

# Preventing and treating surgical site infections

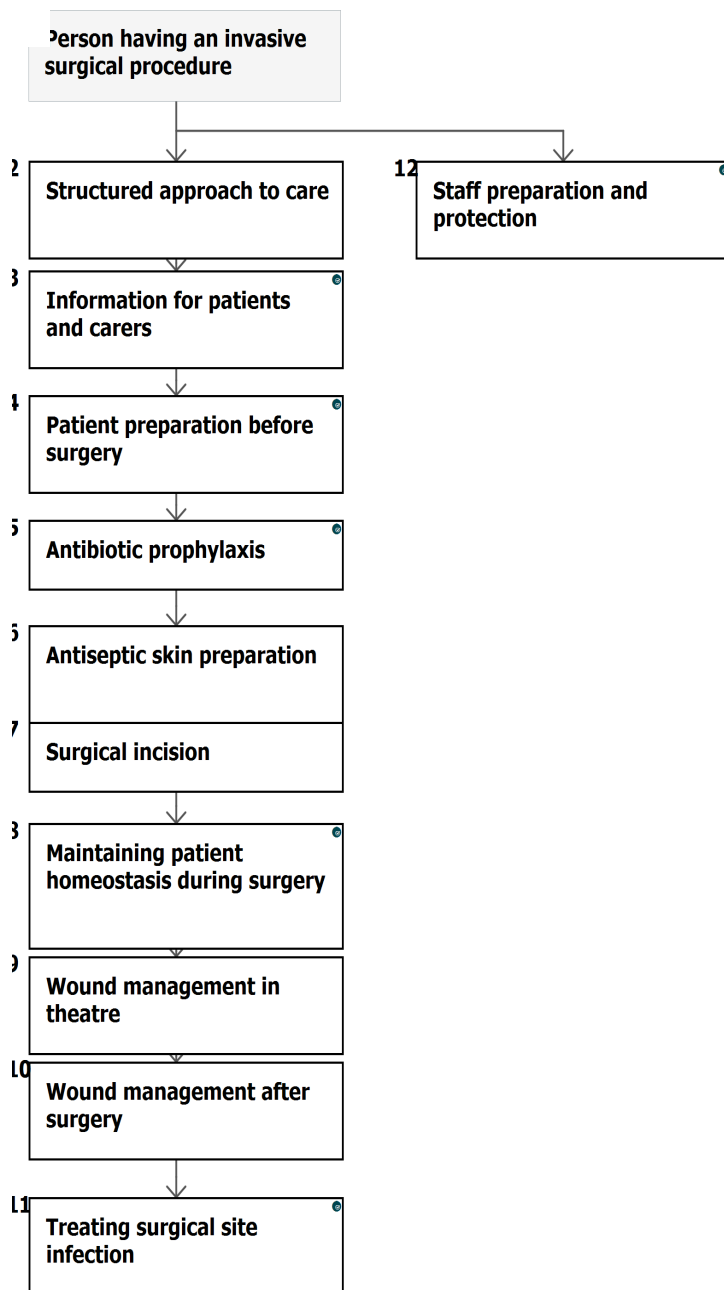
NICE Pathways bring together everything NICE says on a topic in an interactive flowchart. NICE Pathways are interactive and designed to be used online.

They are updated regularly as new NICE guidance is published. To view the latest version of this NICE Pathway see:

<http://pathways.nice.org.uk/pathways/prevention-and-control-of-healthcare-associated-infections>

NICE Pathway last updated: 10 April 2019

This document contains a single flowchart and uses numbering to link the boxes to the associated recommendations.



## 1 Person having an invasive surgical procedure

No additional information

## 2 Structured approach to care

Use a structured approach to care to improve overall management of surgical wounds. This should include preoperative assessments to identify people with potential wound healing problems. Enhanced education of healthcare workers, patients and carers, and sharing of clinical expertise is needed to support this.

## 3 Information for patients and carers

Offer patients and carers clear, consistent information and advice throughout all stages of their care. This should include the risks of surgical site infections, what is being done to reduce them and how they are managed. For more guidance on providing information to adults and discussing their preferences with them, see NICE's recommendations on [patient experience in adult NHS services](#).

Offer patients and carers information and advice on how to care for their wound after discharge.

Offer patients and carers information and advice about how to recognise a surgical site infection and who to contact if they are concerned. Use an integrated care pathway for healthcare-associated infections to help communicate this information to both patients and all those involved in their care after discharge.

Always inform patients after their operation if they have been given antibiotics.

NICE has written information for the public on [preventing and treating surgical site infections](#).

### Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

#### Surgical site infection

5. Information and advice on wound care

## 4 Patient preparation before surgery

### Preoperative showering

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.

