3M Science. Applied to Life.™

Applying the science to surgical safety

Surgical site infections (SSI) key facts:

SSI is the leading healthcare associated infections (HAIs) among hospitalized patients [1,2]

In developed countries,
2-5%
of patients undergoing inpatient surgery will develop as SSI[3].

In developing countries, SSI rates are
2-5x
higher[2].

Impact of SSIs:

4-7 additional postoperative hospital days[4]

2x as likely to die[4]

5x more likely to be readmitted after discharge[4]

2x the cost to treat a patient with SSI compared to one without[5]

Up to
60%
of SSIs could be prevented by using evidence-based guidelines[3]

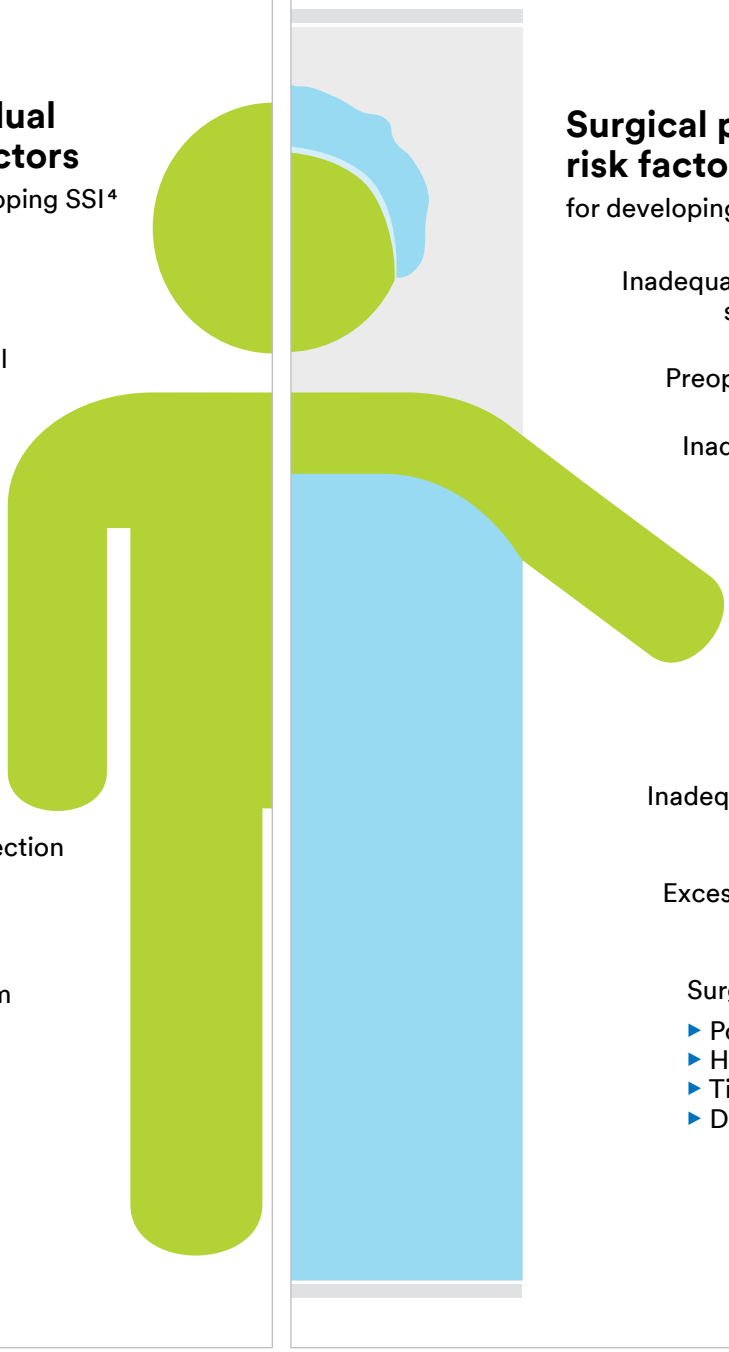
Understanding the risk factors for SSIs

Many SSIs can be prevented with practices that help mitigate the numerous risk factors contributed by the patient or the environment. A surgical care process provides a systematic approach to support implementation of evidence-based, effective strategies to manage modifiable risk factors and improve surgical outcomes.

