Surgical Site Infection Prevention Guidelines, Recommendations and Resources

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DIVISION OF PUBLIC HEALTH

Recommendations were provided based on information known on 9.15.2023 and may become out of date.

Fingernails

Reference Source	
AORN AORN eGuidelines+ Guidelines for Perioperative Practice: Hand Hygiene 2022	Maintain healthy, short, natural fingernails. Keep fingernail tips no longer than 2 mm (0.08 inch). Do not wear artificial fingernails or extenders in the perioperative setting. Do not wear nail lacquer or enhanced nail lacquer while performing the scrub role. If wearing nail lacquer or enhanced nail lacquer is approved by the health care organization, the lacquershould be free of chips and cracks. Take measures to prevent hand dermatitis, to include: • using moisturizing skin care products compatible with hand hygiene products, • implementing practices that decrease skin irritation (eg, controlling water temperature,completely drying hands), • selecting less irritating hand hygiene products, and • participating in education on hand dermatitis prevention. Use moisturizing skin care products that are compatible with hand hygiene and surgical hand antisepsisproducts and are approved for use by the health care organization Control water temperature for hand hygiene between 70° F and 80° F After performing hand hygiene, completely dry hands before donning gloves.

Fingernails

Reference Source	
AST (Association of Surgical Technologists) Effective April 13, 2008 AST Standards of Practice for Surgical Attire, Surgical Scrub, Hand Hygiene and Hand Washing	**Fingernails** The fingernails should be kept clean, not extend beyond the fingertips and artificial nails should not be worn. Fingernails that are long and extend beyond the fingertips can puncture the gloves placing the patient at risk of SSI from exposure to the transient and resident skin flora. Additionally, long fingernails place the patient at risk for injury when the surgical team member is providing direct care to the patient, e.g. aiding the patient in moving from the stretcher to the OR bed, patient positioning, etc. The subungual has been identified as harboring the majority of microorganisms as compared to the skin of the hands and forearms. Debris should be removed from the subungual area with the use of a sterile, plastic single-use, disposable nail cleaner that is usually provided with the scrub brush package. Reusable nail cleaners are not recommended. Orangewood sticks should not be used to clean the fingernails due to the tendency of the wood to splinter and harbor Pseudomonas organisms. The fingernails should be cleaned under running water at the scrub sink. After use, the disposable nail cleaner should be disposed according to healthcare facility policy. The dirty nail cleaner should not be discarded into the scrub sink in order to prevent cross contamination. **Nail Polish/Artificial Nails** Nail polish, if worn, should be freshly applied and free of chips. Studies have not established a correlation between the wearing of freshly applied nail polish and an increase in microbial growth. However, nails with chipped polish or polish that has been worn for more than four days harbor a greater number of bacteria as compared to unpolished nails. Artificial nails and other types of artificial nail coverings, such as silk overlays should not be worn by any member of the surgical team, no matter what team role they are fulfilling **Jewelry** All jewelry including rings, bracelets, and watches should be removed prior to performing the surgical scrub

Surgical Attire

Reference Source	
Centers for Medicare and Medicaid Services(CMS)	The CMS Hospital Infection Control worksheet states: "Surgical attire (e.g., scrubs) and surgical caps/hoods covering all head and facial hair are worn by all personnel and visitors in semi restricted and restricted areas." "Surgical masks are worn fully covering mouth and nose by all personnel in restricted areas where open sterile supplies or scrubbed personnel are located."
The Joint Commission	The Joint Commission standards do not prescribe operating room dress\surgical attire. **Evidence-based guidelines and consensus statements** - If none of the situations above apply and are not specifically required by a Joint Commission standard (e.g., standard precautions or transmission-based precautions), organizations can choose which guidelines or consensus statements they will follow based on their own evaluation process. For example, the Association of Perioperative Registered Nurses (AORN) publishes Guidelines on Surgical Attire, the Association of Surgical Technologists (AST) has published Standards of Practice for Surgical Attire, and the American College of Surgeons have a Statement on Operating Room Attire **Facility policy** - Surveyors will survey to facility policy. It is expected that the policy is in compliance with the first three items stated above and, as applicable, the organization's chosen evidence-based guidelines and consensus statements.

