



3MSM Health Care Academy

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Reducing the Risk of Surgical Site Infections: What are we missing?

Important Information:

The content of this webinar is based on current United States information including regulations, standards, guidelines, and practices as of [6/17/21].

Requirements in other countries may be different and US guidance may change in the future.

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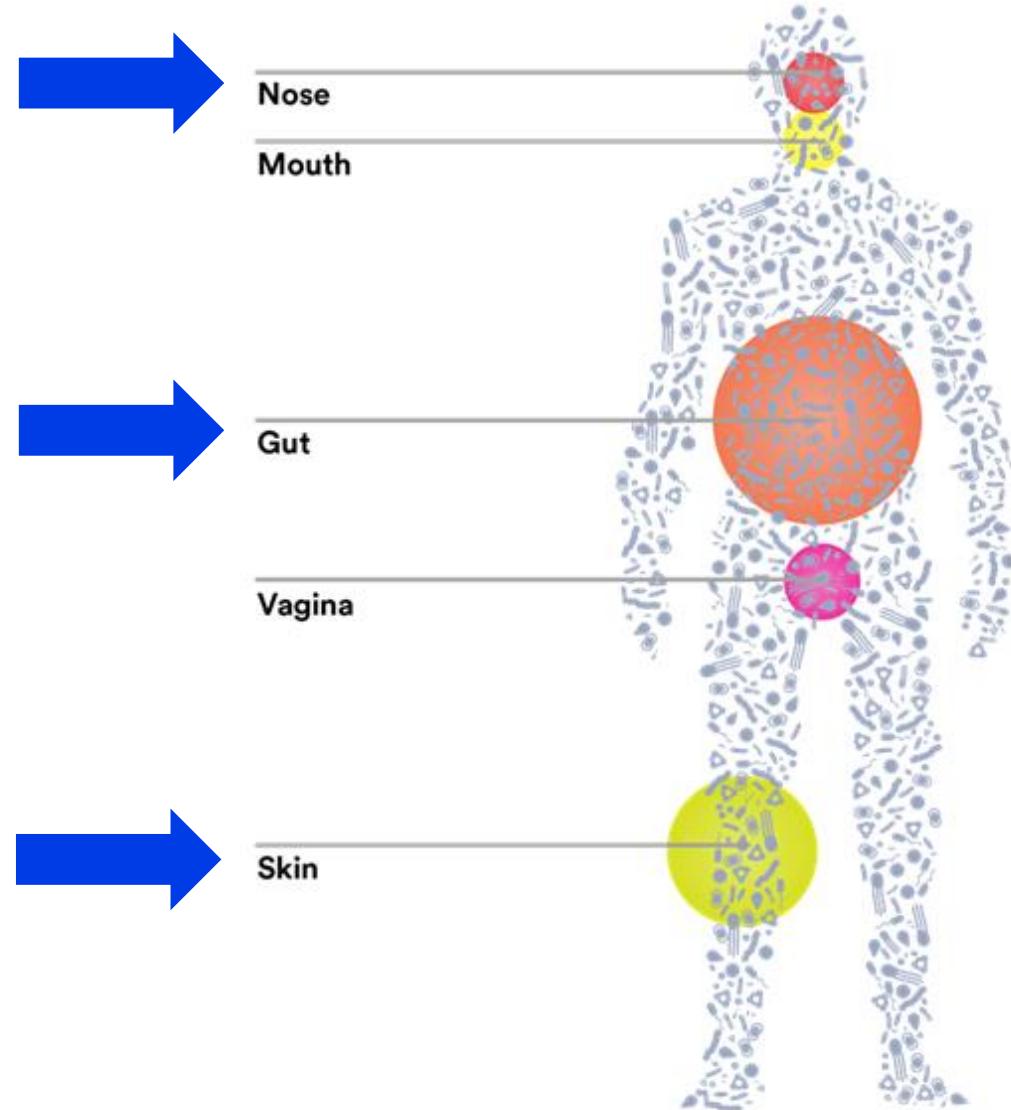
This presentation contains an overview of general information and should not be relied upon, in isolation, to make specific decisions.

Learner Objectives

1. Explain the Centers for Disease Control and Prevention's (CDC's) conceptual formula for surgical site infection (SSI) risk in relation to patient and process variables
2. Describe the purpose of a perioperative bundle
3. Discuss interventions in preparation of the patient for surgery that will reduce the risk of SSI
4. Identify relevant clinical studies that support these measures

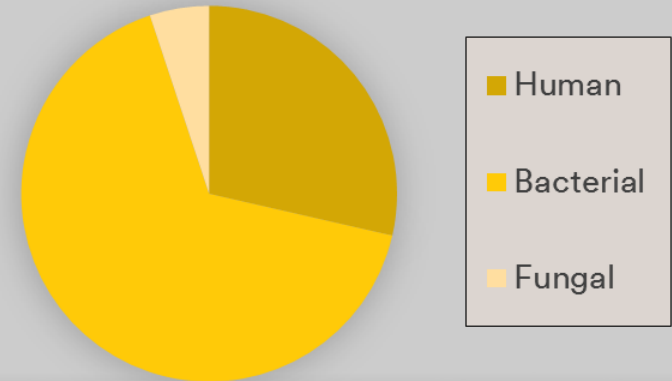
Surgical Site Infections

Human Microbiome



37 Trillion Human Cells
100 Trillion Microbial Cells

Kinds of cells in the human body



SSI Epidemiology

□ SSI are common complications

- SSI occur in 2-5% of patients undergoing inpatient surgery

□ Research shows that up to 60% of all surgical site infections may be prevented with evidence based practice which employs a multifactorial approach to risk reduction

- Up to 60% of these costs could go away
- Up to 60% fewer people would face the burdens of an SSI

#1 risk factor is contamination from patients' own skin ^{1,2}



(Skin, including nares and oral/ mucosal cavities)

The skin can contain over 1,000,000 bacteria per sq cm ³

It can take as few as 10 microbes per sq cm* to cause a surgical site infection⁴



By reducing the number of microorganisms, we can help reduce the risk of infection

- When implant present

1. Reichman DE, Greenberg JA. Reducing surgical site infections: a review. *Rev Obstet Gynecol.* 2009;2:212-21.

2. Cheadle WG. Risk factors for surgical site infection. *Surg Infect.* 2006;7(s1):s7-s11.

3. Percival SL, Emanuel C, Cutting KF, Williams DW. Microbiology of the skin and the role of biofilms in infection. *Int Wound J.* 2012;9:14-32.

4. Feldman G, et al. Recent advances in the basic sciences: osteoarthritis, infection, degenerative disc disease, tendon repair and inherited skeletal diseases. In: Austin MS, Klein GR, ed. *Recent Advances in Orthopedics.* Philadelphia, PA Jaypee Medical Inc; 2014: 256.

The SSI Risk Equation

RISK OF SSI = $\frac{\text{Dose of bacteria} \times \text{Virulence of bacteria}}{\text{Resistance of the host (patient)}}$

Control What You
Can Control



Dose

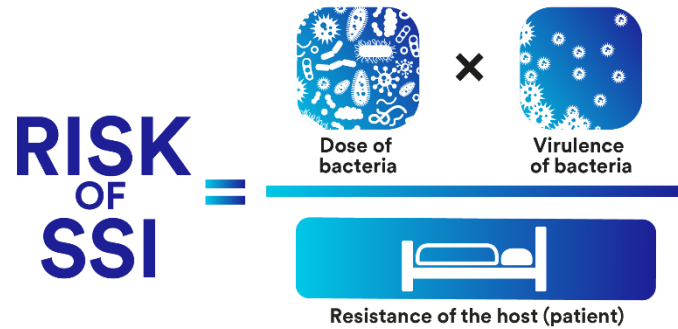
+



Resistance

Resistance of the Host (Patient)

Also commonly known as patient variability



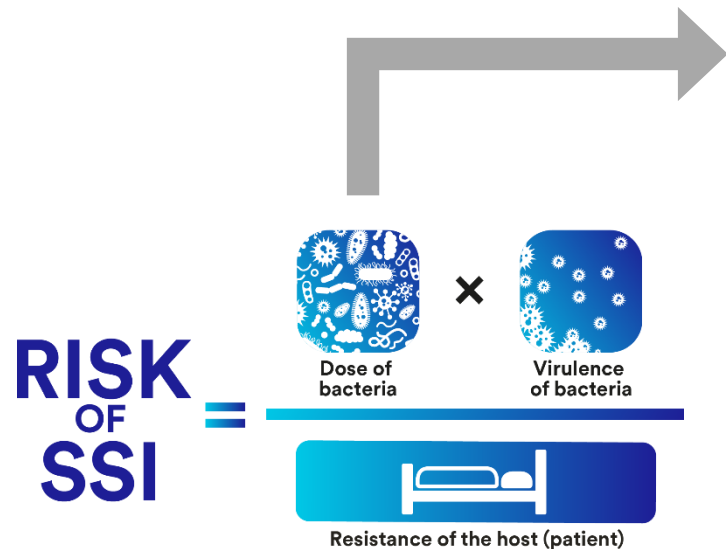
Controllable and Non-controllable Patient Risk Factors

- Age
- Nutritional status
- Diabetes*
- Smoking and nicotine use
- Steroid use
- Obesity
- Core body temperature*
- Hemoglobin saturation*
- Coexistent infections at a remote body site
- Colonization with microorganisms*
- Altered immune system
- Length of preoperative stay

*Also can be controlled during the perioperative process with evidence-based strategies

Dose of Bacteria

Also commonly known as process variability



Evidence-based prevention strategies to reduce the risk of SSIs



Patient Preparation

- Antiseptic showering (bathing)
- Oral decontamination
- Nasal decolonization
- Hair removal
- Skin prep and drape
- Antimicrobial prophylaxis



Surgical wound management

- Clinical Staff Preparation
 - Surgical hand/forearm antisepsis
 - Hand hygiene
 - Surgical attire (PPE)



Surgical Technique

- Hemostasis
- Failure to obliterate dead space



Tissue Trauma

Hospital Environment

- OR ventilation
- OR surfaces
- OR traffic flow
- Microbiological sampling
- Reprocessing of surgical instruments
- Sterile field management

Perioperative Bundle

Institute of Healthcare Improvement defines a bundle as:

“ A structured way of improving the process of care and patient outcomes: a small straightforward set of evidence-based practices – generally 3 to 5 – that, when performed collectively and reliably, have been proven to improve patient outcomes.”