Individual risk factors

for developing SSI[4]

- Advanced age
- Poor nutritional status
- Diabetes
- Smoking
- Obesity
- Bacterial colonization
- Coexisting infection at other sites
- Altered immune system
- Prolonged preoperative hospitalization



Surgical procedure risk factors

for developing SSI[4]

- Inadequate preoperative skin preparation
- Preoperative shaving
- Inadequate surgical hand antisepsis
- Contaminated operating room environment
- Inappropriate surgical attire and drapes
- Inadequate instrument sterilization
- Excessive duration of operation
- Surgical technique:
  - Poor hemostasis
  - Hypothermia
  - Tissue trauma
  - Dead space
- Inappropriate antimicrobial prophylaxis

1. Prevalence of healthcare-associated infections in acute care hospitals in Jacksonville, Florida. Magill, S.S., et al. Infection Control Hospital Epidemiology, 33(3): (2012): 283-91.
2. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. Allegranzi, Benedetta et al. The Lancet , Volume 377, Issue 9761 , 228-241.
3. SHEA/IDSA Practice Recommendations: Strategies to prevent surgical site infections in acute care hospitals. Andersen, D., Podgorny, K., et al. Infection Control and Hospital Epidemiology 2014 June; 35(6): 605-627.
4. World Health Organization Guidelines for Safe Surgery 2009.
5. Broex EC, van Asselt AD, Bruggeman CA, van Tiel FH. Surgical site infections: how high are the costs? J Hosp Infect. 2009 Jul;72(3):193-201. doi: 10.1016/j.jhin.2009.03.020. Epub 2009 May 31. Review. PubMed PMID: 19482375. 375.

Applying the science: Recommended guidelines for prevention of SSI

Clinical guidelines for the prevention of SSI are systematically developed with the aim of providing guidance on the patient's perioperative journey.

The strategies highlighted below are recommendations from various international guidelines to reduce SSI and improve patient outcomes throughout the preoperative, intraoperative and postoperative phases of surgery.

Pre-op phase

Patient and caregiver education

- Educate patients and their families about SSI prevention. *SHEA*
- Provide instructions and information to patients prior to surgery describing strategies for reducing SSI risk. *SHEA*

Body hygiene

- Patients should bathe or shower before surgery with either soap or an antiseptic. *AORN*

Hair removal

- Shaving is not recommended as they increase the risk of surgical site infection. *WHO*
- When necessary, hair at the surgical site should be removed by clipping or depilatory methods in a manner that minimizes injury to the skin. *AORN*
- The patient's hair should be removed in a location outside the operating room. *AORN*

Pre-op phase *Continued*

Patient temperature management

- If the patient's temperature is below 36.0°C, forced air warming should be started preoperatively. *NICE*
- The patient's temperature should be measured and monitored in all phases of perioperative care. *AORN*
- Forced air warming (FAW) devices should be used with the manufacturer-designated blanket attached to the hose and according to the manufacturer's instructions for use. *AORN*

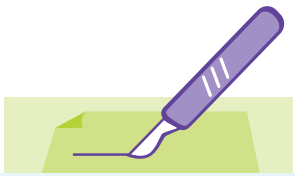
Antibiotic prophylaxis

- When antibiotics are given prophylactically to prevent infection, they should be administered within 1 hour of incision at an appropriate dose. Before skin incision, the team should confirm that prophylactic antibiotics were given within the past 60 minutes. *WHO*
- Antibiotics used for prophylaxis should be discontinued within 24 hours of the procedure. *WHO*

Glucose control

- Control serum blood glucose levels for all surgical patients, including patients without diabetes. *SHEA*

Intra-op phase



Patient

Patient skin antisepsis

- Use an appropriate antiseptic agent for skin preparation. *CDC*
- Prepare the skin at the surgical site immediately before incision using an antiseptic (aqueous or alcohol-based) preparation: povidone-iodine or chlorhexidine are most suitable. *NICE*
- If diathermy is to be used, ensure that antiseptic skin preparations are dried by evaporation and pooling of alcohol-based preparations is avoided. *NICE*