Surgical Attire continued

Reference Source	
AORN AORN eGuidelines+ Guidelines for Perioperative Practice: Surgical Attire 2019	**Laundering** Wear clean surgical attire when entering the semi-restricted and restricted areas. After each daily use, launder scrub attire at • a health care–accredited laundry facility, • the health care organization according to state regulatory requirements, or • the health care organization according to Centers for Disease Control and Prevention recommendations for laundering in the absence of state requirements. Prevent contamination of laundered surgical attire during transport to the healthcare facility Transport laundered surgical attire in enclosed carts or containers and in vehicles that are cleaned and disinfected regularly Store laundered surgical attire in enclosed carts, cabinets, or dispensing machines that are cleaned and disinfected regularly Scrub attire that has been penetrated by blood, body fluids, or other potentially infectious materials must be removed immediately or as soon as possible, and replaced with clean attire Scrub attire contaminated with visible blood or body fluids must remain at the health care facility for laundering Remove surgical attire before leaving the health care facility No recommendation can be made regarding personal clothing worn under scrub attire Establish and implement a process for managing personal clothing that may be worn under scrub attire **Long Sleeves** Arms may be covered during performance of preoperative patient skin antisepsis. No recommendation can be made for wearing long sleeves in the semi-restricted and restricted areas other than during performance of preoperative patient skin antisepsis

Surgical Attire continued

Reference Source	
AORN AORN eGuidelines+ Guidelines for Perioperative Practice: Surgical Attire 2019	**Head Coverings** Cover the scalp and hair when entering the semi-restricted and restricted areas. Cover a beard when entering the restricted areas and while preparing and packaging items in the clean assembly section of the sterile processing area. No recommendation can be made for the type of head covers worn in the semi-restricted and restricted areas An interdisciplinary team, including members of the surgical team and infection preventionists, may determine the type of head covers that will be worn at the health care organization. Religious head coverings (e.g., head scarves [hijabs], veils, turbans, bonnets) that are clean, constructed of tightly-woven and low-linting material, are without adornments, and fit securely with loose ends tucked in the scrub top may be worn to cover the hair and scalp in the semi-restricted and restricted area. Remove head coverings at the end of the shift or when they are contaminated. **Shoes** Wear clean shoes when entering the semi-restricted or restricted areas. Wear protective footwear that meets the health care organization's safety requirements. Fluid-resistant shoe covers or boots must be worn in instances when gross contamination can reasonably be anticipated Shoe covers worn as PPE must be removed immediately after use. After removal, discard the shoe covers and perform hand hygiene **Identification Badges** Clean identification badges with a low-level disinfectant when the badge becomes soiled with blood, body fluids, or other potentially infectious materials. Determine the frequency for routine badge disinfection (e.g., daily, weekly). Clean lanyards with a low-level disinfectant when the lanyard becomes soiled with blood, body fluids, or other potentially infectious materials

Surgical Attire continued

Reference Source	
AORN AORN eGuidelines+ Guidelines for Perioperative Practice: Surgical Attire 2019	**Stethoscopes** Clean stethoscopes before each patient use according to the manufacturer's instructions for use. **Personal Items** Establish a process to prevent contamination of the semi-restricted and restricted areas from personal items (e.g., briefcases, backpacks). The process may include cleaning or containing the item or placing the item in a designated location. Clean cell phones, tablets, and other personal communication or hand-held electronic equipment according to the device manufacturer's instructions for use before these items are brought into the OR and perform hand hygiene. No recommendation can be made for whether a necklace may be worn in the semi-restricted and restricted areas **Visitor Attire** Visitors entering the semi-restricted or restricted areas of the surgical suite (e.g., law enforcement officers, parents, biomedical engineers) should don either clean surgical attire or a single-use jumpsuit (e.g., coveralls, bunny suit) designed to completely cover personal apparel.

Surgical Attire continued

Reference Source	
American College of Surgeons A Statement from the Meeting of ACS, AORN, ASA, APIC, AST, and TJC Concerning Recommendations for Operating Room Attire February 27, 2018	Over the past two years, as recommendations were implemented, it became increasingly apparent that in practice, covering the ears is not practical for surgeons and anesthesiologists and in many cases counterproductive to their ability to perform optimally in the OR. Furthermore, in reassessing the strength of the evidence for this narrowly defined recommendation, the group concluded the following: • Evidence-based recommendations on surgical attire developed for perioperative policies and procedures are best created collaboratively, with a multi-disciplinary team representing surgery, anesthesia, nursing, and infection prevention. • The requirement for ear coverage is not supported by sufficient evidence. • At present, available scientific evidence does not demonstrate any association between the type of hat or extent of hair coverage and SSI rates. One recent study* on head coverings (disposable bouffant or skullcap, cloth cap), identified that the commonly available disposable bouffant hat is the least effective barrier to transmission of particles. • Other issues regarding areas of surgical attire need further evaluation.