Preoperative Hair Removal

The background of the slide is an abstract composition of various shades of blue, ranging from light cyan to deep navy. The design consists of numerous overlapping, irregular polygonal shapes, primarily triangles and quadrilaterals, which create a complex, crystalline or faceted appearance. The text 'Preoperative Hair Removal' is centered horizontally and positioned in the upper half of the image, rendered in a clean, white, sans-serif font.

Pre-Operative Hair Removal ¹⁻⁴

- Only remove hair at the surgical site when it is clinically necessary
- Hair at the surgical site should be removed by **clipping or depilatory** methods
- Single-use clipper heads should be used and disposed of after each patient use
- The reusable clipper handle should be disinfected after each use
- Patients should be instructed not to shave at home
- Hair should be removed in a location **outside** the operating room or procedure room.



1. AORN. Guidelines for Perioperative Practice, Denver, Colorado: AORN, Inc : 2018
2. Centers for Disease Control and Prevention, “Guideline for Prevention of Surgical Site Infections,” *JAMA Surg*. doi:10.1001/jamasurg.2017.0904
3. World Health Organization: WHO Global Guidelines for the Prevention of Surgical Site Infection 2016. Retrieved from <http://www.who.org>
4. National Institute for Health and Care Excellence (NICE). Surgical site infections: prevention and treatment. C2008 [updated 2017 Feb] Available from: <https://www.nice.org.uk/guidance/cg74/resources/surgical-site-infections-prevention-and-treatment-pdf-975628422853>.

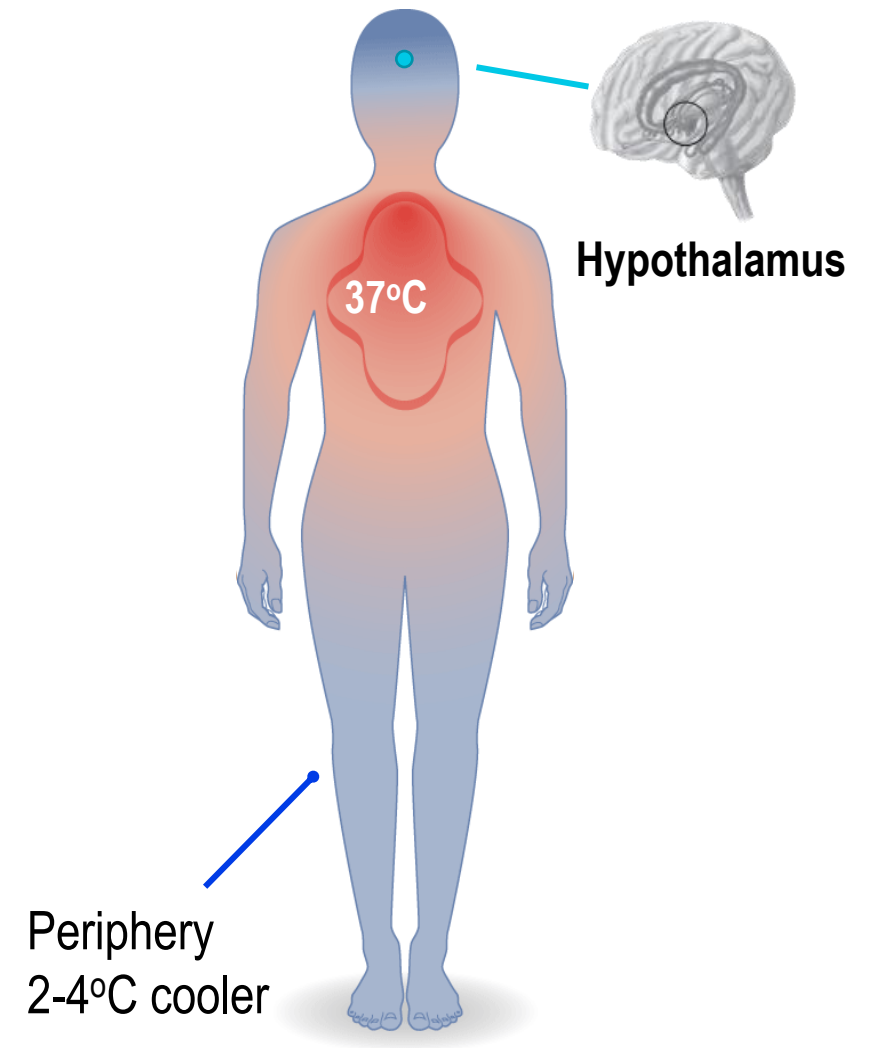


Prewarming to Maintain Normothermia

Normothermia

- ❑ Normothermia: the body's ideal thermal state
- ❑ Normal core temperature:¹
 - Approximately 37.0°C (98.6°F)
- ❑ Temperature gradient:¹
 - 2-4°C between the core and periphery
- ❑ Hypothalamus ^{1,2,3}
 - Regulates core body temperature

1. Sessler DI. Mild Perioperative Hypothermia. *New Engl J Med.* 1997;336(24):1730-1737.
2. Guyton AC, Hall JE. *Textbook of Medical Physiology.* 10th Ed. © 2000.
3. De Witte J, Sessler DI. *Anesth.* 2002;96(2):467-84.



Negative outcomes of inadvertent perioperative hypothermia

Perioperative hypothermia is defined as core temperature less than 36.0°C¹⁻³
Research shows that even mild hypothermia can result in significant negative outcomes including:⁴



Increased Rate of Wound Infection



Increased Mortality Rates



Coagulopathy



Prolonged & Altered Drug Effect



Myocardial Ischemia & Cardiac Disturbance



Shivering & Thermal Discomfort



Delayed Emergence from Anesthesia

1. Young V, Watson M. Prevention of Perioperative Hypothermia in Plastic Surgery. *Aesthetic Surgery Journal*. 2006;551-571.

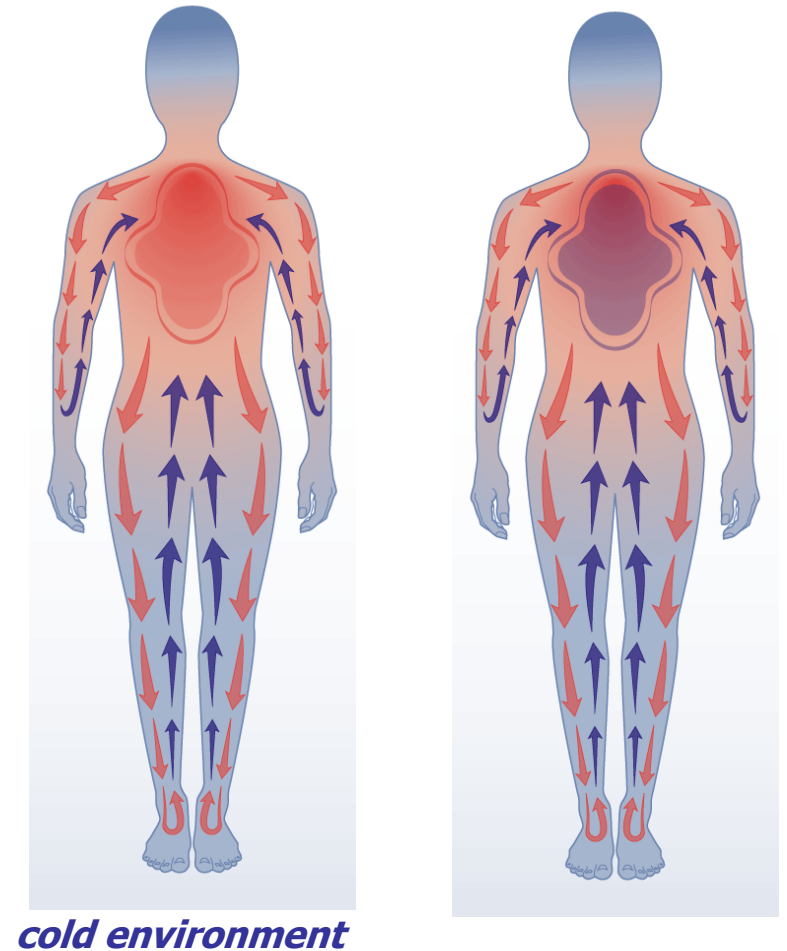
2. Sessler, DI. Perioperative Heat Balance. *Anesth*. 2000;92:578-596.

