Prevention of Surgical Site Infections

V1.0 11.12.2024

Version	Date	Changes from previous version
V1.0	11.12.2024	Initial Document

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Introduction

Surgical site infection (SSI) is defined as an infection that occurs within 30 days after the operation, or 90 days post operatively if a prosthesis is inserted, and involves the skin and subcutaneous tissue, the deep soft tissue (for example, fascia, muscle) of the incision (deep incisional) and/ or any part of the anatomy (for example, organs and spaces) other than the incision that was opened or manipulated during an operation (organ/space) (ECDC 2017).

Surgical site infections are associated with longer length of hospital stays for affected patients, additional surgical procedures or treatment in intensive care units, and greater rates of morbidity and mortality (ECDC, CDC). It is estimated that SSIs affect over 500,000 people per year in Europe and costs €19 billion (WHO).

Surgical site infection is the third most common healthcare-associated infection (HCAI) accounting for 13.6% of all HCAIs in Ireland as per 2023 European point prevalence survey (PPS) (ECDC 2023). This aligns with similar findings in EU/ EEA, where SSI accounted for 16.1% of all HCAIs. In Ireland, SSIs occurred with a prevalence of 1.1% in the study population, remaining stable since the 2017 PPS (1.2%).The majority of SSI cases (n=99) were classified as either deep incisional or organ/ space SSI, with the actual burden of SSI likely underestimated, particularly for superficial incisional SSI, as many SSIs are diagnosed and managed post-discharge.

Surgical site infection

The microorganisms that cause surgical site infections may be endogenous or exogenous. Endogenous microorganisms are derived from the affected person's skin or mucosa. Exogenous infection occurs when microorganisms or bacteria on skin scales shed by staff, instruments or the operating environment contaminate the site during the operation, when microorganisms from the environment contaminate a traumatic wound or when microorganisms gain access to the wound after surgery before the skin has healed.

The risk of surgery related infection is increased by factors which:

- **increase the risk of endogenous contamination**, for example procedures that involve parts of the body with a high concentration of normal flora, such as the bowel;
- **increase the risk of exogenous contamination**, for example prolonged operations that increase the length of time that tissues are exposed;
- **diminish the efficacy of the general immune response**, for example diabetes, malnutrition or immunosuppressive therapy with radiotherapy, chemotherapy or steroids, or local immune response such as foreign bodies, damaged tissue or formation of a haematoma.

The type of surgical procedure influences the risk of infection and can be categorised as clean, clean-contaminated, contaminated or dirty (CDC).

This document aims to provide key practice recommendations on preventing surgical site infections, which are aimed at minimising the number of microorganisms introduced into the operative site, for example by:

- Removing potentially harmful microorganisms that normally colonise the skin;
- By using appropriately timed surgical prophylactic antimicrobial agents, preventing the multiplication of microorganisms at the operative site, (and any bacteria that may have gained entry to the bloodstream, especially if significant haemorrhage during the procedure);
- Enhancing the person's defences against infection - for example by minimising tissue damage, maintaining normothermia and optimal glucose control;
- Preventing access of microorganisms into the incision postoperatively by use of a wound dressing.

Scope

The key measures to prevent SSI outlined in this document should be considered by acute hospitals, and elective surgical hubs and sites delivering surgical services, and all healthcare staff that care for surgical patients, and can be applied into routine practice for the care of adults and older children. This national guidance should be used in conjunction with local clinical guidelines where they exist. In particular, there are special patient populations, such as in neonates, infants and pregnant women where there are different risks relating to perioperative glycaemic control and to use of certain skin preparations, for whom local departmental or specialist guidance should be used.

In the development of these recommendations, adherence to accepted standard practices has been assumed, such as those detailed in the National Clinical Guideline No. 30 Infection Prevention and Control (IPC), Healthcare Infection Society, the European Society of Clinical Microbiology and Infectious Diseases (HIS/ESCMID) guidelines and the World Health Organisation (WHO) global guidelines on the prevention of surgical site infections regarding theatre environment, instrument sterility, operating room attire & conduct, aseptic technique and surgical hand preparation; as such these have not been detailed in this document. Speciality specific recommendations have been deemed out of scope for this guidance update and as such recommendations on specialist wound care and laminar flow theatres in orthopaedics have not been included in this document.

Prevention of SSI recommendations have been categorised as:

- **Core recommendations**: should be considered and adopted by all acute and elective hospitals delivering surgical services and all healthcare staff that care for surgical patients. These include recommendation in the pre, intra and post-operative period;
- **Additional recommendations:** should be considered for use in acute and elective hospitals and/ or in specific patient populations within those settings and when SSIs are not controlled after implementation and auditing of core recommendations.