Surgical Attire continued

Reference Source	
AST (Association of Surgical Technologists) Effective April 13, 2008 AST Standards of Practice for Surgical Attire, Surgical Scrub, Hand Hygiene and Hand Washing	Surgical attire that should be worn in the semi-restricted and restricted areas of the surgery department includes the head cover, masks, scrub suit, warm-up jacket, and shoes. **Head Covering** The surgical head cover or hood should be lint-free and cover all head and facial hear. Head covers prevent the shedding of hair, squamous cells, and/or dandruff onto the scrub suit. Surgeons (skull) caps/head covers are not recommended for use. The determination is that the surgeons head cover does not completely cover the hair exposing the patient to the possibility of acquiring a SSI Disposable bouffant and hood head covers offer complete coverage of the head and facial hair and should be worn by all OR personnel. It is recommended that surgery personnel with facial hair wear a disposable hood to completely cover the facial hair. The practice of allowing the use or not allowing the use of reusable cloth caps is governed by the healthcare facility policies and procedures. However, it is recommended that reusable cloth covers should not be worn. • If worn, reusable cloth head covers should be laundered daily in the healthcare facility laundry services or third party health-care accredited laundry facility that is contracted by the healthcare facility **Masks** The mask must be worn at all times in restricted areas including the sub sterile rooms and scrub sinks. The mask will only be effective when properly worn

Surgical Attire continued

Reference Source	
AST (Association of Surgical Technologists) Effective April 13, 2008 AST Standards of Practice for Surgical Attire, Surgical Scrub, Hand Hygiene and Hand Washing	**Laundry** Healthcare facility approved clean, freshly laundered surgical scrub suit designated for wear in the perioperative environment should be worn by surgical personnel who will enter the semi-restricted and restricted areas. Surgical attire fabric should be free of lint, provide comfort and allow for "breathability" (allow the escape of body heat) while containing the shedding of skin squames. The scrub suit should be donned in the healthcare facility designated changing room. Changing from street clothes to the scrub suit in the designated room aids in decreasing contamination of the environment. Whenever leaving the healthcare facility, the surgical personnel should change into street clothes. A used scrub suit should not be stored in a locker or hung in the changing room to be worn again. Non-sterile surgical team members (anesthesia provider, circulator) should wear a healthcare facility approved, freshly laundered long-sleeved warmup jacket in the semi-restricted and restricted areas. **Shoes** Surgical personnel who wear footwear that is designated for use only in the surgery department must make sure the footwear meets healthcare facility standards. Sandals, shoes made of soft materials, and open toe and open heel shoes should not be worn in the surgery department. Surgical personnel are responsible for keeping the footwear clean and in good repair. Gross contaminants should be cleaned from the footwear as soon as possible and not be allowed to build-up on the surface. If footwear is specifically designated for use in the surgery department and worn without shoe covers, the footwear must not be work outside the department

Pre-Operative Hair Removal

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Do not shave incision site. Hair should not be removed preoperatively unless the hair at or around the incision site will interfere with the operation. Any necessary hair removal should be done immediately before the operation, preferably with electric clippers. A razor should not be used. Patients should be instructed not to shave the operative site themselves because shaving with a razor increases their risk of infection
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Do not remove hair at the operative site unless the presence of hair will interfere with the surgical procedure. (Quality of evidence: HIGH) If hair removal is necessary, remove outside of the operating room by clipping. Do not use razors. (Quality of evidence: HIGH)
JAMA (Journal of the American Medical Association) Surgical Site Infection Prevention A Review (2023)	Do not remove hair at the surgical site unless the presence of hair will affect the procedure If hair removal is necessary, it should be removed in the preoperative holding area and not in the operating room.
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Routine hair removal before surgery does not reduce SSI rates, but should be preferably performed—if deemed necessary—by use of clippers rather than razors immediately before surgery

Staph Aureus Decolonization

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Decolonize surgical patients with an anti-staphylococcal agent in the preoperative setting for orthopedic and cardiothoracic procedures. (Quality of evidence: HIGH) Decolonize surgical patients in other procedures at high risk of staphylococcal SSI, such as those involving prosthetic material. (Quality of evidence: LOW)
JAMA (Journal of the American Medical Association) Surgical Site Infection Prevention A Review (2023)	Decolonize surgical patients with intranasal antistaphylococcal agent and antistaphylococcal skin antiseptic for high-risk procedures (e.g., cardiothoracic, orthopedic). This process typically includes an intranasal treatment with an antistaphylococcal agent (e.g., mupirocin ointment or povidone iodine) and/or application of an antistaphylococcal skin antiseptic agent (e.g., chlorhexidine gluconate solution or wipes) for 5 days. However, the precise timing, agent, and frequency of application are unclear because trials addressing this issue have used different strategies. The decolonization strategy should be completed as close to the surgical procedure as possible.

Surgical Hand Antisepsis

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Use appropriate antiseptic agent to perform preoperative surgical scrub. For most products, scrub the hands and forearms for 2–5 minutes. (Quality of evidence: MODERATE)
AST (Association of Surgical Technologists) Effective April 13, 2008 AST Standards of Practice for Surgical Attire, Surgical Scrub, Hand Hygiene and Hand Washing	The healthcare facility should provide an FDA-approved scrub solution that has immediate, cumulative and persistent antimicrobial action for use by the surgical personnel. Surgical team members should perform a standardized surgical scrub procedure based upon manufacturer's written instructions that are specific to the scrub solution to be used and according to healthcare facility policy and procedures.