3. Sessler DI. Current concepts: Mild Perioperative Hypothermia. *New Engl J Med*. 1997; 336(24):1730-1737.

4. Sessler DI, Kurz A. Mild Perioperative Hypothermia. *Anesthesiology News*. Oct 2008: 17-28.

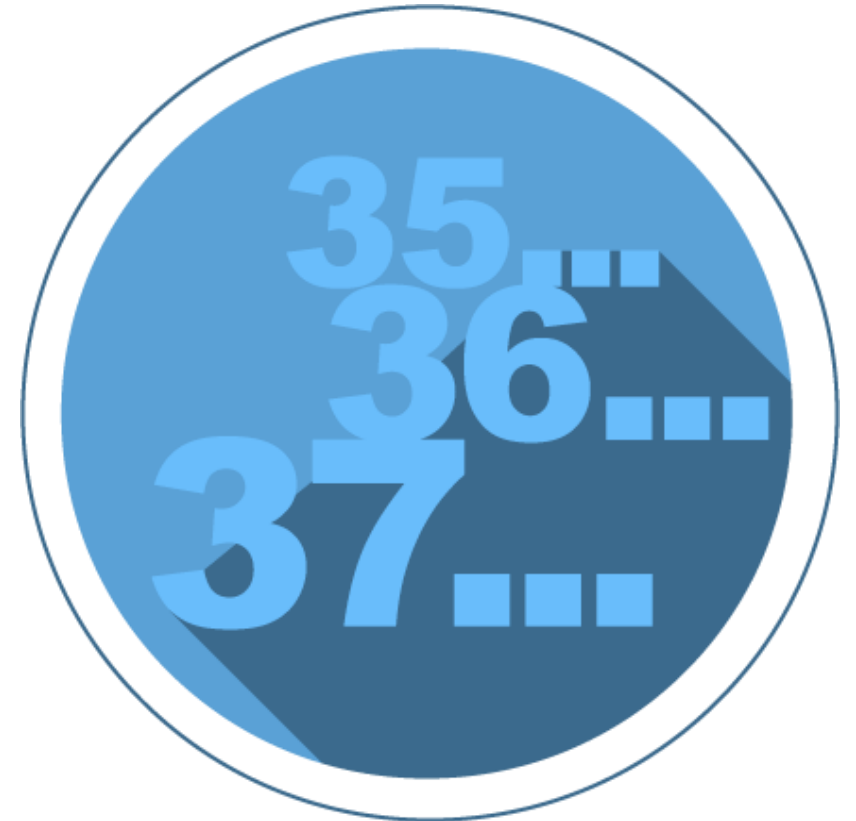
Effects of Anesthesia

- ❑ Anesthesia causes vasodilation, or an opening of arterial shunts, allowing the warm blood from the core to flow freely and mix with the colder periphery
- ❑ As the blood circulates, it cools until returning back to the heart, where it causes a drop in core temperature
- ❑ This is known as **heat redistribution**, commonly referred to as **RTD (redistribution temperature drop)**



Maintaining Patient Normothermia

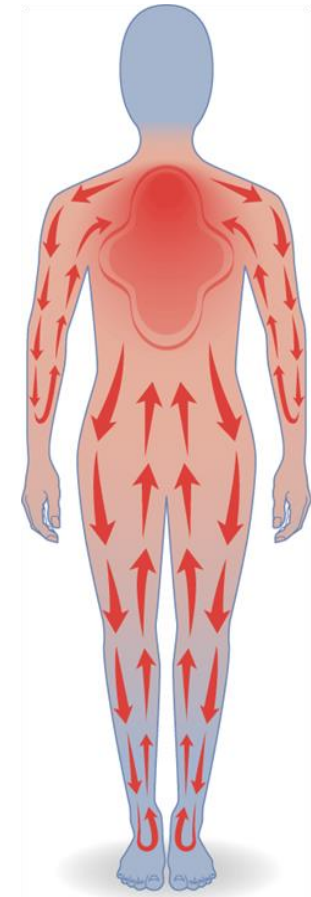
- ❑ The **induction of anesthesia** is the most significant contributor to unintended perioperative hypothermia in surgical patients
- ❑ Reducing the impact of redistribution temperature drop through prewarming is an effective way to help maintain patient normothermia



What Is Prewarming?

*The application of heat **prior to anesthesia** for the purpose of increasing total body temperature*

- ❑ Prewarming = “banking heat”
- ❑ Total body temperature = the average combined temperature of the periphery and core



Effects of Prewarming Patients in the Outpatient Surgery Setting

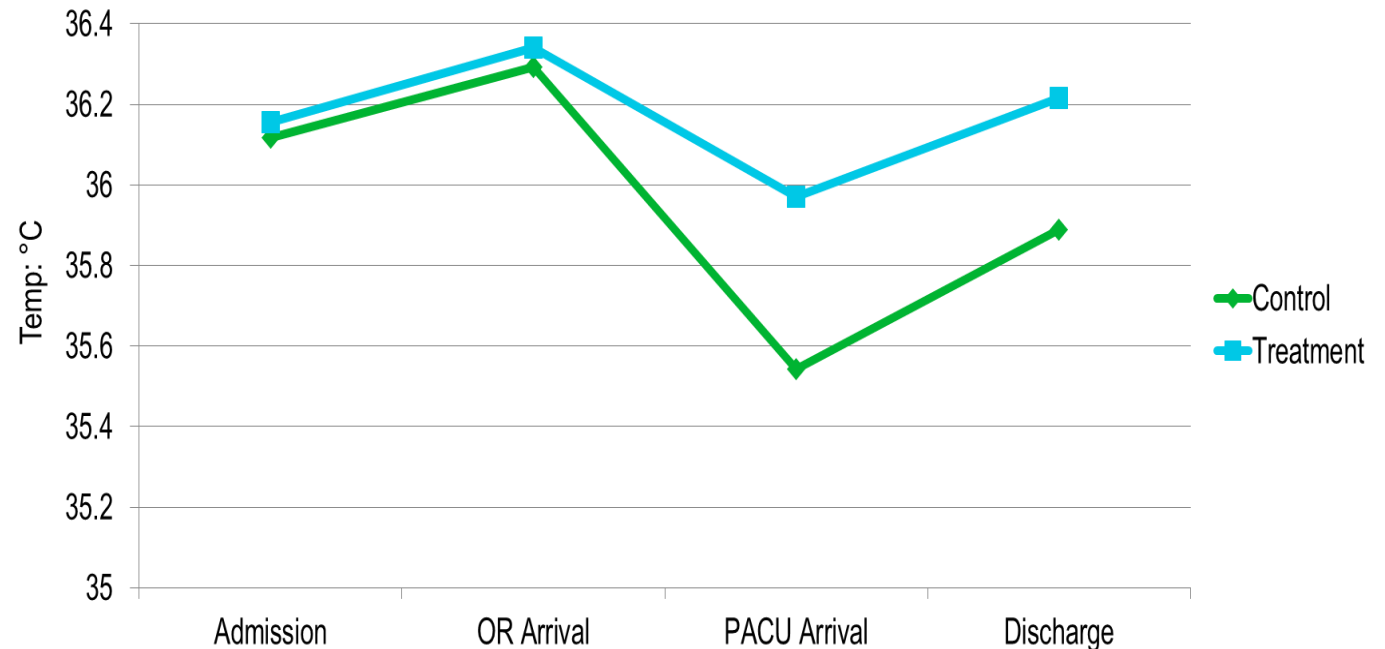
Fossum et al.

A Comparison Study on the Effects of Prewarming Patients in the Outpatient Surgery Setting

In a Randomized Control Trial (RCT) the effect of prewarming on the surgical patient temperature at arrival to PACU was compared between two groups. One using Forced Air Warming (FAW-Treatment, N=50) and one groups using Cotton blankets (Control, N=50)

FAW is more effective than warmed cotton blankets in:

- Achieving higher temperature post-op (p=0.000)
- More patients self reported thermal comfort (p=0.000)