Patient temperature management

- Measures to maintain core normothermia should be taken through-out the perioperative period. *WHO*
- If patient's temperature is below 36°C, forced air warming should be maintained throughout the intraoperative phase. *NICE*
- IV fluids (> 500ml) and blood products should be warmed to 37°C using fluid warming device. *NICE*

Prevent skin recolonization

- Do not use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection. *NICE*
- If an incise drape is required, use an iodophor-impregnated drape unless the patient has an iodine allergy. *NICE*

Wound closure

- Use delayed primary skin closure or leave an incision open to heal by second intention if the surgeon considers the surgical site to be heavily contaminated. *CDC*

Staff

Surgical scrub

- A standardized surgical hand scrub using an alcohol-based surgical hand rub product with demonstrated persistence and cumulative activity should be performed according to the manufacturer's written directions for use. An alcohol and chlorhexidine product that is fast drying and has residual effect is preferred. *AORN*

Surgical attire

- Use surgical gowns and drapes that are effective barriers when wet (i.e., materials that resist liquid penetration). *CDC*

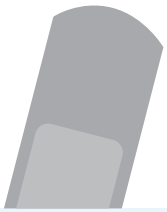
Surgical environment

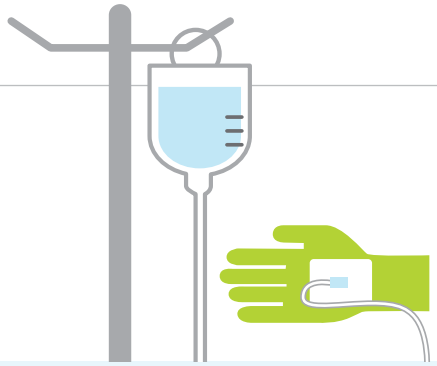
- Limit the number of personnel entering the operating room to necessary personnel. *CDC*

Surgical safety checklist

- Use a checklist based on the World Health Organization (WHO) checklist to ensure compliance with best practices to improve surgical patient safety. *SHEA*

Post-op phase





Patient

Patient temperature management

- Measure and document patient temperature on admission to recovery room and then every 15 minutes. *NICE*
- Actively warm patients with forced air warming to 36°C or until comfortably warm before discharge from recovery room. *NICE*

Wound cover/dressing

- Protect with a sterile dressing for 24 to 48 hours postoperatively an incision that has been closed primarily. *CDC*

Vascular access management

- Transparent semi-permeable polyurethane dressings permit continuous visual inspection of the catheter site, and require less frequent changes than do standard gauze and tape dressings. *CDC*
- Minimize contamination risk by scrubbing the access port with an appropriate antiseptic and accessing the port only with sterile devices. *CDC*
- Prepare clean skin with a >0.5% chlorhexidine preparation with alcohol before central venous catheter and peripheral arterial catheter insertion and during dressing changes unless there is a contraindication to chlorhexidine. *CDC*

Staff

Hand hygiene

- Wash hands before and after dressing changes and any contact with the surgical site. *CDC*

Operating room cleaning and environment monitoring

- Operating and procedure rooms must be cleaned after each patient. *AORN*
- Cleaning practices should be measured with qualitative measures (eg, visual observation, visual inspection, fluorescent marking) and quantitative measures (eg, culture, adenosine triphosphate [ATP] monitoring). Multiple measures should be used as part of a comprehensive assessment of environmental cleaning practices. *AORN*

Surveillance

- Perform surveillance for SSI. *SHEA*
- Provide ongoing feedback of SSI rates to surgical and perioperative personnel and leadership. *SHEA*

Quality sterile processing

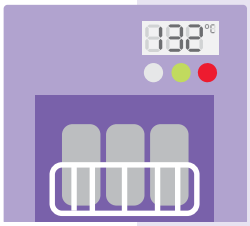
There are five essential steps in sterile processing: 1) **Clean**, 2) **Prep & Pack**, 3) **Sterilize**, 4) **Store**, and 5) **Use**.
The threat of SSIs caused by non-sterile devices makes following every step in the sterilization process absolutely critical.

