

## Overview Guidelines Prevention of Surgical Site Infections (02/2024)

	<b>WHO</b>	<b>CDC/HICPAC</b>	<b>SHEA/IDSA/APIC</b>	<b>NICE</b>
Issued/last updated	2018	August 2017	2022	April 2019 (August 2020)
Literature included up to	December 2013 - October 2015, April 2018 (Oxygen)	April 2014	August 2021	not mentioned
Preoperative showering/bathing	It is good clinical practice for patients to bathe or shower prior to surgery. The panel suggests that either plain soap or an antimicrobial soap may be used for this purpose. The panel decided not to formulate a recommendation on the use of CHG impregnated cloths for the purpose of reducing SSI due to the very low quality of evidence.	Advise patients to shower or bathe (full body) with soap (antimicrobial or non-antimicrobial) or an antiseptic agent on at least the night before the operative day. 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.	Data are mixed on at-home preoperative bathing with CHG-containing products alone for patients not known to be colonized with <i>Staphylococcus aureus</i> . Preoperative bathing with agents such as CHG has been shown to reduce bacterial colonization of the skin. Several studies have examined the utility of preoperative showers, but none has definitively proven that they decrease SSI risk. A Cochrane review evaluated the evidence for preoperative bathing or showering with antiseptics for SSI prevention. Six RCTs evaluating 4%CHG use were included in the analysis, with no clear evidence of benefit noted. Several of these studies had methodologic limitations and were conducted several years ago. Thus, the role of preoperative bathing in SSI prevention remains uncertain.	Advise patients to shower or have a bath (or help patients to shower, bath or bed bath) using soap, either the day before, or on the day of, surgery.
Decolonization	The panel recommends that patients undergoing cardiothoracic and orthopaedic surgery with known nasal carriage of <i>S. aureus</i> should receive perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash. The panel suggests considering to		Decolonize surgical patients with an antistaphylococcal agent in the preoperative setting for orthopedic and cardiothoracic procedures. Decolonize surgical patients for other procedures at high risk of staphylococcal SSI, such as those involving prosthetic material. Published data are most supportive	Consider nasal mupirocin in combination with a chlorhexidine body wash before procedures in which <i>Staphylococcus aureus</i> is a likely cause of a surgical site infection.

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	treat also patients with known nasal carriage of <i>S. aureus</i> undergoing other types of surgery with perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash.		of using intranasal mupirocin and chlorhexidine bathing. The strongest data recommend up to 5 days of intranasal mupirocin (twice daily) and bathing with chlorhexidine gluconate (CHG) (daily).	
Hair removal	The panel recommends that in patients undergoing any surgical procedure, hair should either not be removed or, if absolutely necessary, it should be removed only with a clipper. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room.		Do not remove hair at the operative site unless the presence of hair will interfere with the surgical procedure. If hair removal is necessary in elective procedures, remove hair outside the operating room using clippers or a depilatory agent. Razors may be acceptable for hair removal in a subset of procedures (e.g., procedures involving male genitalia).	Do not use hair removal routinely to reduce the risk of surgical site infection. If hair has to be removed, use electric clippers with a single-use head on the day of surgery. Do not use razors for hair removal, because they increase the risk of surgical site infection.
Bowel preparation: mechanical	The panel recommends that mechanical bowel preparation alone (without administration of oral antibiotics) should not be used for the purpose of reducing SSI in adult patients undergoing elective colorectal surgery.		Mechanical bowel preparation without use of oral antimicrobial agents does not decrease the risk of SSI. A recent prospective randomized multicenter trial confirmed earlier meta-analysis findings, with significantly higher SSI and anastomotic leakage in patients who received mechanical bowel preparation without oral antimicrobial agents.	Do not use mechanical bowel preparation routinely to reduce the risk of surgical site infection.
Bowel preparation: antibiotic	The panel suggests that preoperative oral antibiotics combined with mechanical bowel preparation should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery.		Use a combination of parenteral and oral antimicrobial prophylaxis prior to elective colorectal surgery. Use of combination parenteral and oral antimicrobial agents to reduce the risk of SSI should be considered in any surgical procedure where entry into the colon is possible or	

