**

- Normothermia – 1A (less bleeding/preserve immune function in wound bed)
- Perioperative antimicrobial prophylaxis – Weight-based – 1A (tissue antisepsis)
- Antimicrobial (triclosan) coated sutures (fascia / subcuticular closure) – 1A (mitigate nidus of infection/local tissue antisepsis)
- Preadmission CHG shower/cleansing – Standardized regimen – High (skin antisepsis)
- Perioperative skin-prep – 2% CHG/ 70% alcohol – 1A (skin antisepsis)
- Glycemic control – 1A (preserve granulocytic immune function/enhance wound healing)
- Separate wound closure tray – High (mitigate instrument contamination)
- Glove change prior to fascia/subcuticular closure – High (disrupt cross-contamination across tissue planes)

Inclusive Evidence-Based Intervention for Consideration in 2018**

- Supplemental oxygen – Colorectal – 1A (enhanced oxygenation – immune/metabolic benefits)
- Oral antibiotics / Mechanical bowel prep – Colorectal – 1A (reduce bioburden within the bowel lumen and brush border surfaces)
- Wound edge protector – Colorectal – 1A (intraoperative wound antisepsis)
- Staphylococcal decolonization – Orthopedic / CT - 1A (mitigate SA and MRSA pathogenicity)
- Smoking cessation – Orthopedic, Neuro, CT - 1A (preserve angiogenesis)
- Irrigation with 0.05% CHG - All - Expert Opinion, Moderate (mitigate wound contamination)
- OR traffic control – All services - Device-related procedures – Low to Moderate (reduce room air bioburden)

**Evidence-Based Medicine is a Moving Target*

*** Published level of evidence*

CLINICAL

An Incision Closure Bundle for Colorectal Surgery

PODCAST

2.0 CE www.aornjournal.org/content/cme

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ABSTRACT

Surgical site infections (SSIs) are among the most common and expensive of all health care–associated infections, and as many as 50% are considered preventable. Surgical care bundles, which involve a small set of reliably performed evidence-based practices, may effectively reduce SSI rates. However, closure of the surgical incision is one aspect of surgical care that is not well described in current SSI prevention bundles; this presents an opportunity for perioperative professionals to improve care by identifying and implementing evidence-based incision closure practices for high-risk procedures (eg, colorectal surgery). We propose and review the evidence supporting a colorectal incision closure bundle composed of a glove and sterile instrument set change, irrigation with 0.05% chlorhexidine solution, use of triclosan-coated sutures, removal of surgical drapes after applying postoperative dressings, use of topical skin adhesive or an antiseptic dressing, and distribution of comprehensive postoperative patient instructions.

Key words: *colorectal surgical bundle, incision closure bundle, surgical site infection, SSI prevention bundle, colorectal surgery.*

Surgical site infections (SSIs) represent a substantial burden to health care in the United States, accounting for greater than 20% of health care–associated infections (HAIs) and ranking as the most expensive of all HAIs.[1,2] Patients with HAIs experience higher mortality rates than those who do not experience HAIs. A 2012 review of HAIs in Pennsylvania indicated a mortality rate of 9.1% for patients with an HAI, compared with a mortality rate of 1.7% for patients who did not experience an HAI.[3] The annual cost for all SSIs in the United States is estimated to be between $3.5 and $10 billion.[1] The true costs, however, are likely to be far greater, because these numbers do not account for intangibles such as the postoperative quality of life (ie, patient suffering, lost productivity, pressure on home caregivers, medicolegal costs) that often accompany procedures that are complicated by infection.[4] As many as half of all SSIs could be prevented.[5] This statistic, in addition to pressure from consumer action groups (eg, the Consumer's Union), has led to mandated changes in performance-based reimbursement by the Centers for Medicare & Medicaid Services, which holds health care facilities accountable for their SSI rates and efforts directed at SSI prevention.[6] Accordingly, the stakes for health care facilities and their patients and caregivers are high, and this has resulted in vigorous efforts to identify and apply strategies that effectively reduce SSIs.

In this article, the term *antiseptic* refers to a nonantibiotic antimicrobial substance designed to reduce the risk of infection (eg, chlorhexidine gluconate [CHG], povidone iodine). Antiseptics include bactericides, which are substances with proven ability to act specifically against

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Incisional Wound Closure Bundle

- Glove change prior to wound closure [1,2,3]
- Dedicated wound closure tray [1,2,3]
- Irrigation with 0.05% CHG [2,3]
- Use of antimicrobial sutures for wound closure [1,2,3]
- Remove surgical drape after applying dressing [2,3]
- Application of skin adhesive following subcuticular wound closure [2,3]
- Comprehensive postoperative patient instructions [2,3]

1: SSI Guidelines; 2: Expert opinion; 3: Peer literature

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ORIGINAL ARTICLE

Surgical site infection: poor compliance with guidelines and care bundles

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Key words
Care bundles; Compliance; Guidelines; Surgical site infection