Value of Extended Warming in Patients Undergoing Elective Surgery

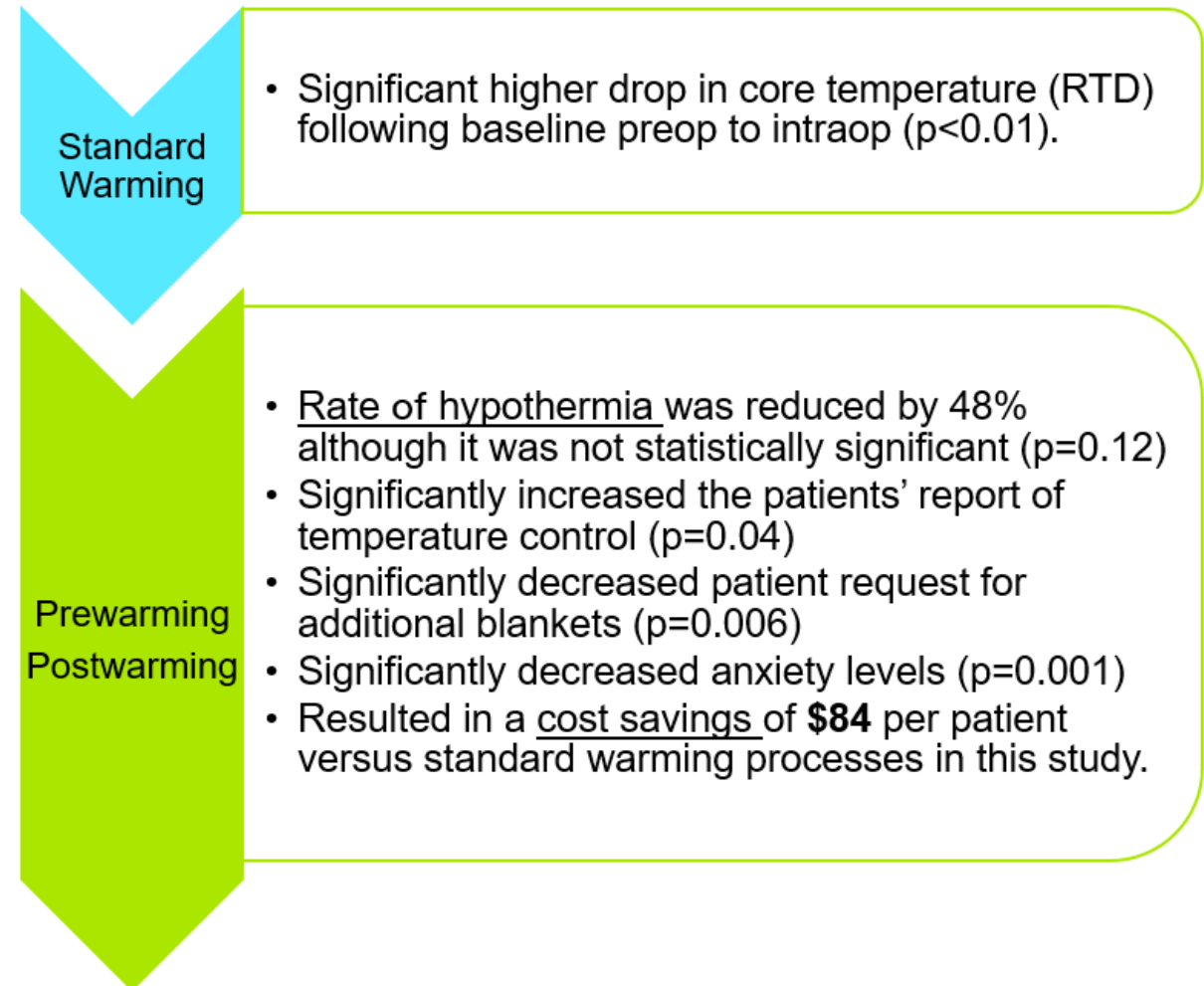
Wasfie et al.

Value of Extended Warming in Patients Undergoing Elective Surgery

In a Randomized Control Trial (RCT) the effect standard warming from induction through the end of surgery (N=48) was compared prewarming / postwarming the patient (preoperative, intraoperative, and PACU through discharge) (N=46).

Outcomes Measured included:

- Rates of hypothermia (<36°C)
- Patient wellbeing (perception of temperature always controlled, request for extra blankets, and anxiety)
- Costs of warming



Summary

- ❑ **Induction of anesthesia** is most significant contributor to unintended perioperative hypothermia in surgical patients
- ❑ Reducing the impact of RTD through prewarming is an effective way to help maintain patient normothermia
- ❑ Studies have shown that prewarming patients has clinical, as well as comfort benefits
- ❑ Prewarming increases patient satisfaction rates & decreases anxiety levels
- ❑ ASPAN & AORN recommend preoperative assessment to determine patient's risk for hypothermia
- ❑ Prevention of hypothermia is one of the top 10 patient safety concerns for perioperative RNs

Nasal Decolonization

The background of the slide is a complex, abstract geometric pattern composed of numerous overlapping triangles. The color palette is a range of blues, from deep, dark navy blues to bright, vibrant cyan and light blue tones. The triangles vary in size and orientation, creating a dynamic and textured visual effect. The overall composition is balanced and modern.

Why Implement an Intervention to Decolonize the Nares?

- *S. aureus* is the leading cause of SSI¹
- Approximately 30% of the population are colonized with *S. aureus* in the nares.²
- 80% of the *S. aureus* infections are caused by the patient's own nasal flora.³

In a study published in the New England Journal of Medicine in which nasal screening was done, for the patients from which samples were available from both the nares and the surgical site (known as paired isolates), over 84% of the *S. aureus* strains isolated from the nares were identical to those isolated from the surgical site³

1. Sievert DM, et al. Antimicrobial-Resistant Pathogens Associated with Healthcare-Associated Infections: Summary of Data Reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2009-2010. *Infect Control Hosp Epidemiol* 2013; 34(1):1-14.
2. Kuehnert MJ, et al. Prevalence of *Staphylococcus aureus* nasal colonization in the United States, 2001–2002. *Journal of Infectious Diseases* 2006;193:172-179. National Center for Infectious Diseases and National Center for Health Statistics, Centers for Disease Control and Prevention, Atlanta, Georgia
3. Perl TM., et al. Intranasal mupirocin to prevent postoperative *Staphylococcus aureus* (italicized) infections. *NEJM* 2002;346(24):1871-77.

Options for Pre-surgical Nasal Decolonization

- Intranasal mupirocin has been used historically to decolonize the nares
 - Compliance burdens
 - Antibiotic resistance
- Povidone Iodine Nasal Antiseptic
 - Specifically formulated to work in nares
 - Observed compliance
 - No antibiotic resistance



Preventing Surgical Site Infections: A randomized, open-label trial of nasal mupirocin ointment and nasal povidone-iodine solution

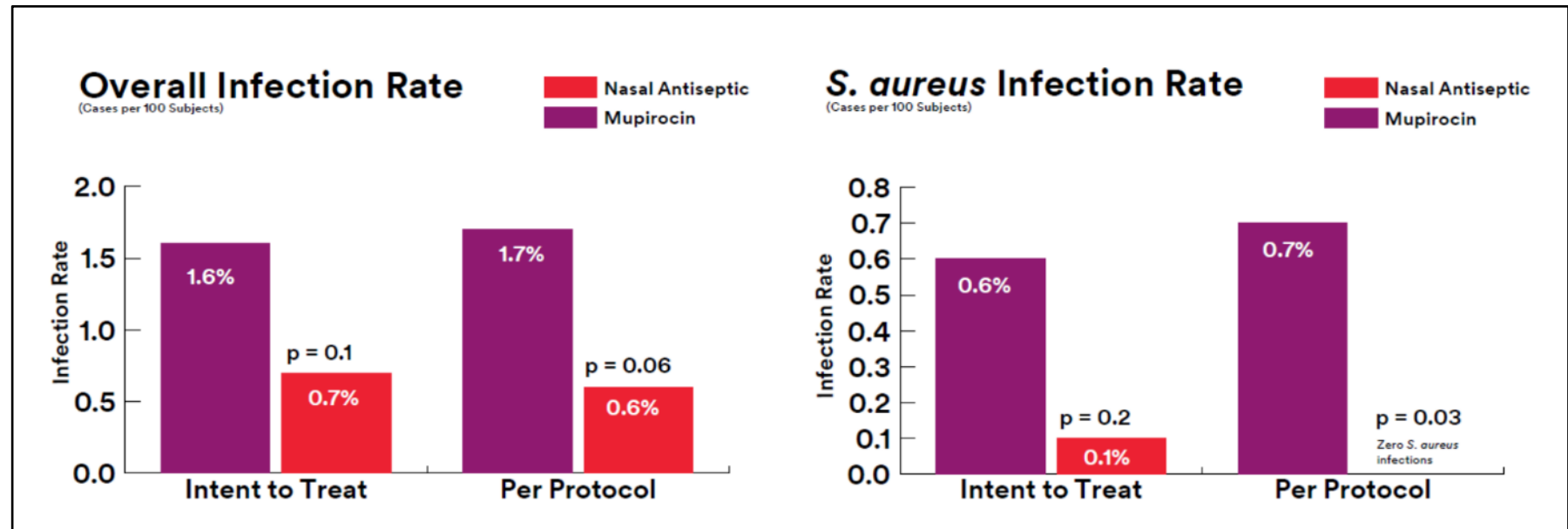
Investigator initiated, prospective randomized controlled trial comparing SSI after arthroplasty or spine fusion surgery. Patients receiving two applications of 2% CHG cloths were randomized to:

- one time treatment of 5% Nasal Povidone- Iodine Antiseptic or five days of nasal mupirocin ointment prior to surgery

The primary end point was deep SSI within 3 months of surgery

Conclusion:

- 5% nasal PI may be considered as an alternative to mupirocin in a multifaceted approach to reduce SSI
- Other observation:
 - Compared to mupirocin in terms of cost and efficacy, 5% nasal PI provides more value, defined as quality of outcomes divided by cost
 - Application of 5% nasal PI by the patient care team just prior to surgery may ensure greater compliance