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			likely, as in gynaecologic oncology surgery.	
Antibiotic prophylaxis	The panel recommends that SAP should be administered prior to the surgical incision when indicated (depending on the type of operation).	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.	Administer antimicrobial prophylaxis according to evidence-based standards and guidelines. Do not routinely use vancomycin for antimicrobial prophylaxis.	Give antibiotic prophylaxis to patients before: clean surgery involving the placement of a prosthesis or implant, clean-contaminated surgery, contaminated surgery. Do not use antibiotic prophylaxis routinely for clean non-prosthetic uncomplicated surgery.
<i>Timing ABP</i>	The panel recommends the administration of SAP within 120 minutes before incision, while considering the half-life of the antibiotic.	Timed such that a bactericidal concentration of the agents is established in the serum and tissues when the incision is made. No further refinement of timing can be made for preoperative antimicrobial agents based on clinical outcomes.	Begin administration within 1 hour prior to incision to maximize tissue concentration. Administering an antimicrobial agent <1 hour prior to incision is effective, some studies show superior efficacy for administration between 0 and 30 minutes prior to incision compared with 30 and 60 minutes. Two hours are allowed for vancomycin and fluoroquinolones. For cesarean delivery, administer antimicrobial prophylaxis prior to skin incision rather than after cord clamping. In procedures using “bloodless” techniques, many experts believe that antimicrobial agents should be infused prior to tourniquet inflation, though data are lacking to inform this recommendation.	Consider giving a single dose of antibiotic prophylaxis intravenously on starting anaesthesia. However, give prophylaxis earlier for operations in which a tourniquet is used. Before giving antibiotic prophylaxis, take into account the timing and pharmacokinetics (for example, the serum half-life) and necessary infusion time of the antibiotic.
<i>Weight adjustment ABP</i>		The literature search did not identify randomized controlled trials that evaluated the benefits and harms of weight-adjusted parental antimicrobial prophylaxis and its effect on the risk of SSI.	Adjust dosing based on patient weight, according to the following examples: For cefazolin, use 30–40 mg/kg for pediatric patients, use 2 grams for patients weighing ≤120 kg, and 3 grams for patients weighing >120 kg. Although data are	

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			<p>conflicting regarding the role of 3 grams of cefazolin dosing in reducing SSI in obese patients, multiple studies have shown a benefit compared to 2-gram dosing in this patient population, with few adverse events from a single dose of 3 grams versus 2 grams of cefazolin. Although some hospitals use 1 gram for adult patients weighing <math>\leq 80</math> kg, there is no harm associated with giving a 2-gram dose.</p> <p>Dose vancomycin at 15 mg/kg. Dose gentamicin at 5 mg/kg for adult patients and 2.5 mg/kg for pediatric patients.</p>	
<i>Redosing ABP</i>		The search did not identify sufficient randomized controlled trial evidence to evaluate the benefits and harms of intraoperative re-dosing of parenteral prophylactic antimicrobial agents for the prevention of SSI.	Re-dose prophylactic antimicrobial agents for lengthy procedures and in cases with excessive blood loss during the procedure (i.e., $>1,500$ mL). Re-dose prophylactic antimicrobial agents at intervals of 2 half-lives (measured from the time the preoperative dose was administered) in cases that exceed this period. For example, re-dose cefazolin after 4 hours in procedures $>4$ hours long.	Give a repeat dose of antibiotic prophylaxis when the operation is longer than the half-life of the antibiotic given.
<i>Prolonged ABP</i>	The panel recommends against the prolongation of SAP after completion of the operation for the purpose of preventing SSI. The panel suggests that preoperative antibiotic prophylaxis should not be continued in the presence of a wound drain for the purpose of preventing SSI.	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.	Discontinue antimicrobial agents after incisional closure in the operating room. Although some guidelines suggest stopping the antimicrobial agents within 24 hours of surgery, there is no evidence that antimicrobial agents given after incisional closure contribute to reduced SSIs even when drains are inserted during the procedure.	No prolonged prophylaxis (except if dirty or infected wound). Give antibiotic treatment (in addition to prophylaxis) to patients having surgery on a dirty or infected wound.

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<i>Prophylaxis for MDRO carriers</i>	No recommendation for screening of ESBL colonization and impact on antibiotic prophylaxis.		Although it is not recommended to routinely use vancomycin, this agent should be considered in patients who are known to be MRSA colonized (including those identified on preoperative screening), particularly if the surgery involves prosthetic material.	
<i>Allergy</i>			Obtain a thorough allergy history. Self-reported $\beta$ -lactam allergy has been linked to a higher risk of SSI due to use of alternative, non- $\beta$ -lactam and often inferior antibiotics, and many patients with a self-reported $\beta$ -lactam allergy can safely receive a $\beta$ -lactam antibiotic as prophylaxis.	
Incise foils	No: not to use plastic adhesive incise drapes with or without antimicrobial properties	The use of plastic adhesive drapes with or without antimicrobial properties is not necessary for the prevention of SSI.	Do not routinely use antiseptic drapes as a strategy to prevent SSI.	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.
Wound protectors for digestive surgery	The panel suggests considering the use of wound protector devices in clean-contaminated, contaminated and dirty abdominal surgical procedures for the purpose of reducing the rate of SSI.		Use impervious plastic wound protectors for gastrointestinal and biliary tract surgery.	
Non-parenteral antimicrobial Prophylaxis	The panel suggests that antibiotic incisional wound irrigation should not be used for the purpose of preventing SSI.	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. The search did not identify randomized controlled trials that	We recommend studying antibiotic irrigation versus dilute povidone-iodine irrigation in an RCT focused on intra-abdominal surgery that is contaminated-dirty. Bacitracin is contraindicated. The FDA withdrew injectable bacitracin from the market because safety concerns outweighed the benefits.	Only apply an antiseptic or antibiotic to the wound before closure as part of a clinical research trial. Consider using gentamicin-collagen implants in cardiac surgery.