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Abstract

Surgical site infections (SSIs) are probably the most preventable of the health care-associated infections. Despite the widespread international introduction of level I evidence-based guidelines for the prevention of SSIs, such as that of the National Institute for Clinical Excellence (NICE) in the UK and the surgical care improvement project (SCIP) of the USA, SSI rates have not measurably fallen. The care bundle approach is an accepted method of packaging best, evidence-based measures into routine care for all patients and, common to many guidelines for the prevention of SSI, includes methods for preoperative removal of hair (where appropriate), rational antibiotic prophylaxis, avoidance of perioperative hypothermia, management of perioperative blood glucose and effective skin preparation. Reasons for poor compliance with care bundles are not clear and have not matched the wide uptake and perceived benefit of the WHO 'Safe Surgery Saves Lives' checklist. Recommendations include the need for further research and continuous updating of guidelines; comprehensive surveillance, using validated definitions that facilitate benchmarking of anonymised surgeon-specific SSI rates; assurance that incorporation of checklists and care bundles has taken place; the development of effective communication strategies for all health care providers and those who commission services and comprehensive information for patients.

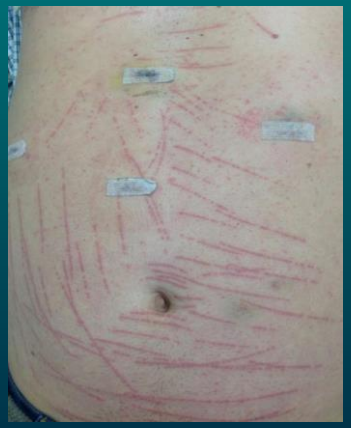
Enhanced Recovery After Surgery Protocol (ERAS)

Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- ★ Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

Day of Surgery

- NPO
- Carbohydrate loading
- ★ Hair management
- Skin decontamination
- Patient Warming
- Ileus Prevention
- Glucose management
- Pain management
- DVT
- EPIC/Grease Board



Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Wound Closing Protocol
- Wound management
- Residual neuromuscular weakness
- ★ Wound classification

Postoperative

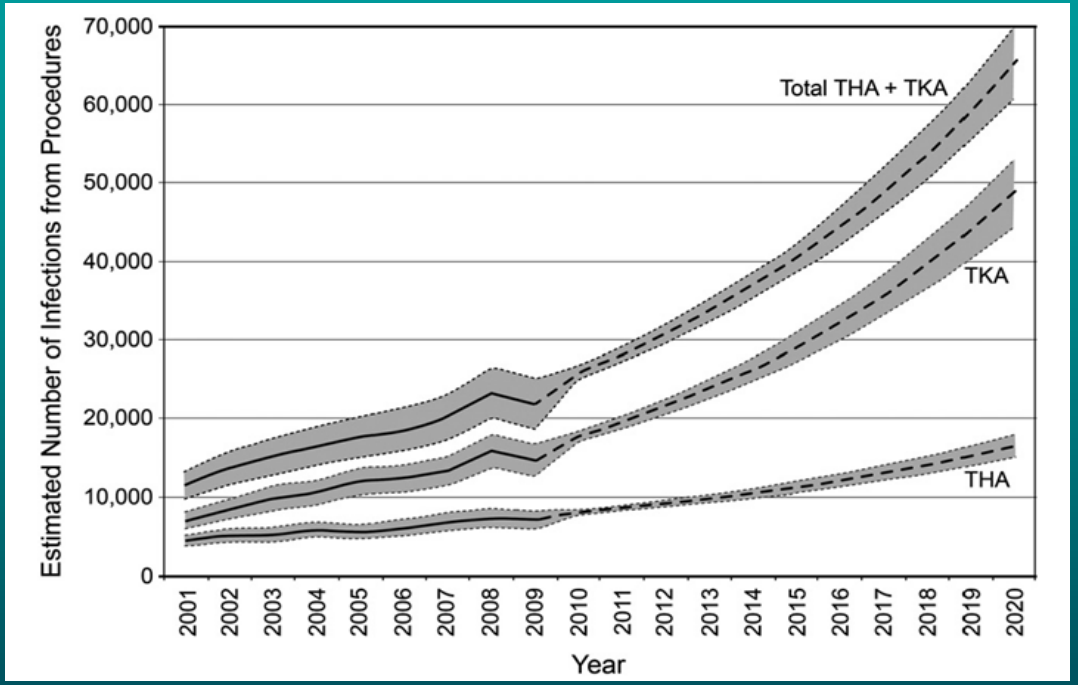
- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination
- ★ Audit compliance
- Reporting

Source: Marc Singer, MD, FAC, SSI Symposium VI
September 21, 2018 – Wisconsin Dells, WI

“When They Say its Never About the Money – Its Always About the Money” – Morbidity versus Fiscal Risk for the Patient and Institution

Periprosthetic Joint Infections

- 2.18% of hip and knee implants become infected
- Overall lifetime cost for a single case of a septic THA (age 65) using a one-way sensitivity analysis of $390,806 per patient.
- PJI is associated with a mortality rate of between 2 – 7%
- Experts report that the five-year survival rate of patients with PJI is worse than with most cancers.