### Nasal decontamination

Consider nasal mupirocin in combination with a chlorhexidine body wash before procedures in which *Staphylococcus aureus* is a likely cause of a surgical site infection. This should be locally determined and take into account:

- the type of procedure
- individual patient risk factors
- the increased risk of side effects in preterm infants (see [antiseptic skin preparation \[See page 6\]](#))
- the potential impact of infection.

Maintain surveillance on antimicrobial resistance associated with the use of mupirocin. For information on antimicrobial stewardship programmes, see NICE's recommendations on [antimicrobial stewardship](#).

See the NICE guideline to find out [why we made these recommendations and how they might affect practice](#).

### Hair removal

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.

### Patient theatre wear

Give patients specific theatre wear that is appropriate for the procedure and clinical setting, and that provides easy access to the operative site and areas for placing devices, such as intravenous cannulas. Take into account the patient's comfort and dignity.

## Mechanical bowel preparation

Do not use mechanical bowel preparation routinely to reduce the risk of surgical site infection.

## Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

### Surgical site infection

1. Personal preparation for surgery

## 5 Antibiotic prophylaxis

Give antibiotic prophylaxis to patients before:

- clean surgery involving the placement of a prosthesis or implant
- clean-contaminated surgery
- contaminated surgery.

For advice on antibiotic prophylaxis before caesarean section, see NICE's recommendations on [preparation for caesarean section](#). See also NICE's recommendations on [antimicrobial stewardship](#).

Do not use antibiotic prophylaxis routinely for clean non-prosthetic uncomplicated surgery.

Use the local antibiotic formulary and always take into account the potential adverse effects when choosing specific antibiotics for prophylaxis.

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. Give a repeat dose of antibiotic prophylaxis when the operation is longer than the half-life of the antibiotic given.

Give antibiotic treatment (in addition to prophylaxis) to patients having surgery on a dirty or infected wound.

Inform patients before the operation, whenever possible, if they will need antibiotic prophylaxis, and afterwards if they have been given antibiotics during their operation.

## Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

### Surgical site infection

#### 2. Antibiotic prophylaxis

## 6 Antiseptic skin preparation

Prepare the skin at the surgical site immediately before incision using an antiseptic preparation.

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.

When deciding which antiseptic skin preparation to use, options may include those in the table on [options for antiseptic skin preparation](#) [See page 12].

If diathermy is to be carried out:

- use evaporation to dry antiseptic skin preparations **and**
- avoid pooling of alcohol-based preparations.

See the NICE guideline to find out [why we made these recommendations and how they might affect practice](#).

## 7 Surgical incision

### Incise drapes

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.

## Diathermy

Do not use diathermy for surgical incision to reduce the risk of surgical site infection.

## Creutzfeldt–Jakob disease

NICE has published interventional procedures guidance on [patient safety and reduction of risk of transmission of Creutzfeldt–Jakob disease \(CJD\) via interventional procedures](#).

## 8 Maintaining patient homeostasis during surgery

Maintain patient temperature in line with NICE's recommendations on [inadvertent perioperative hypothermia](#).

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.

Maintain adequate perfusion during surgery.

Do not give insulin routinely to patients who do not have diabetes to optimise blood glucose postoperatively as a means of reducing the risk of surgical site infection.

## Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

### Surgical site infection

3. Patient temperature

## 9 Wound management in theatre

### Wound irrigation and intracavity lavage

Do not use wound irrigation to reduce the risk of surgical site infection.

Do not use intracavity lavage to reduce the risk of surgical site infection.

## Antiseptics and antibiotics before wound closure

Only apply an antiseptic or antibiotic to the wound before wound closure as part of a clinical research trial.

Consider using gentamicin-collagen implants in cardiac surgery.

See the NICE guideline to find out [why we made these recommendations and how they might affect practice](#).

## Closure methods

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 section to reduce the risk of superficial wound dehiscence.

See the NICE guideline to find out [why we made these recommendations and how they might affect practice](#).

## Wound dressings

Cover surgical incisions with an appropriate interactive dressing at the end of the operation.

See also NICE's recommendations [wound management for skin conditions](#).

## 10 Wound management after surgery

### Changing dressings

Use an aseptic non-touch technique for changing or removing surgical wound dressings.

### Postoperative cleansing

Use sterile saline for wound cleansing up to 48 hours after surgery.

Advise patients that they may shower safely 48 hours after surgery.

Use tap water for wound cleansing after 48 hours if the surgical wound has separated or has



been surgically opened to drain pus.

### **Topical antimicrobial agents for wound healing by primary intention**

Do not use topical antimicrobial agents for surgical wounds that are healing by primary intention to reduce the risk of surgical site infection.