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		<p>evaluated soaking prosthetic devices in antimicrobial solutions before implantation for the prevention of SSI.</p> <p>Do not apply antimicrobial agents (i.e., ointments, solutions, or powders) to the surgical incision for the prevention of SSI.</p> <p>Application of autologous platelet-rich plasma is not necessary for the prevention of SSI.</p>	<p>This was based on case reports of intraoperative anaphylactic shock associated with bacitracin irrigation.</p> <p>Unresolved issue: Use of gentamicin-collagen sponges.</p> <p>Unresolved issue: Use of antimicrobial powder.</p>	
Glycemic control	<p>The panel suggests the use of protocols for intensive perioperative blood glucose control for both diabetic and non-diabetic adult patients undergoing surgical procedures to reduce the risk of SSI.</p> <p>The panel decided not to formulate a recommendation on the optimal perioperative glucose target levels in diabetic and non-diabetic patients due to the lack of evidence.</p>	<p>Implement perioperative glycemic control and use blood glucose target levels less than 200 mg/dL in patients with and without diabetes.</p>	<p>Control blood-glucose level during the immediate postoperative period for all patients. Maintain postoperative blood-glucose level between 110 and 150 mg/dL.</p> <p>Control for 24-48 hours.</p>	<p>Do not use glucose-lowering medicines to achieve tight blood glucose control (4 to 6 mmol/liter) for people having surgery who have type 2 diabetes or do not have diabetes.</p>
Normothermia	<p>The panel suggests the use of warming devices in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI.</p>	<p>Maintain perioperative normothermia. The search did not identify randomized controlled trials that evaluated strategies to achieve and maintain normothermia, the lower limit of normothermia, or the optimal timing and duration of normothermia for the prevention of SSI.</p>	<p>For procedures not requiring hypothermia, maintain normothermia (temperature &gt;35.5°C) during the perioperative period.</p>	<p>Maintain patient temperature in line with NICE's guideline on hypothermia: prevention and management in adults having surgery.</p>
Oxygenation	<p>The panel suggests that adult patients undergoing general anaesthesia with tracheal intubation for surgical procedures should receive an 80% fraction of inspired oxygen intraoperatively and, if feasible, in the immediate</p>	<p>Randomized controlled trial evidence suggested uncertain trade-offs between the benefits and harms regarding the administration of increased fraction of inspired oxygen (FIO<sub>2</sub>) via endotracheal intubation during only the intraoperative period in patients</p>	<p>unresolved issue</p>	<p>Maintain optimal oxygenation during surgery. In particular, give patients sufficient oxygen during major surgery and in the recovery period to ensure that a haemoglobin saturation of more than 95% is maintained.</p>

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	postoperative period for 2-6 hours to reduce the risk of SSI.	with normal pulmonary function undergoing general anesthesia for the prevention of SSI. For patients with normal pulmonary function undergoing general anesthesia with endotracheal intubation, administer increased FIO2 during surgery and after extubation in the immediate postoperative period. To optimize tissue oxygen delivery, maintain peri Operative normothermia and adequate volume replacement.		
Double gloving and change of gloves	The panel decided not to formulate a recommendation due to the lack of evidence to assess whether double gloving or a change of gloves during the operation or the use of specific types of gloves are more effective in reducing the risk of SSI.			Consider wearing 2 pairs of sterile gloves when there is a high risk of glove perforation and the consequences of contamination may be serious.
Preoperative skin preparation	The panel recommends alcohol-based antiseptic solutions based on CHG for surgical site skin preparation in patients undergoing surgical procedures.	Perform intraoperative skin preparation with an alcohol-based antiseptic agent unless contraindicated. Application of a microbial sealant immediately after intraoperative skin preparation is not necessary for the prevention of SSI.	Use alcohol-containing preoperative skin preparatory agents in combination with an antiseptic. e. Rapid, persistent, and cumulative antiseptics can be achieved by combining alcohol with CHG or an iodophor. The most effective antiseptic to combine with alcohol remains unclear; however, data from recent trials favor the use of CHG–alcohol over povidone-iodine–alcohol. Use antiseptic-containing preoperative vaginal preparation agents for patients undergoing cesarean delivery or hysterectomy.	Prepare the skin at the surgical site immediately before incision using an antiseptic preparation. First choice: Alcohol-based solution of chlorhexidine. If mucous membrane: aqueous solution of CHG. If CHG is contraindicated: Alcohol-based solution of povidone-iodine. Be aware of the risks of using skin antiseptics in babies, in particular the risk of severe chemical injuries with the use of chlorhexidine (both alcohol-based and aqueous solutions) in preterm babies.
Intraoperative antiseptic use	Antimicrobial sealants should not be used.	Consider intraoperative irrigation of deep or subcutaneous tissues with aqueous iodophor solution.	Perform intraoperative antiseptic wound lavage. Evidence does not support saline lavage (non-	Do not use wound irrigation to reduce the risk of surgical site infection.

