

Preventing Surgical Site Infections

Information for Healthcare Workers

Preventing Surgical Site Infections:

Surgical site infections (SSI) are one of the most common complications associated with surgery and are largely preventable. In Australia, SSI is the most common healthcare-associated infection occurring in approximately 3% of procedures. State-wide surveillance data from Victorian hospitals participating in the Victorian Healthcare Associated Infection Surveillance System (VICNISS) demonstrated an overall crude SSI rate of 2.8 per 100 procedures (2002-13).¹ SSI can cause significant distress for patients, prolong their hospital stay and expose them to long courses of antibiotics.² A range of precautions undertaken before, during and after surgery can significantly reduce the risk of SSI.³⁻¹⁴ Implementing these measures will improve the quality of care and patient safety and reduce antimicrobial resistance.

It is recognised that evidence-based interventions for the prevention of SSI are evolving as new quality evidence emerges. In addition to international guidelines, the Australian Guidelines for the Prevention and Control of Infection in Healthcare provide a nationally-accepted approach, focusing on core principles and provide a basis for healthcare facilities to develop detailed protocols and processes for infection prevention and control specific to local settings.⁴ The following summary outlines interventions for prevention of SSIs, with a focus on Australian recommendations. These should be utilised by healthcare facilities performing surgical procedures, and local practice reviewed in settings where increased SSI is observed through surveillance activities.

Pre-Operative Period:

Patient preparation prior to procedure

Length of stay: An extended period of hospitalisation prior to surgery is a known risk factor for SSI as this increases patient risk of colonisation with some pathogens. Where possible, shorten patient's pre-operative hospital stay to admission on day of surgery.

Decolonisation: *Staphylococcus aureus* (*S. aureus*)

carriage increases the risk of post-operative SSI. Patients undergoing high-risk surgery (e.g. coronary artery bypass surgery or insertion of joint prostheses) should be screened pre-operatively for *S. aureus*. Patients with positive swabs should be advised to commence decolonisation the week before their planned procedure. Advise patients to bathe or shower prior to surgery with either plain or antimicrobial soap or chlorhexidine wash (as recommended by surgeon).

Patient preparation on day of procedure

Hair removal: Do NOT remove patient hair or, if absolutely necessary, remove with a clipper, do not shave

Antibiotic prophylaxis: Do not use surgical antibiotic prophylaxis unless there is a clear indication. For optimal effect, surgical antibiotic prophylaxis must be given before surgical incision. For short-acting antibiotics, such as cefazolin, the dose should be administered no more than 60 minutes before incision. For longer-acting antibiotics, such as vancomycin, often used to provide protection against methicillin-resistant *S. aureus*, the dose should be administered no more than 120 minutes before surgical incision.⁵

Temperature control: Maintain *perioperative* normothermia. This may include use of a warmed blanket or warming device.^{4, 6, 8, 9, 10}

Blood glucose management: Implement *perioperative* glycaemic control and use blood glucose target levels less than 180mg/dl (10mmol/L) in patients with and without diabetes.⁴

Preparation of Operating Room Personnel/ Environment

Hand hygiene: Operating team members should not wear hand jewellery, nail polish or artificial nails. If hands are visibly soiled perform hand hygiene with liquid soap prior to scrubbing. Remove debris from underneath fingernails using a nail cleaner, preferably under running water. Prepare hands for surgery by scrubbing, using the correct technique with a suitable antimicrobial soap and water OR surgical alcohol-based hand rub (before donning sterile gloves).

Surgical attire: Operating team members within the critical aseptic field must wear sterile attire and personal protective equipment such as masks and eyewear. All staff not operating within the critical aseptic field must wear dedicated non-sterile attire.

Intra-operative Period:

Maintenance of asepsis: Movements in and out of the operating area should be kept to a minimum. Use sterile disposable non-woven drapes, or sterile reusable woven drapes. Ensure all surgical equipment is sterile and maintain asepsis throughout surgery.

Skin preparation and wound management: Use alcohol-based solution preferably containing chlorhexidine gluconate for skin preparation unless contraindicated e.g. patient sensitivity/allergy, mucous membranes. Do NOT use antimicrobial sealants after surgical site skin preparation. Do NOT perform antibiotic wound irrigation. Triclosan-coated sutures can help reduce SSI rates.^{4, 6, 8, 9}

Oxygenation: Administer supplemental oxygen, intraoperatively and after extubation in the immediate post-operative period for patients undergoing general anaesthesia with endotracheal intubation and mechanical ventilation.^{4, 6, 8, 11}

Antibiotic prophylaxis: Redosing of antibiotic prophylaxis may be required for prolonged procedures. Applying topical antimicrobial agents (e.g. ointments, solutions, and powders) to the surgical incision may cause hypersensitivity reactions and has inadequate evidence to support benefit in reducing SSI risk.⁵

Other strategies to consider:

Irrigating incisional wound with an aqueous povidone iodine solution before closure (in clean and clean-contaminated wounds).^{4, 6, 8}

Wearing two pairs of sterile gloves when there is a high risk of glove perforation and the consequences of contamination of the operative field are high.^{4, 9, 14}

Wound protector devices (in clean-contaminated, contaminated and dirty abdominal procedures).^{4, 8}