Hand Hygiene

Reference Source	
AORN AORN eGuidelines+ Guidelines for Perioperative Practice: Hand Hygiene 2022	Take measures to prevent hand dermatitis, to include: • using moisturizing skin care products compatible with hand hygiene products, • implementing practices that decrease skin irritation (eg, controlling water temperature,completely drying hands), • selecting less irritating hand hygiene products, and • participating in education on hand dermatitis prevention. Use moisturizing skin care products that are compatible with hand hygiene and surgical hand antisepsisproducts and are approved for use by the health care organization Control water temperature for hand hygiene between 70° F and 80° F After performing hand hygiene, completely dry hands before donning gloves.

Normothermia

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	For procedures not requiring hypothermia, maintain normothermia (temperature > 35.5°C) during the perioperative period. (Quality of evidence: HIGH)
JAMA (Journal of the American Medical Association) Surgical Site Infection Prevention A Review (2023)	Maintain normothermia during the surgical procedure Normothermia to keep core body temperatures from dropping during surgery is maintained by combinations of forced warm air, skin warming, and warmed intravenous fluids (Table 2). Targets for core temperatures vary: more than 35.5 °C and more than 36 °C.
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Reliable temperature monitoring should be undertaken in all colorectal surgical patients and methods to actively warm patients to avoid intraoperative hypothermia should be employed. Accurate measurement of temperature is fundamental. Core temperature measurements are best carried out directly (or using a direct estimate) rather than using indirect estimate. Another area to minimize IPH is the use of prewarming.
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	Maintain perioperative normothermia. (Category IA–strong recommendation; high to moderate–quality evidence.)

Blood Glucose Control

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Preoperative diabetes screening can be performed for women at high risk who have not been recently screened Implement perioperative glycemic control and use blood glucose target levels of less than 200 mg/dL in patients with and without diabetes
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Control blood-glucose level during the immediate postoperative period for all patients. (Quality of evidence: HIGH) Monitor and maintain postoperative blood-glucose level regardless of diabetes status. Maintain postoperative blood-glucose level between 110 and 150 mg/dL. Increased glucose levels during the operational procedure are associated with higher levels in the postoperative setting
JAMA (Journal of the American Medical Association) Surgical Site Infection Prevention A Review (2023)	Maintain and monitor blood glucose levels regardless of diabetes Status. Maintain blood glucose values between 110 and 150 mg/dL
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Hyperglycaemia is a risk factor for complications and should therefore be avoided. Several interventions in the ERAS protocol prevent insulin resistance, thereby improving glycaemic control with no risk of causing hypoglycaemia. For in patients, insulin should be used judiciously to maintain blood glucose as low as feasible with the available resources.
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	3A.1. Implement perioperative glycemic control and use blood glucose target levels less than 200 mg/dL in patients with and without diabetes. (Category IA–strong recommendation; high to moderate–quality evidence.) 3A.2. The search did not identify randomized controlled trials that evaluated lower (<200mg/dL) or narrower blood glucose target levels than recommended in this guideline nor the optimal timing, duration, or delivery method of perioperative glycemic control for the prevention of SSI. (No recommendation/unresolved issue.) 3B. The search did not identify randomized controlled trials that evaluated the optimal hemoglobin A1C target levels for the prevention of SSI in patients with and without diabetes. (No recommendation/unresolved issue.)
ACS American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update	Hyperglycemia in the immediate preoperative period is associated with an increased risk of SSI. Target perioperative blood glucose should be between 110-150 mg/dL in all patients, regardless of diabetic status, except in cardiac surgery patients where the target perioperative blood glucose is <180 mg/dL Target blood glucose rates <110mg/dL have been tied to adverse outcomes.

Minimizing Operating Room Traffic

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Increased traffic in the operating room may increase infection risk. Implementation of a safety bundle that included decreasing the operating room door opening was associated with decreased surgical site infections
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Minimize operating room traffic. (Quality of evidence: LOW)

Preoperative and Intraoperative Bathing

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Advise patients to shower or bathe (full body) with soap (antimicrobial or nonantimicrobial) or an antiseptic agent on at least the night before abdominal surgery Perform preoperative surgical site skin preparation with an alcohol-based agent unless contraindicated. Chlorhexidine–alcohol is an appropriate choice.
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	8A.1. Advise patients to shower or bathe (full body) with soap (antimicrobial or nonantimicrobial) or an antiseptic agent on at least the night before the operative day. (Category IB–strong recommendation; accepted practice.) 8A.2. Randomized controlled trial evidence suggested uncertain trade-offs between the benefits and harms regarding the optimal timing of the preoperative shower or bath, the total number of soap or antiseptic agent applications, or the use of chlorhexidine gluconate washcloths for the prevention of SSI. (No recommendation/unresolved issue.)