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	The panel considered that there is insufficient evidence to recommend for or against saline irrigation of incisional wounds before closure for the purpose of preventing SSI. The panel suggests considering the use of irrigation of the incisional wound with an aqueous PVP-I solution before closure for the purpose of preventing SSI, particularly in clean and clean-contaminated wounds.	Intraperitoneal lavage with aqueous iodophor solution in contaminated or dirty abdominal procedures is not necessary. The search did not identify randomized controlled trials that evaluated soaking prosthetic devices in antiseptic solutions before implantation for the prevention of SSI. Randomized controlled trial evidence was insufficient to evaluate the trade-offs between the benefits and harms of repeat application of antiseptic agents to the patient's skin immediately before closing the surgical incision for the prevention of SSI.	antiseptic lavage) to reduce SSIs. Several systematic reviews and meta-analyses support the use of prophylactic intraoperative wound irrigation with sterile dilute povidone-iodine lavage.	Do not use intracavity lavage to reduce the risk of surgical site infection. Only apply an antiseptic or antibiotic to the wound before closure as part of a clinical research trial.
Blade exchange	The panel decided not to formulate a recommendation on this topic due to the lack of evidence.			
Antimicrobial-coated sutures	The panel suggests the use of triclosan-coated sutures for the purpose of reducing the risk of SSI, independent of the type of surgery.	Consider the use of triclosan-coated sutures for the prevention of SSI.	Use antiseptic-impregnated sutures as a strategy to prevent SSI. Some trials have shown that surgical wound closure with triclosan-coated polyglactin 910 antimicrobial sutures may decrease the risk of SSI compared to standard sutures. The impact of routinely using antiseptic-impregnated sutures on the development of antiseptic resistance remains unknown.	When using sutures, consider using antimicrobial triclosan-coated sutures, especially for paediatric surgery, to reduce the risk of surgical site infection. Consider using sutures rather than staples to close the skin after caesarean birth to reduce the risk of superficial wound dehiscence.
Dressings	The panel suggests not using any type of advanced dressing over a standard dressing on primarily closed surgical wounds for the purpose of preventing SSI.	Randomized controlled trial evidence suggested uncertain trade-offs between the benefits and harms regarding antimicrobial dressings applied to surgical incisions after primary closure in the		Cover surgical incisions with an appropriate interactive dressing at the end of the operation. Use an aseptic non-touch technique for changing or removing surgical wound dressings.

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		operating room for the prevention of SSI.		Do not use topical antimicrobial agents for surgical wounds that are healing by primary intention to reduce the risk of surgical site infection.
<i>Epicutaneous negative-pressure dressings after high-risk surgeries</i>	The panel suggests the use of prophylactic negative pressure wound therapy in adult patients on primarily closed surgical incisions in high-risk wounds for the purpose of the prevention of SSI, while taking resources into account.		Consider use of negative-pressure dressings in patients who may benefit. 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.	
Air quality and ventilation	The panel suggests that laminar airflow ventilation systems should not be used to reduce the risk of SSI for patients undergoing total arthroplasty surgery. The panel decided not to formulate a recommendation on the use of fans or cooling devices on increase of SSI and natural ventilation as an acceptable alternative to mechanical ventilation due to the lack of evidence.			
Other topics	Enhanced nutritional support, perioperative discontinuation of immunosuppressive agents, Normovolemia	blood transfusion, systemic immunosuppressive therapy, intra-articular corticosteroid injection, anticoagulation, orthopedic surgical space suit	Risk assessment.	Assessing risks of surgery, Anticoagulation, Nutritional assessment, Homeostasis, fluid management, Postoperative wound cleansing