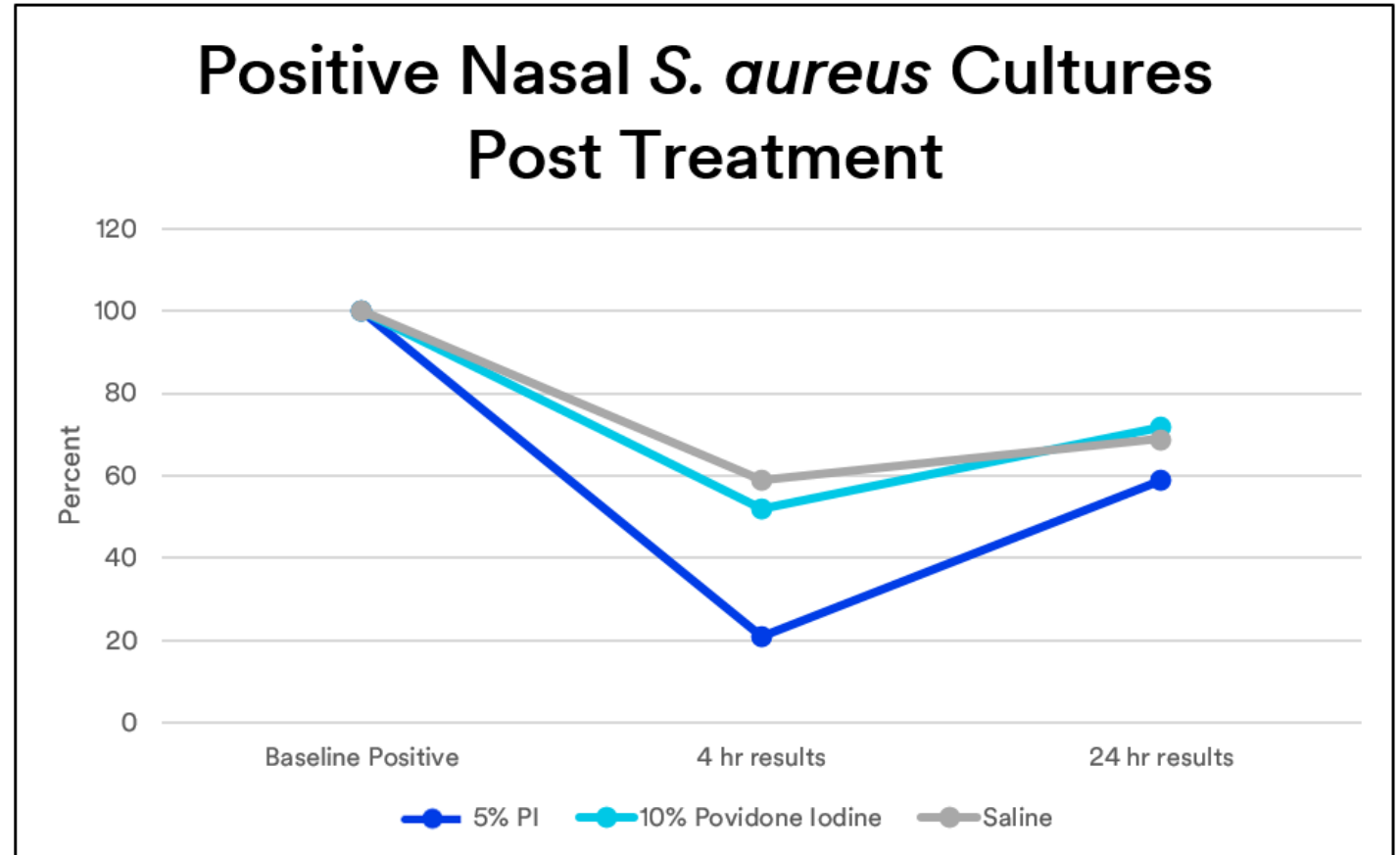


- Significantly more adverse events were reported by patients in the mupirocin group (8.9%) than patients in the antiseptic group (1.8%) ($p < 0.05$ for all treatment related symptoms)

Do iodine-based solutions differ in their effectiveness for decolonizing intranasal *Staphylococcus aureus*?

Investigator initiated, prospective randomized controlled trial comparing nasal *S. aureus* cultures at baseline, 4 and 24 hours after treatment with off the shelf 10% povidone iodine, 5% povidone iodine or saline (control)

- 429 patients were randomized, of which 95/429 (22.1%) were positive at baseline for *S. aureus* and 13.6% of these were MRSA
- 5% PI formulation demonstrated significantly more effective intranasal decolonization of *S. aureus* over the 4 hour time interval ($p=0.003$)
- 10% PI no different than saline (control)



Formulation impacts effectiveness

Summary of Clinical Evidence

- ❑ 5% PVP-I is an effective alternative to mupirocin for nasal decolonization¹
- ❑ One time application of a specially formulated 5% PVP-I Nasal Antiseptic helps reduce the risk of SSI when part of a preoperative protocol¹⁻³
- ❑ It is cost effective¹⁻³
- ❑ It has better antimicrobial efficacy in the nose than 10% PVP-I⁴

1. Phillips M., et al. Preventing Surgical Site Infections: A randomized, open-label trial of nasal mupirocin ointment and nasal povidone-iodine solution. *Infect Control Hosp Epidemiol* 2014; 35(7): 826-832
2. Bebko SP, Green DM, Awad SS. Effect of a Preoperative Decontamination Protocol on Surgical Site Infections in Patients Undergoing Elective Orthopedic Surgery With Hardware Implantation. *JAMA Surg*. Published online March 04, 2015. doi:10.1001/jamasurg.2014.3480.
3. Torres EG, Lindmair-Snell JM, Langan JW, Burnikel BG. Is preoperative nasal povidone-iodine as efficient and cost-effective as standard methicillin-resistant *Staphylococcus aureus* screening protocol in total joint arthroplasty? *J Arthroplasty*. 2016; 31: 215-218.
4. Rezapoor M, Nicholson T, Patel R, Mostafavi R, Chen AF, Parvizi J. Do iodine-based solutions differ in their effectiveness for decolonizing intranasal *Staphylococcus aureus*? Presented at the MSIS Annual Meeting, Cleveland, OH, August 2015



Patient Preoperative Skin Preparation

Basic Antiseptics for Skin Preps



Alcohol



Iodine / Iodophor



Chlorhexidine
Gluconate



Dual-active
Antiseptic Products



Considerations for Selection of Preps

- The most commonly used patient skin preps must meet regulatory criteria for immediate microbial kill and persistent antimicrobial activity
- It is important to look at other factors that may affect performance when choosing a prep for surgical patients
- There is **NO** one prep that will meet all prepping needs

Things to Consider when Choosing a Surgical Prep

Baseline Considerations



Patient Factors

- Allergies / sensitivities
- Age of patient
- Skin condition
- Location / Type of procedure



Active Ingredients

- Aqueous solution
- Dual active solution



Size of Area Being Prepped

- Use an appropriately sized applicator

Additional Considerations when Choosing a Surgical Prep

Ability to maintain antimicrobial effectiveness

Does the prep provide protection throughout surgery?

- Preps vary in their ability to remain on the skin throughout surgery and provide antimicrobial efficacy
- Why do they vary?
 - Not all skin preps perform to the same level under surgical conditions



Additional Considerations when Choosing a Surgical Prep

Dripping, running, and pooling...
application affects safety and efficacy

✓ **Protect**

AORN Guidelines State...

“Sheets, padding, positioning equipment, and adhesive tape should be protected from dripping or pooling of skin antiseptics beneath and around the patient...removal of materials that are saturated with the skin antiseptic before the patient is draped

- Guidelines for Perioperative Patient Skin Antisepsis, AORN

2017

✓ **Apply**

Scrub



Paint



Use repeated
back and forth
strokes



✓ **Dry**





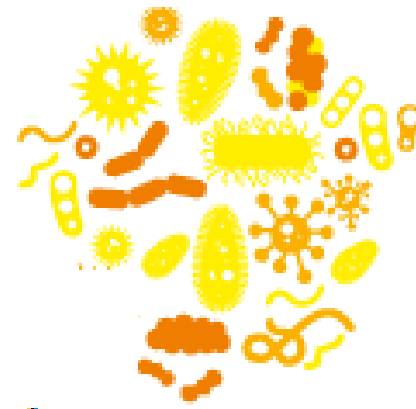
Sterile Surface

Why do we wear gloves during surgery?

We scrub our hands before surgery to remove bacteria

But still we wear gloves to prevent residual bacteria and regrowth from our hands getting into the incision and causing an infection

How can we apply the same standard of care to the patient's skin?