Intraoperative Skin Prep

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Perform preoperative surgical site skin preparation with an alcohol-based agent unless contraindicated. Chlorhexidine–alcohol is an appropriate choice.
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Use alcohol-containing preoperative skin preparatory agents in combination with an antiseptic. (Quality of evidence: HIGH) Wash and clean skin around incision site. Use a dual agent skin prep containing alcohol unless contraindications exist. (Quality of evidence: HIGH) Alcohol is highly bactericidal and effective for preoperative skin antisepsis, but it does not have persistent activity when used alone. Rapid, persistent, and cumulative antisepsis can be achieved by combining alcohol with CHG or an iodophor.
JAMA (Journal of the American Medical Association) Surgical Site Infection Prevention A Review (2023)	Using chlorhexidine gluconate and alcohol-containing skin preparatory agent in combination Topical alcohol is highly bactericidal but does not have persistent activity when used as monotherapy for skin antisepsis (Table 3). Multiple guidelines recommend that surgical site antisepsis should be performed with a product that contains alcohol and another antiseptic agent (eg, chlorhexidine gluconate or povidone iodine).
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Skin disinfection should be performed using chlorhexidine–alcohol-based preparations.
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	8B. Perform intraoperative skin preparation with an alcohol-based antiseptic agent unless contraindicated. (Category IA–strong recommendation; high-quality evidence.) 8C. Application of a microbial sealant immediately after intraoperative skin preparation is not necessary for the prevention of SSI. (Category II–weak recommendation; low-quality evidence suggesting a trade-off between clinical benefits and harms.)

Antimicrobial Prophylaxis

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Antimicrobial prophylaxis generally is defined as a brief course of an antimicrobial agent initiated within 1 hour before a procedure begins. The use of a weight-based dosage is recommended. For lengthy procedures, additional intraoperative doses of an antibiotic, given at intervals of two times the half-life of the drug measured from the initiation of the preoperative dose, not from the onset of surgery, are recommended to maintain adequate levels throughout the operation In surgical cases with excessive blood loss, a second dose of the prophylactic antibiotic may be appropriate.
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Administer antimicrobial prophylaxis according to evidence-based standards and guidelines. (Quality of evidence: HIGH) Increase dosing of prophylactic antimicrobial agent for morbidly obese patients. (Quality of evidence: HIGH) Administer only when indicated. Select appropriate agents based on surgical procedure, most common pathogens causing SSI for a specific procedure, and published recommendations. Administer within 1 hour of incision to maximize tissue concentration. Discontinue antimicrobial agents after incisional closure in the operating room Re-dose prophylactic antimicrobial agents for lengthy procedures and in cases with excessive blood loss during the procedure (i.e., >1,500 mL).
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Intravenous antibiotic prophylaxis should be given within 60 min before incision as a single-dose administration to all patients undergoing colorectal surgery. In addition, in patients receiving oral mechanical bowel preparation, oral antibiotics should be given. No recommendation for the use of oral antibiotic decontamination can be given for patients having no bowel preparation.

Antimicrobial Prophylaxis continued

Reference Source	
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	**Parenteral Antimicrobial Prophylaxis** 1A.1. **Administer preoperative antimicrobial agents only when indicated based on published clinical practice guidelines** and timed such that a bactericidal concentration of the agents is established in the serum and tissues when the incision is made. (Category IB–strong recommendation; accepted practice.) 1A.2. No further refinement of timing can be made for preoperative antimicrobial agents based on clinical outcomes.(No recommendation/ unresolved issue.) 1B. **Administer the appropriate parenteral prophylactic antimicrobial agents before skin incision in all cesarean section procedures**. (Category IA–strong recommendation; high-quality evidence.) 1C. The literature search did not identify randomized controlled trials that evaluated the benefits and harms of weight-adjusted parenteral antimicrobial prophylaxis dosing and its effect on the risk of SSI. (No recommendation/unresolved issue.) 1D. The search did not identify sufficient randomized controlled trial evidence to evaluate the benefits and harms of intraoperative redosing of parenteral prophylactic antimicrobial agents for the prevention of SSI. (No recommendation/unresolved issue.) 1E. **In clean and clean-contaminated procedures, do not administer additional prophylactic antimicrobial agent doses after the surgical incision is closed in the operating room, even in the presence of a drain.** (Category IA–strong recommendation; high-quality evidence.)