Surveillance and recommendations on governance for surgical site infection surveillance have been incorporated into this document.

Document development

This document has been developed by the AMRIC national team and provides an update to the joint RCSI / RCPI document: Preventing Surgical Site Infections Key Recommendations for Practice (2012).

The document development process included extensive consultation with stakeholders, allowing opportunities for review of draft guidance and formal feedback, which has been incorporated into this guidance.

This document aligns to the objectives of Irish National Action Plan 2 (INAP2 ref: Strategic Objective 2: Enhancing surveillance of antibiotic resistance and antibiotic use) and the HSE Antimicrobial Resistance and Infection Control Action Plan 2022-2025 (Action 2-02 Establish a national system for continuous monitoring of HCAIs in surgical site infections). It supports the Framework for HSE National Programme for Surgical Site Infection Surveillance (2024) which outlines monitoring processes for SSIs in hip fractures.

The recommendations in this document are underpinned by review of best practice guidance and evidence and are a focus of improving patient outcomes. The recommendations align with the national clinical guideline No. 30 Infection Prevention and Control, and other international guidance has been reviewed to inform these recommendations. These include the US Centers for Disease Control and Prevention (CDC) guideline for the prevention of surgical site infection, the UK National Institute for Health and Clinical Excellence (NICE) on surgical site infection prevention, the World Health Organisation (WHO) global guidelines on the prevention of surgical site infections, and guidance on surgical site infection prevention from Society of Healthcare Epidemiology of America (SHEA). Where appropriate, the strength and evidence quality of recommendations has been included after individual recommendations.

Prevention of Surgical Site Infections- Recommendations for Practice

Core Recommendations

Patients and carers/ family

- Patients and carers require clear consistent information and advice throughout all stages of their care including:
    - The risk of surgical site infections, what is being done to reduce risk and how it is managed;
    - How to care for their wound after discharge;
    - How to recognise signs and symptoms of surgical site infection and who to contact if they are concerned;
    - Post discharge surgical review arrangements.
- Patients should always be informed before any intervention such as screening or before antibiotic administration. When this is not possible, inform patients as soon as is practicable.

Pre-operative recommendations

- Advise patients to shower or bathe (or support patients to shower, bath or bed bath) using soap or antimicrobial soap, either the day before or on the day of surgery (conditional recommendation/ quality of evidence moderate WHO);
- If clinical circumstances require hair removal, it should be clipped on the day of surgery outside of the operating theatre where possible. (strong recommendation/ quality of evidence moderate WHO) (quality of evidence: moderate SHEA);
- Consider testing pre-operatively for *Staphylococcus aureus* and decolonise those with nasal carriage identified before high- risk surgery such as cardiothoracic or orthopaedic.

(This may include testing for methicillin-resistant *Staphylococcus aureus* (MRSA) or both methicillin-resistant *Staphylococcus aureus* (MRSA) methicillin-sensitive *Staphylococcus aureus* (MSSA). Consideration would need to be given to the feasibility of MRSA and MSSA pre op screening programme and local laboratory resources). Decolonisation protocols are available at https://www.gov.ie/pdf/?file=https://assets.gov.ie/11637/16cc6fd28fb147bf8066dd2de902072e.pdf#page=null ;

- In adult patients undergoing colorectal procedures the use of preoperative oral antibiotics, with mechanical bowel preparation, in addition to intravenous surgical antibiotic prophylaxis, can lead to a reduced risk of SSIs. (Conditional recommendation/ quality of evidence moderate WHO) (Quality of evidence: high SHEA);

- Mechanical bowel preparation alone (without administration of preoperative oral antibiotics) should not be used for the purpose of reducing SSI in adult patients undergoing elective colorectal surgery (strong recommendation/ quality of evidence moderate WHO).