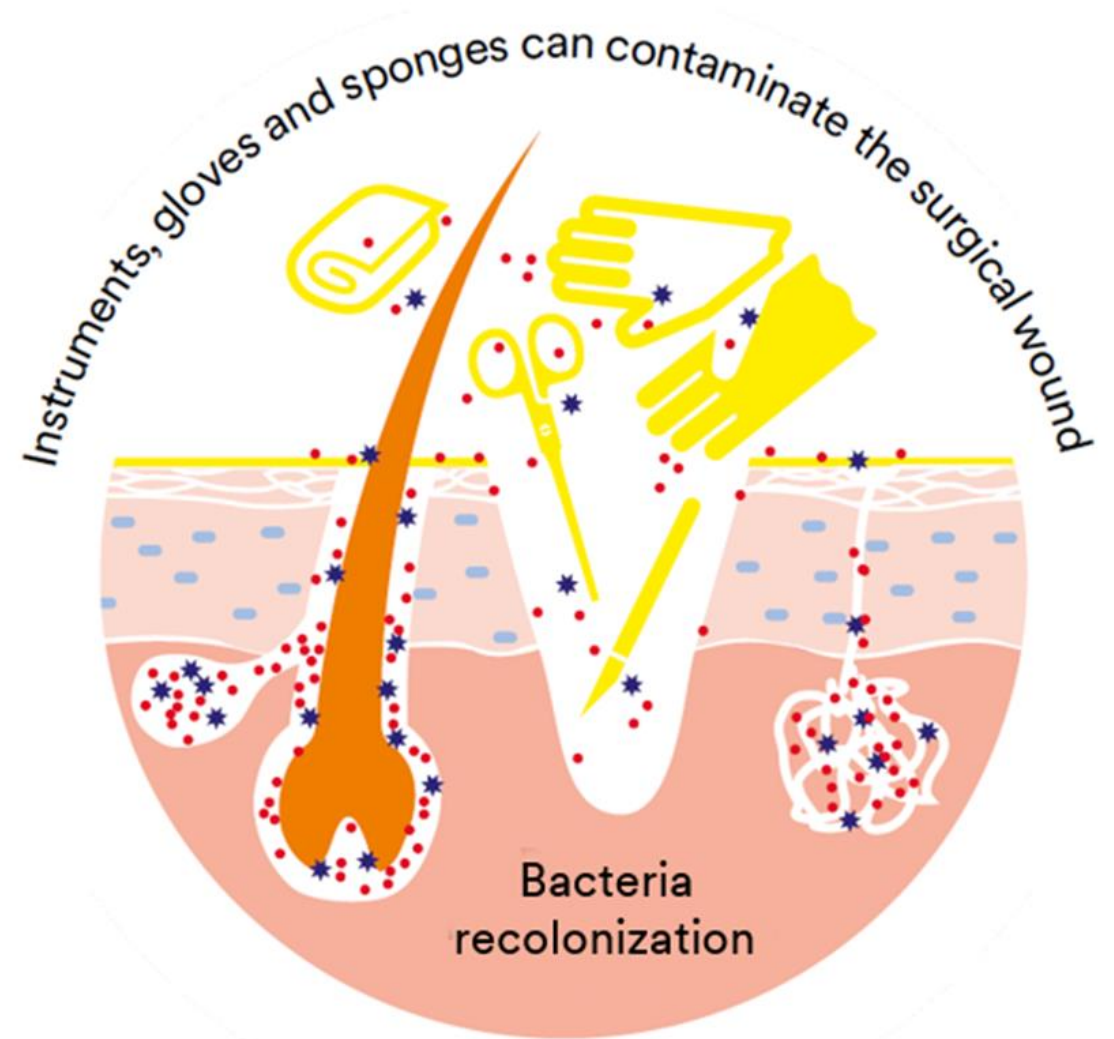
Risk of Contamination

There are ***always*** residual microbes that survive on the skin surface, in deeper skin layers, and in hair follicles

Without additional protection, residual bacteria on the skin surface, and bacteria from the hair follicles that migrate to the skin surface, can be picked-up by items that touch the skin

– like gloves, instruments, sponges, saline, bodily fluids –

and transferred into the incision, increasing the patient's risk of infection



An antimicrobial incise drape can create a sterile surface all the way to the wound edge decreasing the risk of residual microbes being transferred into the incision

Creating a Sterile Surface on the Patient's Skin

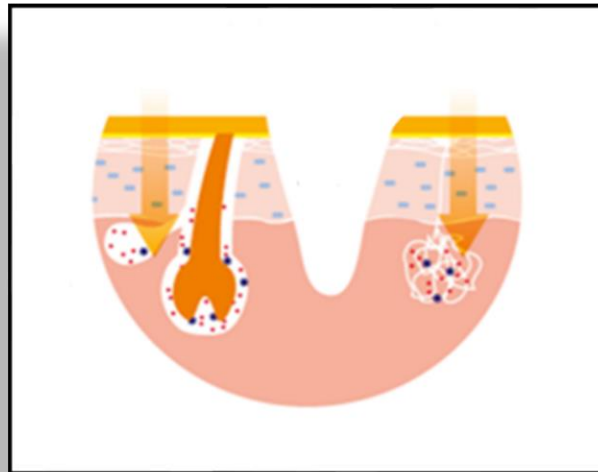
Applying the same standard of care to the patient's skin as we do our hands requires creating a sterile surface

Steps in Creating a Sterile Surface

1. Use an effective surgical prep to reduce as much bacteria on the skin as possible
2. Place surgical drapes to create a sterile field
3. When appropriate add a sterile incise drape to create the sterile surface





Incise Drapes Help Prevent Contamination of the Incision

- ❑ An incise drape is a sterile plastic film coated with adhesive that is placed on the skin over the incision area
- ❑ An incise drape immobilizes residual bacteria on the skin and helps prevent items in surgery from touching the skin and transferring bacteria into the incision
- ❑ Antimicrobial incise drapes containing iodine in the adhesive helps kill residual bacteria under the drape



Guidelines: Best practices for the prevention of SSIs are evolving to support the use of antimicrobial incise drapes.

Current guidelines indicate that using an antimicrobial incise drape is more effective at reducing contamination than using a standard clear incise drape.

Organization	Key Guidance / Recommendations
AORN (2018) ¹⁰ 	Adhesive incise drapes without antimicrobial properties should not be used. Iodophor-impregnated adhesive incise drapes may be used in accordance with the manufacturer's IFU, unless contraindicated by a patient's allergy to iodine. [1: Strong Evidence]
APSIC (2018) ¹¹	<ul style="list-style-type: none"> • When using adhesive drapes, do not use non-iodophor-impregnated drapes for surgery as they may increase the risk of surgical site infection. (IE) • In orthopaedic and cardiac surgical procedures where adhesive drapes are used, consider using an iodophor-impregnated incise drape, unless the patient has an iodine allergy or other contraindication. (IIB)
NICE (2008, updated in 2017) ¹² 	<ul style="list-style-type: none"> • Do not use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection. • If an incise drape is required, use an iodophor-impregnated drape unless the patient has an iodine allergy.
NHMRC (2010) ¹³ 	<ul style="list-style-type: none"> • Do not use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection. • If an incise drape is required, use an iodophor-impregnated drape unless the patient has an iodine allergy.
KRINKO (2018) ¹⁴ 	Increase of SSI due to the non-antiseptically impregnated incision drape is reversed with using an antimicrobial incise drape.

10. Association of periOperative Registered Nurses (AORN). Guideline for sterile technique [DRAFT 2018].
 11. Asia Pacific Society of Infection Control. The APSIC guidelines for the prevention of surgical site infections. <http://apsic-apac.org/wp-content/uploads/2018/05/APSIC-SSI-Preventionguideline-March-2018.pdf>. Published March, 2018. Accessed August 23, 2018
 12. National Institute for Health and Clinical Excellence. Prevention and treatment of surgical site infection. Clinical Guideline. <https://www.nice.org.uk/guidance/cg74/evidence/fullguideline-242005933>. Published October 22, 2008. Updated February, 2017. Accessed August 23, 2018
 13. National Health and Medical Research Council. Australian guidelines for the prevention and control of infection in healthcare. <https://www.nhmrc.gov.au/book/australian-guidelinesprevention-and-control-infection-healthcare-2010/b4-3-4-considerations-du>. Published 2010. Updated January 10, 2010. Accessed August 23, 2018.
 14. Commission for Hospital Hygiene and Infection Prevention (KRINKO) at RKI, Prevention of postoperative wound infections. 2018.

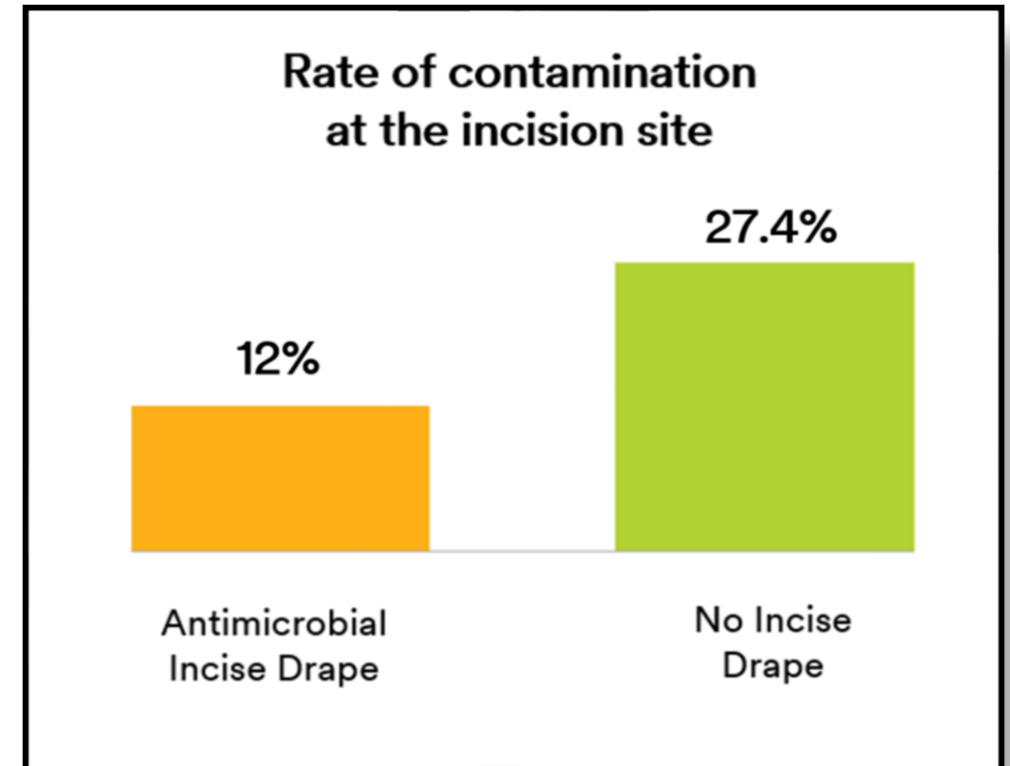
Using an incise drape was shown to be significantly more effective at reducing microbial contamination vs. using no drape

Rezapoor et al.