Antimicrobial Prophylaxis continued

Reference Source	
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	**Nonparenteral Antimicrobial Prophylaxis** 2A.1. **Randomized controlled trial evidence suggested uncertain trade-offs between the benefits and harms regarding intraoperative antimicrobial irrigation (e.g., intra-abdominal, deep, or subcutaneous tissues) for the prevention of SSI.** (No recommendation/unresolved issue.) 2A.2. The search did not identify randomized controlled trials that evaluated soaking prosthetic devices in antimicrobial solutions before implantation for the prevention of SSI. (No recommendation/ unresolved issue.) 2B.1. Do not apply antimicrobial agents (ie, ointments, solutions, or powders) to the surgical incision for the prevention of SSI. (Category IB–strong recommendation; low-quality evidence.) 2B.2. Application of autologous platelet-rich plasma is not necessary for the prevention of SSI. (Category II–weak recommendation; moderate-quality evidence suggesting a trade-off between clinical benefits and harms.) 2C. Consider the use of triclosan-coated sutures for the prevention of SSI. (Category II–weak recommendation; moderate-quality evidence suggesting a trade-off between clinical benefits and harms.) 2D. Randomized controlled trial evidence suggested uncertain tradeoffs between the benefits and harms regarding antimicrobial dressings applied to surgical incisions after primary closure in the operating room for the prevention of SSI. (No recommendation/ unresolved issue.)

Aseptic Technique

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Surgeons should wash, prep, or scrub their hands and forearms up to the elbows according to manufacturer recommendations. Rigorous adherence to the principles of asepsis by all scrubbed personnel is essential to surgical site infection prevention.
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Adhere to standard principles of operating room asepsis (Quality of evidence: LOW)

Operating Room Design

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Ventilation: Follow American Institute of Architects' recommendations for proper air handling in the operating room

Incisional Negative Pressure Wound Dressings

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Consider use of negative-pressure dressings in patients who may benefit. (Quality of Evidence: MODERATE) Negative-pressure dressings placed over closed incisions are thought to work by reducing fluid accumulation in the wound. Recent systematic reviews have demonstrated a significant reduction in SSI with their use. These dressings have been particularly noted to reduce SSIs in patients who have undergone abdominal surgery and joint arthroplasty
JAMA (Journal of the American Medical Association) Surgical Site Infection Prevention A Review (2023)	Application of incisional negative pressure wound dressings

Hysterectomy-Specific Questions

Screening for Bacterial Vaginosis

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Perioperative screening for bacterial vaginosis with treatment if present can be considered before hysterectomy as a possible means to decrease surgical site infections. Women with bacterial vaginosis have an increase in the vaginal concentration of microorganisms such as Gardnerella vaginalis, anaerobic microorganisms, and the genital mycoplasmas, which are potential pathogens that can cause postprocedural infection. In older studies performed before routine antibiotic prophylaxis, bacterial vaginosis was a clear risk factor for surgical site infection after hysterectomy (6, 46). In one study of patients who did not receive antimicrobial prophylaxis, preoperative and postoperative treatment of bacterial vaginosis with rectal metronidazole for at least 4 perioperative days significantly reduced vaginal cuff infection among women with abnormal vaginal flora but had no effect on the rate of wound infections. This study has not been replicated with the routine use of systemic antibiotic prophylaxis. However, given the low risk of bacterial vaginosis screening and treatment, screening for bacterial vaginosis during the preoperative visit and initiation of therapy with metronidazole or one of the other CDC-recommended treatment regimens can be considered. If the therapy duration of 5–7 days encroaches on the scheduled time for surgery, it would be reasonable to continue therapy perioperatively for at least 4 days.

Pre- and Intraoperative Antimicrobial Agents

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Patients undergoing vaginal, abdominal, laparoscopic, or robotic hysterectomy, including supracervical hysterectomy, should receive single-dose antimicrobial prophylaxis. Single-dose cefazolin is currently recommended as the prophylactic antibiotic of choice for hysterectomy. The combination of metronidazole or clindamycin plus gentamicin or aztreonam is recommended for patients in whom cephalosporins are contraindicated

HYST Vaginal Prep Practices

Reference Source	
ACOG Prevention of infection after gynecologic procedures. (2018). *The American College of Obstetricians and Gynecologists*, *131*(6).	Vaginal cleansing with either 4% chlorhexidine gluconate or povidone–iodine should be performed before hysterectomy or vaginal surgery. Currently, only povidone–iodine preparations are approved by the U.S. Food and Drug Administration (FDA) for vaginal surgical site antisepsis. In the United States, 4% chlorhexidine gluconate soap (containing 4% isopropyl alcohol) is often used off-label to prepare the vagina in women with iodine allergy, and some U.S. institutions prefer it for routine cases. To avoid irritation, chlorhexidine gluconate with high concentrations of alcohol (eg, 70% isopropyl alcohol, commonly used for skin preparation) is contraindicated for surgical preparation of the vagina. However, solutions that contain lower concentrations, such as the commonly used 4% chlorhexidine gluconate soap containing 4% alcohol, are usually well tolerated and may be used for vaginal surgical preparation as an alternative to iodine-based preparations in cases of allergy or when preferred by the surgeon.
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Use antiseptic-containing preoperative vaginal preparation agents for patients undergoing cesarean delivery or hysterectomy. (Quality of evidence: MODERATE) Use of povidone-iodine or CHG-based vaginal preparation agents immediately before cesarean delivery reduces endometritis by 59%, with possibly even greater benefit among women in labor. Products should be chosen and used in accordance with manufacturer's instructions for use. Vaginal preparation with antiseptic solution is also recommended for elective hysterectomy