### **Dressings for wound healing by secondary intention**

Do not use Eusol and gauze, or moist cotton gauze or mercuric antiseptic solutions to manage surgical wounds that are healing by secondary intention.

Use an appropriate interactive dressing to manage surgical wounds that are healing by secondary intention.

Ask a tissue viability nurse (or another healthcare professional with tissue viability expertise) for advice on appropriate dressings for the management of surgical wounds that are healing by secondary intention.

### **Medtech innovation briefings**

NICE has published medtech innovation briefings on:

- [Prevena incision management system for closed surgical incisions](#)
- [PICO negative pressure wound therapy for closed surgical incision wounds](#).

See also NICE's recommendations on [wound management for skin conditions](#).

## **11 Treating surgical site infection**

When surgical site infection is suspected by the presence of cellulitis, either by a new infection or an infection caused by treatment failure, give the patient an antibiotic that covers the likely causative organisms. Consider local resistance patterns and the results of microbiological tests in choosing an antibiotic. See also NICE's recommendations on [antimicrobial stewardship](#).

Do not use Eusol and gauze, or dextranomer or enzymatic treatments for debridement in the management of surgical site infection.

## Quality standards

The following quality statement is relevant to this part of the interactive flowchart.

### Surgical site infection

6. Treatment of surgical site infection

## 12 Staff preparation and protection

### Hand jewellery, artificial nails and nail polish

The operating team should remove hand jewellery before operations.

The operating team should remove artificial nails and nail polish before operations.

### Hand decontamination

The operating team should wash their hands prior to the first operation on the list using an aqueous antiseptic surgical solution, with a single-use brush or pick for the nails, and ensure that hands and nails are visibly clean.

Before subsequent operations, hands should be washed using either an alcoholic hand rub or an antiseptic surgical solution. If hands are soiled then they should be washed again with an antiseptic surgical solution.

### Staff theatre wear

All staff should wear specific non-sterile theatre wear in all areas where operations are undertaken.

### Staff leaving the operating area

Staff wearing non-sterile theatre wear should keep their movements in and out of the operating area to a minimum.

### Sterile gowns

The operating team should wear sterile gowns in the operating theatre during the operation.

**Gloves**

Consider wearing 2 pairs of sterile gloves when there is a high risk of glove perforation and the consequences of contamination may be serious.

**Quality standards**

The following quality statement is relevant to this part of the interactive flowchart.

**Surgical site infection****4. Intraoperative staff practices**

## Options for antiseptic skin preparation

When	Choice of antiseptic skin preparation
First choice unless contraindicated or the surgical site is next to a mucous membrane	Alcohol-based solution of chlorhexidine <sup>1</sup>
If the surgical site is next to a mucous membrane	Aqueous solution of chlorhexidine <sup>2</sup>
If chlorhexidine is contraindicated	Alcohol-based solution of povidone-iodine <sup>3</sup>
If both an alcohol-based solution and chlorhexidine are unsuitable	Aqueous solution of povidone-iodine <sup>4</sup>
<p><sup>1</sup> At the time of publication (April 2019), 0.5% chlorhexidine in 70% alcohol solution (Hydrex; Prevasse) had a UK marketing authorisation for 'preoperative skin disinfection prior to minor surgical procedures' and 2.0% chlorhexidine in 70% alcohol applicators (ChloraPrep) had a UK marketing authorisation for 'disinfection of the skin prior to invasive medical procedures'. Other formulations of chlorhexidine in alcohol did not have UK marketing authorisation for these uses. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the GMC's <a href="#">Prescribing guidance: prescribing unlicensed medicines</a> for further information.</p>	
<p><sup>2</sup> At the time of publication (April 2019), 4.0% aqueous chlorhexidine (Hibiscrub) had a marketing authorisation for 'preoperative and postoperative skin antisepsis for patients undergoing elective surgery'; however, relevant instructions are limited to use as a body wash to be used before the person enters the operating theatre. Other formulations of aqueous chlorhexidine did not have UK marketing authorisation for these uses. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed</p>	

consent should be obtained and documented. See the GMC's [Prescribing guidance: prescribing unlicensed medicines](#) for further information.

<sup>3</sup> At the time of publication (April 2019), 10% povidone-iodine alcoholic solution (Videne alcoholic tincture) had a UK marketing authorisation for 'topical application'. 10% povidone-iodine (Betadine Alcoholic solution) had a UK marketing authorisation for 'antiseptic skin cleanser for major and minor surgical procedures'. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the GMC's [Prescribing guidance: prescribing unlicensed medicines](#) for further information.