Clean & Decontaminate

- Use cleaning agents that are capable of removing visible organic and inorganic residues. *CDC*
- Clean medical devices as soon as practical after use because soiled materials become dried onto the instruments. *CDC*
- Testing should be performed to assess efficacy of cleaning of medical devices. *AORN*

Prep/Pack

- Surgical instruments should be inspected and evaluated for cleanliness and functionality after decontamination. *AORN*
- Ensure that packaging materials are compatible with the sterilization process. *CDC*
- A chemical indicator should be placed on the outside and inside of every package to be processed unless the internal indicator is readable through the package material. *AORN*

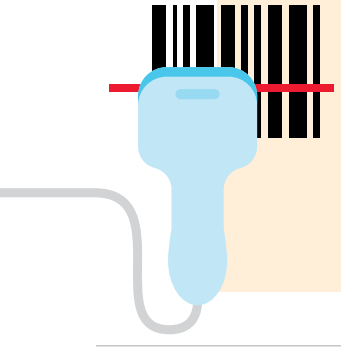


Sterilize

- Use mechanical, chemical and biologic monitors to ensure the effectiveness of the sterilization process. *CDC*
- A biological indicator (BI) within a process challenge device (PCD) should be used for weekly*, preferably daily routine efficacy testing and in every load containing implants. Loads containing implants should be quarantined until the BI results are known. *AAMI*
- Immediate use steam sterilization (IUSS) should be kept to a minimum and should be used only in selected clinical situations and in a controlled manner. *AORN*

Store

- Means of preserving the integrity and impermeability of the packaging by keeping the sterilized materials in appropriate storage must be available. *WHO*
- Ensure the sterile storage area is a well-ventilated area that provides protection against dust, moisture, insects and temperature and humidity extremes. *CDC*



Use/Track

- Include in a quality control program for sterilized items: a sterilizer maintenance contract with records of service; a system of process monitoring; a visual inspection of packaging materials; traceability of load contents. *CDC*
- Indicators should be used to determine sterility before item is introduced onto the sterile field…the nurse responsible should confirm the sterility by evaluating the sterility indicator. *WHO*

*Minimum requirement; some countries have adopted daily or every load biological monitoring, raising the standard of patient care.

References:

1 SHEA/IDSA Practice Recommendations: Strategies to prevent surgical site infections in acute care hospitals. Andersen, D., Podgorny, K., et al. Infection Control and Hospital Epidemiology 2014 June; 35(6): 605-627.
2 World Health Organization Guidelines for Safe Surgery 2009.
3 Centers for Disease Control and Prevention, Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008
4 The Association of perioperative Registered Nurses, Guidelines for PeriOperative Practice, 2016
5 National Institute for Health and Clinical Excellence Clinical Guideline 74 – Surgical Site Infection, 2008
6 National Institute for Health and Clinical Excellence Clinical Guideline 65 – Inadvertent Perioperative Hypothermia, 2008
7 Centers for Disease Control and Prevention, Guideline for Prevention Intravascular-Catheter Related infections, 2011
8 Association for the Advancement of Medical Instrumentation, Comprehensive guide to steam sterilization and sterility assurance in healthcare facilities, ANSI/AAMI ST79:2010 & A1:2010 & A2:2011 & A3:2012 & A4:2013

3M surgical care solutions

3M can help your facility reduce the risk of SSIs and improve outcomes for your patients. The 3M℠ Health Care Academy provides educational services, training resources and consultancy to improve your processes.

To learn more about our 3M℠ Health Care Academy educational offering, talk to your 3M representative or visit 3M.com/IPED.

Combined with our comprehensive portfolio of clinical solutions, we stand ready to partner with your facility to manage SSI-associated risk factors and provide appropriate clinical solutions that best fit your facility.