Closing HYST Case

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	All members of the operative team should double glove and change gloves when perforation is noted (Quality of evidence: LOW)

Colon Procedure Specific Questions

Preoperative Mechanical Bowel Preparation (MBP) Regimen

Reference Source	
ASCRS and SAGES Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and the Society of American Gastrointestinal and Endoscopic Surgeons 2023 update	Mechanical bowel preparation combined with preoperative oral antibiotics is typically recommended prior to elective colorectal resection. Grade of recommendation: strong recommendation based on moderate-quality evidence
ASCRS The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the Use of Bowel Preparation in Elective Colon and Rectal Surgery Updated 2019	**MBP combined with preoperative oral antibiotics is typically recommended for elective colorectal resections. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B.** Preoperative MBP alone, without oral antibiotics, is generally not recommended for patients undergoing elective colorectal surgery. Grade of Recommendation: Strong recommendation based on high-quality evidence, 1A. Preoperative oral antibiotics alone, without mechanical preparation, are generally not recommended for patients undergoing elective colorectal surgery. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C. Preoperative enemas alone, without MBP and oral antibiotics, are generally not recommended for patients undergoing elective colorectal surgery. Grade of Recommendation: Weak recommendation based on moderate-quality evidence, 2B.
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Use a combination of parenteral and oral antimicrobial prophylaxis prior to elective colorectal surgery to reduce the risk of SSI. (Quality of evidence: HIGH) Mechanical bowel preparation without use of oral antimicrobial agents does not decrease the risk of SSI
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Mechanical bowel preparation alone with systemic antibiotic prophylaxis has no clinical advantage and can cause dehydration and discomfort and should not be used routinely in colonic surgery but may be used for rectal surgery. **There is some evidence from randomized controlled trials to support the use of a combination of MBP and oral antibiotics over MBP alone.** In patients receiving oral mechanical bowel preparation, oral antibiotics should be given. No recommendation for the use of oral antibiotic decontamination can be given for patients having no bowel preparation.

Closing COLO Case

Reference Source	
ACS American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update	**Gloves/Gown Change** The use of double gloves is recommended. Changing gloves before closure in colorectal cases is recommended, however, rescrubbing before closure in colorectal cases is not recommended. **New Closing Tray/Instrumentation** The use of new instruments for closure in colorectal cases is recommended.
ASCRS Reducing Surgical Site Infection: Where Do I Look?	Perioperative list of elements to consider in developing a comprehensible approach to reducing rates of SSI: • Gown/glove change • New closing trays
AORN An Incision Closure Bundle for Colorectal Surgery 2018	Outer surgical glove change before incision closure Use of a dedicated sterile incision closure instrument tray
JAMA The Preventive Surgical Site Infection Bundle in Colorectal Surgery: An Effective Approach to Surgical Site Infection Reduction and Health Care Cost Savings	Colorectal surgery: At the time of wound closure, surgeons and scrub staff underwent a gown and glove change. (pg. 1047) Colorectal surgery: dedicated wound closure tray used to close the fascia and skin. (pg. 1047)

Additional Recommendations

Intraoperative Irrigation

Reference Source	
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	9A. Consider intraoperative irrigation of deep or subcutaneous tissues with aqueous iodophor solution for the prevention of SSI. Intraperitoneal lavage with aqueous iodophor solution in contaminated or dirty abdominal procedures is not necessary. (Category II–weak recommendation; moderate-quality evidence suggesting a trade-off between clinical benefits and harms.)
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Perform intraoperative antiseptic wound lavage (Quality of evidence: MODERATE)

Plastic Adhesive Drapes

Reference Source	
CDC Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017	8D. The use of plastic adhesive drapes with or without antimicrobial properties is not necessary for the prevention of SSI. (Category II–weak recommendation; high to moderate–quality evidence suggesting a trade-off between clinical benefits and harms.)
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Available evidence does not support the practice of preoperative antiseptic shower or adhesive drapes

Auditing Recommendations

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Provide ongoing SSI rate feedback to surgical and perioperative personnel and leadership. (Quality of evidence: MODERATE) • Routinely audit and provide confidential feedback on SSI rates or SIRs ***AND*** adherence to process measures to individual surgeons, the surgical division and/or department chiefs, and hospital leadership Measure and provide feedback to HCP regarding rates of compliance with process measures (Quality of evidence: LOW) • Routinely provide feedback to surgical staff, perioperative personnel, and leadership regarding compliance with targeted process measures Observe and review operating-room personnel and the environment of care in the operating room and in central sterile reprocessing. (Quality of evidence: LOW) Perform direct observation audits of operating-room personnel to assess operating-room processes and practices to identify infection control lapses, including but not limited to adherence to process measures • antimicrobial prophylaxis choice • timing and duration protocols • Hair removal • surgical hand antisepsis • patient skin preparation, • operative technique • surgical attire (wearing and/or laundering outside the operating room) • level of operating- room traffic. Perform remediation when breaches of standards are identified. Operating-room personnel should include surgeons, surgical technologists, anesthesiologists, circulating nurses, residents, medical students, trainees, and device manufacturer representatives.