Intra-operative recommendations

- Use alcohol-containing preoperative skin preparatory agents in combination with an antiseptic such as chlorhexidine (CHG) or povidone-iodine (PVI). (Quality of evidence: high SHEA). Ensure manufacturers' recommendations are followed for application and drying, and that products are in date. (See *Specific precautions Chlorhexidine);
- Maintain perioperative (pre, intra and post-operative) normothermia (above 36°C). (Conditional recommendation/ quality of evidence moderate WHO);
- Administering supplemental oxygen intraoperatively and postoperatively can reduce the risk of SSI in people undergoing mechanical ventilation;
- Maintain adequate perfusion during surgery;
- In adult patients maintain perioperative blood glucose between 4-6 mmol/l and not exceed 10 mmol/l.(Refer to specific local guidelines for perioperative glycaemic control for paediatrics, pregnant women and patients with diabetes);

- Provide surgical antibiotic prophylaxis as clinically indicated, using the right agent at the right time, by the right route and for the right duration in accordance with national and local surgical antibiotic prophylaxis guidelines https://www.hse.ie/eng/services/list/2/gp/antibiotic-prescribing/hospital-related-guidelines/antibiotic-prophylaxis-in-surgery.html

- Using certain antimicrobial-coated sutures (for example triclosan-coated sutures) may help to reduce SSI rates (Conditional recommendation/ moderate quality of evidence WHO) (Quality of evidence: moderate SHEA);
- Ensure that the wound is covered with a sterile wound dressing at the end of surgery.

Post-operative recommendations

- Ensure that the wound dressing is kept in place for up to 48 hours after surgery unless clinically indicated. Local guidelines and use of clinically specified specialist dressings may allow for variation. Wound area should be checked routinely for excess wound leakage, haemorrhage or signs of infection;
- Use aseptic technique for surgical site (wound) inspection and/ or surgical site (wound) dressing changes;
- Use hand hygiene as per WHO 5 moments of hand hygiene;
- Inform patients on discharge about the mechanism of surgical team follow up, for example outpatient appointment/s. Where surgical site infection surveillance programmes are established, inform the patient of monitoring, reporting and review arrangements.

Additional recommendations

- Consider 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. (Conditional recommendation, low quality of evidence WHO) (Quality of evidence: moderate SHEA);
- Consider the use of irrigation of the incisional wound with a sterile aqueous povidone iodine solution before closure for the purpose of preventing SSI, particularly in clean and clean-contaminated wounds (Conditional recommendations/ low quality of evidence WHO);
- Consider the use of wound protector (WP) devices in clean-contaminated, contaminated and dirty abdominal surgical procedures for the purpose of reducing the rate of SSI. (Conditional recommendation, very low quality of evidence WHO). Use of these devices should be determined by local need, and the availability and cost of the devices;
- Consider the use of vaginal preparation with an antiseptic solution prior to caesarean delivery and hysterectomy. (Quality of evidence: moderate SHEA);
- Consider the implementation of surgical site infection prevention care bundles to ensure compliance with best practices (Quality of evidence: high SHEA).

*****Specific precautions Chlorhexidine

In patients with known chlorhexidine hypersensitivity, skin antiseptic products that do not contain chlorhexidine may be used where there is patient benefit. Chlorhexidine in alcohol should not come into contact with the brain, meninges, mucosa, eye or middle ear (WHO).

No recommendation can be made for the safety or efficacy of chlorhexidine in infants aged less than 2 months. If used in neonates, preterm infants, especially those born before 32 weeks of gestation and within the first 2 weeks of life it should be used with caution. The use of chlorhexidine solutions, both alcohol based and aqueous, has been associated with chemical burns in this age group when used for skin antisepsis prior to invasive procedures.

Surveillance

Optimal prevention of HCAIs, including SSIs, requires the continued implementation of existing guidelines and recommendations (ECDC, WHO). Successful strategies for the prevention of HCAIs include sustained and multifaceted IPC programmes, including surveillance with timely feedback of appropriate data. (ECDC, CDC).

SSI surveillance is key for determining the current extent and burden of SSI, looking at trends over time, and assessing the impact of interventions that have been applied.

Governance for surgical site infection surveillance

It is recommended a local SSI steering committee be established who have governance of surgical site infection surveillance and prevention programmes. This programme should include implementation of best practice, ongoing audit, quality assurance/improvement and risk management, feedback and education strategies for patients and staff. It should also monitor, manage and report the incidence of infection and other adverse events associated with surgical site infection.

The SSI steering committee should be supported by multidisciplinary membership which includes senior hospital management, risk management and appropriate clinical representation and relevant surgical, theatre, surveillance and infection prevention and control (IPC) and antimicrobial stewardship (AMS)/pharmacy staff. Surveillance and monitoring of SSI should inform local improvement strategies and plans to reduce incidence of SSI and support antimicrobial stewardship. SSI surveillance and prevention should also become an agenda item on Hospital IPC/AMS committees.

All surgical site infections and other complications with significant patient impact (for example requiring systemic antimicrobial treatment or delay in discharge) should be reported as incidents on the National Incident Management System (NIMS) and have an incident review completed.

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