Two powerful agents, one effective product

Surgical hand antisepsis

3M™ Avagard™ Surgical and Healthcare Personnel Hand Antiseptic
(Chlorhexidine Gluconate 1% Solution and Ethyl Alcohol 61%, w/w)

The only FDA NDA approved hand antiseptic with two proven active ingredients for both immediate and long-term action, offering maximum protection while maintaining skin health and integrity. Its unique formulation makes it a good fit for surgical, invasive procedures and critical care areas.

Raise the standard, lower the nick rate

Hair removal

3M™ Surgical Clippers

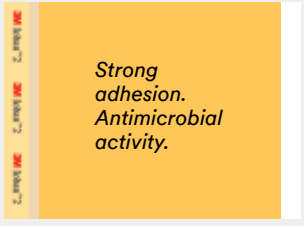
Maintain skin integrity during preoperative hair clipping. Clinically shown to lower infection rates compared to shaving.

Patient skin antisepsis

3M™ DuraPrep™ Surgical Solution
(Iodine povacrylex [0.7% available iodine] and isopropyl alcohol, 74% w/w)

A preoperative skin preparation that provides an effective antimicrobial kill in an easy-to-apply solution. Superior drape adhesion.

3M™ SoluPrep™ Antiseptic Solutions
(2% w/v chlorhexidine gluconate and 70% v/v isopropyl alcohol)



Antimicrobial incise drapes

3M™ Ioban 2™ Antimicrobial Incise Drapes

Skin flora is the leading cause of SSI. Creating a barrier with a 3M™ Ioban™ 2 Antimicrobial incise drape helps reduce the risk of bacteria transferring into the surgical wound.

A revolution in core temperature monitoring

Temperature monitoring

3M™ SpotOn™ Temperature Monitoring System

The system offers an easy, non-invasive, continuous method to accurately measure core temperature throughout the perioperative journey.

Blood/fluid warming

3M™ Ranger™ Blood and Fluid Warming Systems

Simple, flexible and reliable solutions for blood and fluid warming.

Proven patient warming

Patient warming

3M™ Bair Hugger™ Therapy

Maintaining a normal body temperature is vital when patients are undergoing complex surgical procedures. 3M™ Bair Hugger™ Therapy offers flexible temperature management solutions designed to achieve patient normothermia goals from pre-op, intra-op to post-op.

3M™ Bair Paws™ System

Patient gowning and clinical plus comfort warming in one easy step.

Surgical site dressings

3M™ Tegaderm™ Dressings Portfolio

Cover and protect surgical site wounds with dressings that provide protection of newly formed tissue. 3M wound care dressings have been synonymous with quality and performance for more than 30 years, offering easy-to-use, cost-effective solutions that support best practices and help improve patient outcomes.

Solutions to secure and protect

Vascular access

3M™ Vascular Access Solutions

Every I.V. site presents the potential for infection, dislodgement, skin damage, and other complications.

3M has a broad portfolio for I.V. site management: from skin preps and barrier films to securement devices, transparent dressings, and disinfecting caps. 3M Vascular Access Solutions help prevent the risks of costly complications, and improve patient satisfaction.

Your perfect partner in cleaning assurance

Instrument cleaning

3M™ Multi-Enzyme Cleaning Solutions

A broad range of multi-enzymatic cleaning solutions that ensure effective and rapid removal of biological soil, including biofilms on medical instruments. Suitable for automated cleaning systems and manual washing.

Cleaning monitoring

3M™ Clean-Trace™ ATP Cleaning Monitoring System

A rapid cleaning efficacy monitoring tool that measures cleanliness of medical devices, endoscopes, and environmental surfaces. In just 30 seconds, the 3M™ Clean-Trace™ ATP Cleaning Monitoring System can quantify the cleanliness of a surface or lumen sample using Adenosine Triphosphate (ATP) bioluminescence. The integrated software allows for tracking of data and report generation in support of process improvement efforts.

Raise standards, lower risk

Sterilization monitoring

3M™ Sterilization Monitoring Portfolio

A comprehensive range of reliable sterilization monitoring solutions to simplify processes and meet demands for quick turnarounds, while ensuring patients receive the highest standard of care.

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