Incise Draping Reduces the Rate of Contamination of the Surgical Site During Hip Surgery: A Prospective, Randomized Trial

In a prospective, randomized clinical study of patients undergoing hip preservation surgery the use of an antimicrobial incise drape versus not using and incise drape showed:

- Antimicrobial Incise Drape was significantly more effective at reducing microbial wound contamination at the incision site compared to not using an incise drape
- At surgery end 12.0% of incisions with antimicrobial incise drape and 27.4% of incisions without an incise drape were positive for bacteria
- When controlling for preoperative colonization and other factors, patients without incise drapes were significantly more likely to have bacteria at the incision than patients with antimicrobial incise drape at the time of closure



*Due to significant reduction in bacterial colonization in the adhesive group decision was made to terminate the study

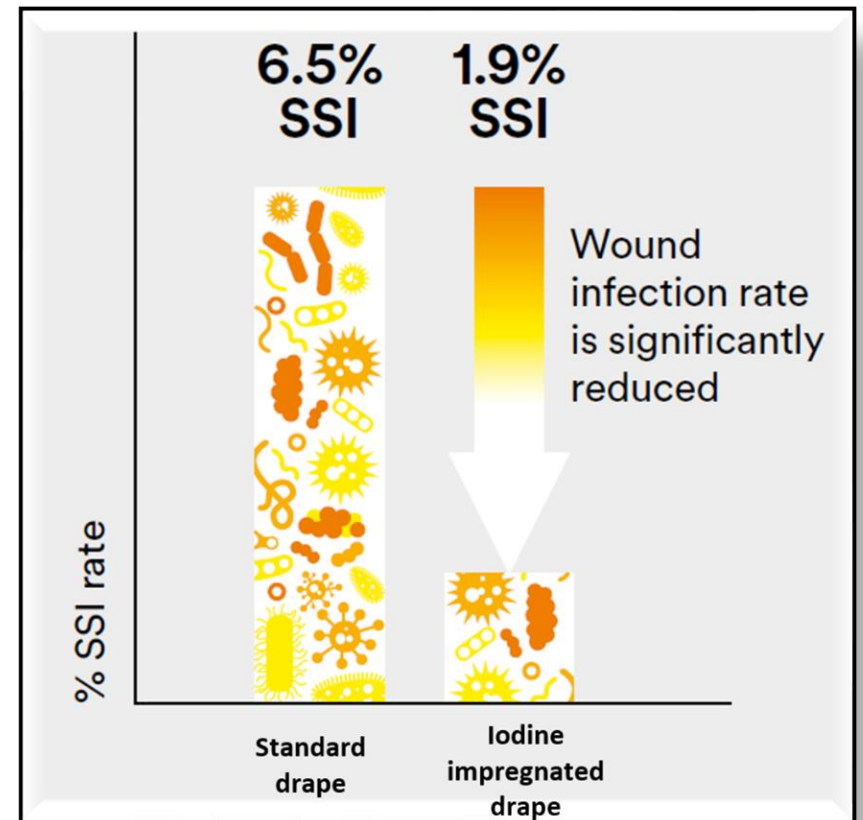
Clinical study shows that an iodine impregnated drape can help reduce the risk of infection as well as reduce overall cost

Bejko et al.

Comparison of efficacy and cost of iodine impregnated drape vs. standard drape in cardiac surgery

In a retrospective study of 5,100 patients undergoing cardiac surgery, iodine impregnated drape was associated with:

- A significant reduction (71%) in the overall incidence of SSIs when compared with the use of a non-antimicrobial incise drape ¹
- Cost-effective direct patient-related care, delivering overall cost savings of \$828,000 (or about \$1,025 per patient) ¹



Surgical incision management

The background of the slide is a complex, abstract geometric pattern composed of numerous overlapping triangles. The color palette is a range of blues, from deep, dark navy blues to bright, light cyan and turquoise hues. The triangles vary in size and orientation, creating a dynamic and textured visual effect. The overall composition is balanced and modern.

Surgical incision management – Closure

Suture, Strips, Staples, Adhesive Skin Closure, Skin Glue.

Dictated by the surgeon and procedure

- Three types of closure:
 - Primary intent
 - Secondary intent
 - Tertiary intent
- Primary intention is most often seen in surgery
 - Closure immediately following the injury/incision
 - Faster healing–normal healing pattern
 - Best cosmetic result
 - **Focus on protecting the site**



Primary goal is protecting the incision until healed

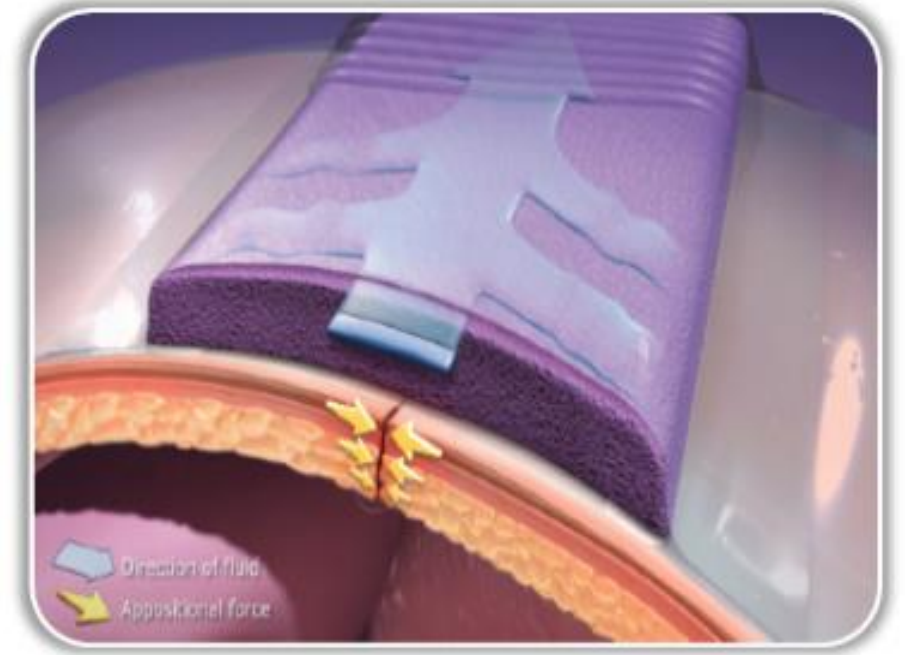
Negative Pressure Wound Therapy- Active dressings

- New and emerging approach to managing closed incisions ¹
- Beneficial in reducing rates of surgical site infection, seroma/hematoma and dehiscence²
- In high risk patients and procedures clinical evidence demonstrated ³ :
 - reduced surgical incision complications
 - reduced surgical cost per patient
 - decreased SSI incidence

1. Cipriandi, & Djohan, & Dohmen, Pascal & Sibai, & Sugrue, & tanner, & Acosta, & Hudson, Don & Birke-Sorensen, Hanne & Stannard, James & Nair, & Sandy-Hodgetts, Kylie. (2016). World Union Wound Healing Societies (WUWHS) Consensus Document. Closed incision management: understanding the role of NPWT.
2. Hyldig N, Birke-Sorensen H, Kruse M, et al. Meta-analysis of negative-pressure wound therapy for closed surgical incisions. *Br J Surg* 2016; 103; 477-86
3. Willy, C., Agarwal, A., Andersen, C. A., Santis, G. D., Gabriel, A., Grauhan, O., Guerra, O. M., Lipsky, B. A., Malas, M. B., Mathiesen, L. L., Singh, D. P., & Reddy, V. S. (2017). Closed incision negative pressure therapy: international multidisciplinary consensus recommendations. *International Wound Journal*, 14(2), 385-398. <https://doi.org/10.1111/iwj>.