Mechanical bowel preparation and pre-operative oral antibiotics can be considered for elective colorectal surgery, in particular, high-risk procedures.^{4, 7}

Negative pressure wound therapy (NPWT) for closed surgical incisions in patients at high risk of developing SSI. Benefits of NPWT vary according to type of surgery and patient risk factors.¹²

Use of gentamicin-collagen implants in cardiac surgery.^{9, 13}

Post-Operative Period:

Antibiotic prophylaxis: For the vast majority of clean and clean-contaminated procedures, prophylactic antibiotics are not required after surgical incision is closed, even in the presence of a surgical drain or urinary catheter. For a small minority of procedures, post-operative dosing for prophylaxis can be considered but should not continue beyond 24 hours from time of incision. Prolonged duration of antibiotic prophylaxis increases the patient's risk of subsequent infections with resistant pathogens and *Clostridioides difficile*.⁵

Wound management: Evaluate and manage wound appropriately using aseptic technique, including cleansing, dressing and care.

References:

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- 11 WHO Surgical Site Infection Prevention Guidelines, Web Appendix 13 (Accessed 23/01/2020) <https://www.who.int/gpsc/appendix13.pdf?ua=1>
- 12 National Institute for Health and Care Excellence, recommendations May 2019 – PICO negative pressure wound dressings for closed surgical incisions <https://www.nice.org.uk/guidance/mtg43/chapter/1-recommendations>
- 13 Kowalewski M et al. Gentamicin-collagen sponge reduces the risk of sternal wound infections after heart surgery: meta-analysis. *J Thor and Card Surg* 2015; 149(6); 1631-40. <https://www.sciencedirect.com/science/article/pii/S0022522315000549>
- 14 Australian College of Perioperative Nurses. Standards for Perioperative Nursing Practice in Australia, 2018. Adelaide, South Australia

Appendix One: SSI Risk Reduction Strategies for Consideration

Review of International Guidelines

	Australian Guidelines (2019)	WHO (2016)	CDC (US, 2017)	NICE (UK, 2019)	TG: Antibiotic v16 (2019)
		<p>Recommendation Categories</p> <p>Strong (the expert panel was confident that the benefits of the intervention outweighed the risks)</p> <p>Conditional (the panel considered that the benefits of the intervention probably outweighed the risks)</p> <p>Strong recommendations are considered to be adaptable for implementation in most (if not all) situations and patients should receive the intervention as the course of action. For conditional recommendations, a more structured decision-making process should be undertaken, on the basis of stakeholder consultation and the involvement of patients and health-care professionals.</p>	<p>Recommendation Categories</p> <p>Cat IA- strong recommendation, high to mod quality evidence suggesting net clinical benefits or harms</p> <p>Cat IB- strong recommendation , low quality evidence suggesting net clinical benefit s or harms or an accepted practice</p> <p>Cat IC- strong recommendation required by US state or federal regulation</p> <p>Cat II – weak recommendation supported by quality evidence suggesting a trade-off between clinical benefits and harms</p> <p>No recommendation/ unresolved issue – low to very low quality evidence with uncertain trade-offs between the benefits and harms</p>		
Pre/peri-operative					
Mechanical bowel prep	The combined use of oral antibiotics and mechanical cleaning in adult patients undergoing colorectal procedures can lead to a reduced risk of SSI's in high-risk patients. Neither oral antibiotics or mechanical cleaning alone are suggested	Carry out mechanical bowel preparation always combined with administering pre-operative oral antibiotics in adult patients undergoing elective colorectal surgery (Conditional recommendation)		Do not use mechanical bowel preparation routinely to reduce risk of SSI	Oral non-absorbable antibiotics (e.g. neomycin), in combination with erythromycin or metronidazole and mechanical bowel preparation, improved outcomes in elective colorectal resections in some studies (can be considered)
Gloves	Consider wearing two pairs of sterile gloves when there is a high risk of glove perforation and the consequences of contamination of the operative field are high			Consider wearing two pairs of sterile gloves when there is a high risk of glove perforation and the consequences of contamination may be serious	

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Intra -operative					
Wound protector devices	Single or double ring wound protector devices can reduce the rate of SSIs compared to regular wound protection. The use of wound protector devices should be determined by local need, availability and cost	Consider the use of wound protector devices in clean contaminated, contaminated and dirty abdominal surgical procedures. (Conditional recommendation, very low)			
Incisional wound irrigation	Avoid routine use of wound irrigation or intra-cavity antibiotic lavage as a measure to reduce SSI as there is no evidence that it reduces the incidence of SSI. There is some evidence that post-operative lavage of the peritoneal space with povidone-iodine reduces SSI	Consider the use of irrigation of the incisional wound with an aqueous povidone-iodine solution before closure, particularly in clean and clean-contaminated wounds (Conditional recommendation, low)	Consider intra-operative 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).	Do not use wound irrigation to reduce the risk of SSI Do not use intracavity lavage to reduce the risk of SSI	
Use of gentamicin-collagen implants	No recommendation			Consider using gentamicin-collagen implants in cardiac surgery	
Post-operative					
Prophylactic negative-pressure wound therapy	No recommendation	Prophylactic negative-pressure wound therapy on primarily closed surgical incisions is suggested in high-risk wounds, while taking resources into account (Conditional recommendation, low)			