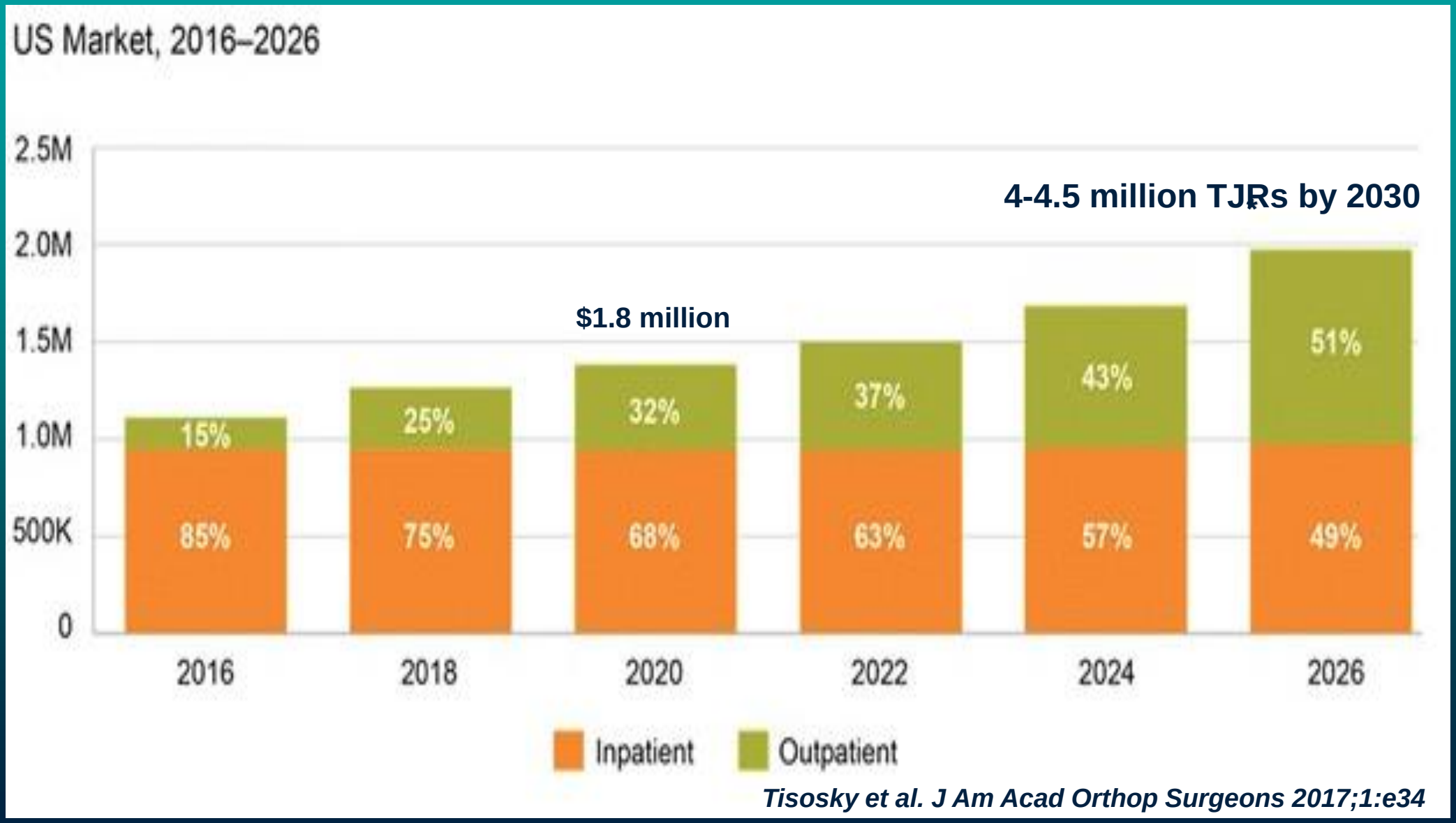


Historical and projected number of infected THA, TKA, and total (THA + TKA) procedures in the United States.

Parisi TJ, et al. Clin Orthop Relat Res. 2017;475:1891-1900

Kurtz et al. J Arthroplasty 2012;27:61-64

Projected Trends and it is not Pretty



Tisosky et al. J Am Acad Orthop Surgeons 2017;1:e34

4-4.5 Million Total Joint Implantation/Year (2030)
80,000-90,000 Prosthetic Joint Infections (PJI)

★ Baseline

- $100,000 = 8-9 Billion USD
- $200,000 = 16-18 Billion USD
- $300,000 = 24-27 Billion USD
- $400,000 = 32-36 Billion USD

SSI Prevention Is Not a Solo Recital But Rather a Symphony and We Are All Part of the Orchestra

Thank You

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