Closed Incision Negative Pressure Wound Therapy (ciNPWT)

- Actively manages the surgical incision site
- Negative pressure helps hold incision edges together
- Removes fluid and infectious materials¹⁻⁴
- Acts as a barrier to external contamination¹⁻⁴
- Delivers continuous negative pressure at -125mmHg for up to seven days¹⁻⁴
- Skin-friendly interface layer wicks fluid from the skin surface and the foam bolster allows manifolding of continuous delivery of negative pressure wound therapy¹⁻⁴

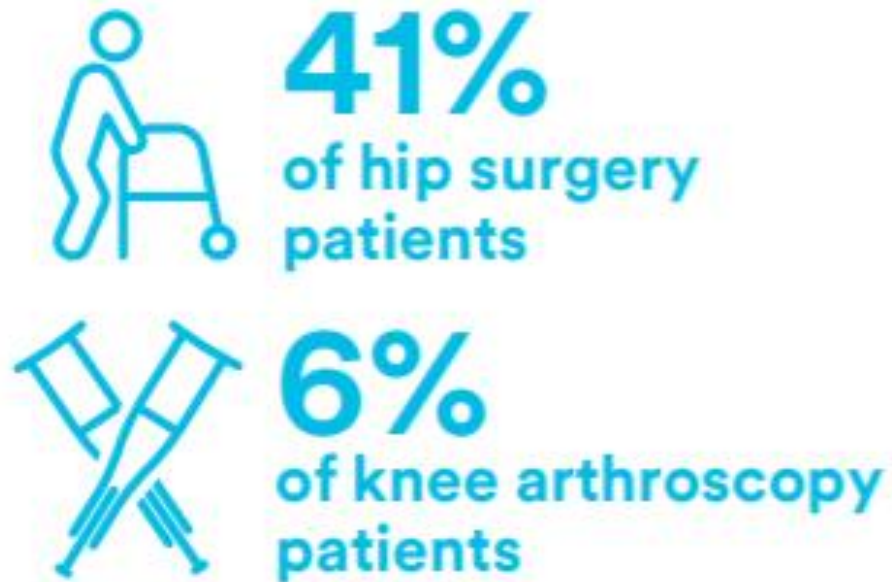


- 1.) Wilkes RP, Kilpadi DV, Zhao Y, Kazala R, McNulty A. Closed incision management with negative pressure wound therapy (CIM): biomechanics. *Surg Innov.* 2012 Mar;19(1):67-75. doi:10.1177/1553350611414920.
- 2.) Kilpadi DV, Cunningham MR. Evaluation of closed incision management with negative pressure wound therapy (CIM): hematoma/seroma and involvement of the lymphatic system. *Wound Repair Regen.* 2011 Sep- Oct;19(5):588-596. doi:10.1111/j.1524-475X.2011.00714.x.
- 3.) Payne J. Evaluation of the resistance of the Prevena™ incision dressing top film to viral penetration. San Antonio, TX: Kinetic Concepts, Inc.; June 19, 2009. Report No.: 0000021109.
- 4.) Glaser DA, Farnsworth CL, Varley ES, et al. Negative pressure therapy for closed spine incisions: a pilot study. *Wounds.* 2012 Nov;24(11):308-316.



Medical adhesive-related skin injuries

MARSI is a common occurrence



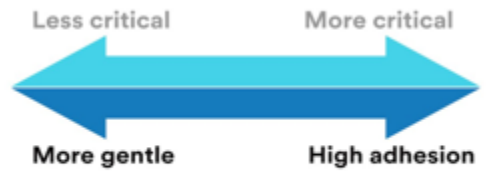
The incidence of tension blisters has been reported to be as high as 41% following hip surgery, and as high as 6% following knee arthroscopy.²

- Skin injuries are more prominent among orthopedic surgery patients due to the large amounts of tape used to secure large compression bandages. The risk of skin damage is then compounded by joint movement, skin friction and the presence of tissue edema, which creates a strapping effect.¹

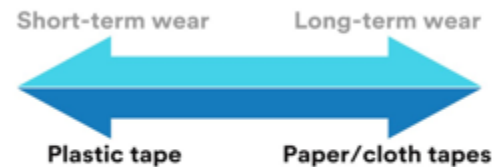
¹Jester R, Russell L, Fell S, Williams S, Prest C. A one-hospital study of the effect of wound dressing and other related factors on skin blistering following total knee and hip arthroplasty

²McNichol L, Lund C, Rosen T, Gray M. Medical adhesives and patient safety: state of the science. Consensus statements for the assessment, prevention and treatment of adhesive-related skin injuries. J WOCN. 2013;40(4):365-380.

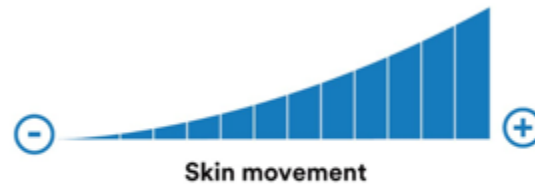
Selection starts with the job



Intended use of the product



Anticipated wear time



Anatomical location



Ambient conditions present at the site

- Fragile, at-risk skin
- Blood draws
- Dressings
- IV lines and tubing
- Non-critical tubes

Gentle Securement

- Blood draws
- Dressings
- IV lines and tubing
- Non-critical tubes

General Securement

- Compression
- When swelling or movement is anticipated

Flexible Securement

- Endotracheal Tubes
- Chest tubes
- Central venous catheters
- Surgical drains

High-Adhesion Securement



Other Items to Consider

Every IV site presents the potential for infection, dislodgement, skin damage and other complications. Utilizing evidence-based products and protocols will help to minimize the risks of vascular access complications and help you achieve better patient outcomes.

When their ports are protected, so is your peace of mind.

71,900

PREVENTABLE CENTRAL LINE INFECTIONS ANNUALLY.³

CLABSI

is a serious threat

Every I.V. catheter presents potential for central line-associated bloodstream infections (CLABSI).



UP TO
1 IN 4 PATIENTS
WHO CONTRACT CLABSI DIE.¹

Infection Reduction

APIC, INS and the SHEA Compendium recommend CHG-impregnated dressings.^{6,7,8} In use for over 50 years, CHG has proven to be an effective antimicrobial. Bacterial resistance to CHG has been rare.⁹

Site Visibility

The CDC and *Infusion Therapy Standards of Practice* recommend the use of transparent dressings because they permit continuous visual inspection of the catheter site.^{6,10}

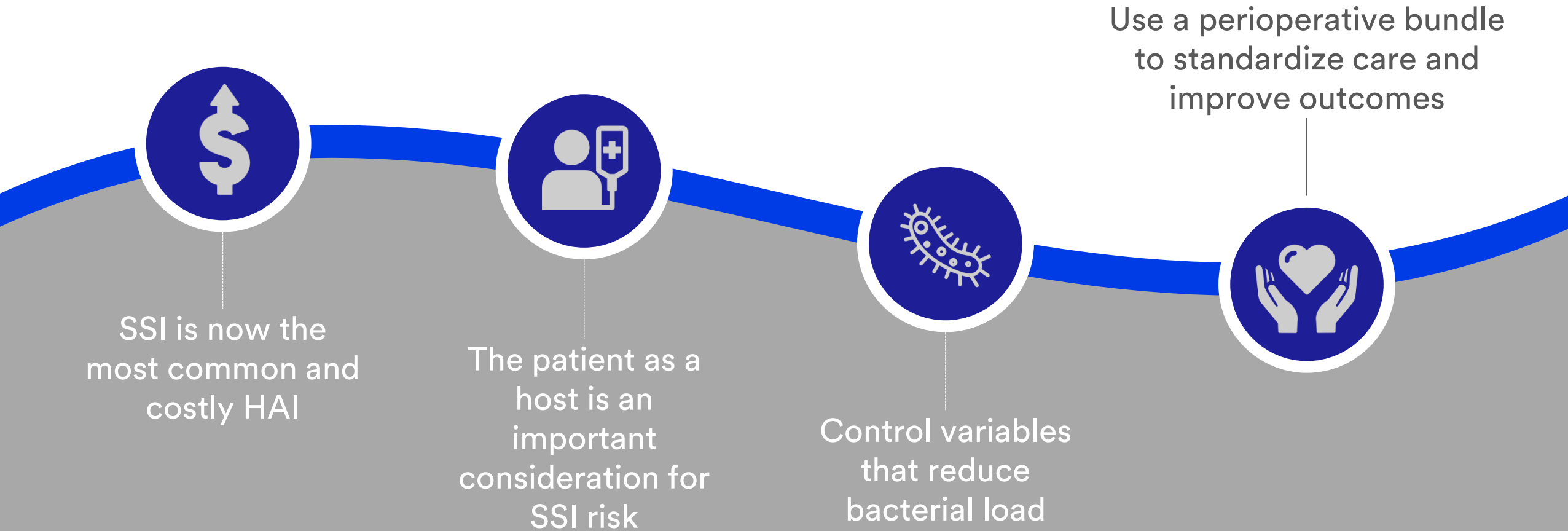
Consistent Application

The International Organization of Standards promote the importance of medical device design to support correct use, patient safety, user satisfaction and to reduce medical device-related errors.¹¹

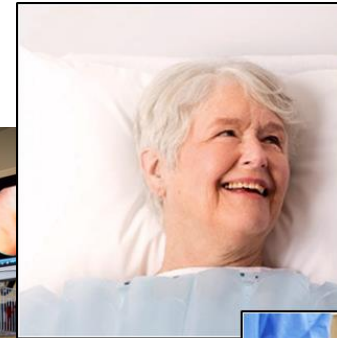
Catheter Securement

The CDC and *Infusion Therapy Standards of Practice* recommend the use of sutureless securement devices to minimize the risks of movement, dislodgement, and needlestick injuries.^{6,10}

Reducing the Risk of SSI: Summary



Working together for better patient outcomes



Reducing the Risk of SSI

- ❖ **What do you have in place?**
- ❖ **Are there protocols you could add?**

Questions?