<sup>4</sup> At the time of publication (April 2019), 7.5% povidone-iodine surgical scrub solution (Videne) had a UK marketing authorisation for 'preoperative hand disinfection by the surgical team, or for disinfecting the site of incision prior to elective surgery' and 7.5% povidone-iodine (Betadine surgical scrub) had a marketing authorisation for 'preoperative scrubbing and washing by surgeons and theatre staff and preoperative preparation of patients' skin'. 10% iodine antiseptic solution (Videne) had a UK marketing authorisation for 'disinfection of intact external skin or as a mucosal antiseptic' and 10% povidone-iodine solution (Standardised Betadine antiseptic solution) had a UK marketing authorisation for 'preoperative and postoperative antiseptic skin cleanser for major and minor surgical procedures'. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the GMC's [Prescribing guidance: prescribing unlicensed medicines](#) for further information.

## Glossary

### Aseptic technique

(an aseptic technique ensures that only uncontaminated equipment and fluids come into contact with susceptible body sites, which should be used during any clinical procedure that bypasses the body's natural defences; using the principles of asepsis minimises the spread of organisms from one person to another)

**Clean surgery**

(surgery involving an incision in which no inflammation is encountered, without a break in sterile technique, and during which the respiratory tract, alimentary or genitourinary tracts are not entered)

**Clean-contaminated surgery**

(surgery involving an incision through which the respiratory, alimentary, or genitourinary tract is entered under controlled conditions but with no contamination encountered)

**Contaminated surgery**

(surgery involving an incision in which there is a major break in sterile technique or gross spillage from the gastrointestinal tract, or an incision in which acute, non-purulent inflammation is encountered; open traumatic wounds that are more than 12 to 24 hours old also fall into this category)

**CRBSI**

catheter-related bloodstream infection

**Direct patient care**

('hands on' or face-to-face contact with patients, in other words any physical aspect of the healthcare of a patient, including treatments, self-care and administration of medication)

**Dirty or infected wound**

(an incision undertaken during an operation in which the viscera are perforated or when acute inflammation with pus is encountered (for example, emergency surgery for faecal peritonitis), and for traumatic wounds if treatment is delayed, there is faecal contamination, or devitalised tissue is present)

**Hand decontamination**

(the use of handrub or handwashing to reduce the number of bacteria on the hands; in this guidance, this term is interchangeable with 'hand hygiene')

**Handrub**

(a preparation applied to the hands to reduce the number of viable microorganisms; this guidance refers to handrubs compliant with British standards (BS EN1500; standard for efficacy of hygienic handrubs using a reference of 60% isopropyl alcohol))

**HCAIs**

healthcare-associated infections

**Healing by primary intention**

(occurs when a wound has been sutured after an operation and heals to leave a minimal, cosmetically acceptable scar)

**Healing by secondary intention**

(occurs when a wound is deliberately left open at the end of an operation because of excessive bacterial contamination, particularly by anaerobes or when there is a risk of devitalised tissue, which leads to infection and delayed healing; it may be sutured within a few days (delayed primary closure), or much later when the wound is clean and granulating (secondary closure), or left to complete healing naturally without suturing)

**Healthcare workers**

(people employed by the health service, social services, a local authority or an agency to provide care for a sick, disabled or elderly person)

**Healthcare waste**

(any waste produced by, and as a consequence of, healthcare activities)

**Interactive dressing**

(dressings designed to promote the wound healing process through the creation and maintenance of a local, warm, moist environment underneath the chosen dressing, when left in place for a period indicated through a continuous assessment process)

## Personal protective equipment

(equipment that is intended to be worn or held by a person to protect them from risks to their health and safety while at work; examples include gloves, aprons, and eye and face protection)

## Surgical site infections

(a surgical wound with local signs and symptoms of infection, for example, heat, redness, pain and swelling, and (in more serious cases) with systemic signs of fever or a raised white blood cell count: infection in the surgical wound may prevent healing, causing the wound edges to separate, or it may cause an abscess to form in the deeper tissues; definitions of the severity of surgical site infections vary and this should be taken into account when comparing reported rates of surgical site infection)

## Sources

[Surgical site infections: prevention and treatment](#) (2019) NICE guideline NG125

## Your responsibility

### Guidelines

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.



---

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

### **Technology appraisals**

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, health professionals are expected to take these recommendations fully into account, alongside the individual needs, preferences and values of their patients. The application of the recommendations in this interactive flowchart is at the discretion of health professionals and their individual patients and do not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

Commissioners and/or providers have a responsibility to provide the funding required to enable the recommendations to be applied when individual health professionals and their patients wish to use it, in accordance with the NHS Constitution. They should do so in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

### **Medical technologies guidance, diagnostics guidance and interventional procedures guidance**

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take these recommendations fully into account. However, the interactive flowchart does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Commissioners and/or providers have a responsibility to implement the recommendations, in

their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this interactive flowchart should be interpreted in a way that would be inconsistent with compliance with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.