Auditing Recommendations continued

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Perform direct observation audits of environmental cleaning practices in the operating room, instrument reprocessing (sterilization) area, and storage facilities. Review instrument reprocessing and flash sterilization or immediate-use steam sterilization (IUSS) logs. Review maintenance records for operating room heating, ventilation, and air conditioning (HVAC) system including, results of temperature, relative humidity, and positive air pressure maintenance testing in the operating rooms(s). Provide feedback and review infection control measures with operating-room and environmental personnel.

Auditing Recommendations continued

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Observe and review practices in the preoperative clinic, postanesthesia care unit, surgical intensive care unit, and/or surgical ward. (Quality of evidence: MODERATE) • Perform direct observation audits of hand-hygiene practices among all HCP with direct patient contact. • Evaluate wound care practices. • Perform direct observation audits of environmental cleaning practices. Provide feedback and review infection control measures with HCP in these perioperative care settings
ERAS Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018	Collection of key outcome and process data used for repeated audit and feedback is essential to drive change for improvements and to know and control practice. Outcomes (complications and mortality 30 days) and processes should be audited and feed back to all healthcare providers on a regular basis when driving change or implementing ERAS programmes, as well as for sustaining improvements.

Education Recommendations

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Educate surgeons and perioperative personnel about SSI prevention measures. (Quality of evidence: LOW) • Include risk factors, outcomes associated with SSI, local epidemiology (eg, SSI rates by procedure, rate of methicillin- resistant Staphylococcus aureus [MRSA] infection in a facility), and essential prevention measures. Educate patients and their families about SSI prevention as appropriate. (Quality of evidence: LOW) • Provide instructions and information to patients prior to surgery describing strategies for reducing SSI risk. • Specifically provide preprinted materials to patients

Policy Recommendations

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Implement policies and practices to reduce the risk of SSI for patients that align with applicable evidence-based standards, rules and regulations, and medical device manufacturer instructions for use. (Quality of evidence: MODERATE) Implement policies and practices to reduce modifiable risk factors (Table 1), including the following: • Optimally disinfect the hands of the surgical team members. • Adhere to hand hygiene practices, including non-surgeon • members of the operating team. • Reduce unnecessary traffic in operating rooms. • Avoid use of nonsterile water sources in the operating room. • Properly care for and maintain the operating rooms, including appropriate air handling, pressure relative to hallway, temperature, humidity, and optimal cleaning and disinfection of equipment and the environment. • Maintain asepsis from the start of preparation of surgical instruments on the sterile field through wound closure and dressing. • Establish a robust infection control risk assessment program focused on mitigating risk during construction projects. • Proactively address potential risks from supply-chain shortages and communicate to frontline teams. • Discuss any staffing shortages and potential impact on outcomes as they relate to compliance with SSI prevention measures

SSI Risk Assessment

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Perform an SSI risk assessment. (Quality of Evidence: LOW) Convene a multidisciplinary team (eg, surgical leadership, hospital administration, quality management services, and infection control) to identify gaps, improve performance, measure compliance, assess impacts of interventions, and provide feedback

Use a checklist and/or bundle

Reference Source	
SHEA Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update	Use a checklist and/or bundle to ensure compliance with best practices to improve surgical patient safety. (Quality of evidence: HIGH) • The World Health Organization (WHO) checklist is a 19- item surgical safety checklist to improve adherence with best practices • A multicenter, quasi-experimental study conducted across 8 countries demonstrated that use of the WHO checklist led to lower surgical complication rates, including SSI and death. • These findings have been confirmed in subsequent single- and multicenter quasi-experimental studies. Overall, the use of bundles can reduce SSI, but the exact elements needed in a bundle are unknown. This issue is important because some elements have considerable cost and logistical implications, so it is important to understand the impact of individual elements outside a bundle.
JAMA (Journal of the American Medical Association) Surgical Site Infection Prevention A Review (2023)	Use a checklist based on the World Health Organization 19-item surgical checklist to ensure adherence to best practices
ASCRS and SAGES Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and the Society of American Gastrointestinal and Endoscopic Surgeons 2023 update	A bundle of measures should be in place to reduce SSI. Grade of recommendation: strong recommendation based on moderate-quality evidence Higher rates of compliance with specific bundle elements within SSI prevention bundles have repeatedly been associated with significantly lower SSI rates