Appendix A: Summary of evidence from surveillance

8-year surveillance (2017) – Surgical site infections: prevention and treatment (2008) NICE guideline CG74

Summary of evidence from surveillance

Information for patients and carers

74 – 01 When, how and what information should be provided for patients for the prevention of surgical site infection?

Recommendations derived from this question

1.1.1 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.

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

1.1.3 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.

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

Surveillance decision

No new information was identified at any surveillance review.

Preoperative phase

74 – 02 What is the clinical effectiveness of preoperative showering to reduce surgical site infection?

Subquestion

What is the contribution to clinical effectiveness of the timing and number of preoperative washing for the prevention of surgical site infection?

Are preoperative showers with antiseptics cost-effective?

Recommendations derived from this question

1.2.1 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.

Surveillance decision

This review question should not be updated.

Preoperative showering

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A Cochrane review[1] of 7 trials (n=10,157) examined bathing or showering with antiseptics for preventing surgical site infection. All trials assessed 4% chlorhexidine gluconate. Overall, it was found that bathing with chlorhexidine did not significantly reduce surgical site infection compared with placebo or no pre-surgical washing.

A systematic review[2] of 20 studies (n=9,520) assessed preoperative showering in 3 randomised controlled trials (RCTs) and 4 cohort studies. Results were inconclusive for the effect on surgical site infection and conclusions on the most effective antiseptic could not be made.

6-year surveillance summary

A meta-analysis[3] of 16 studies (n=17,932) examined whole-body preoperative bathing with chlorhexidine compared with placebo or no bath for prevention of surgical site infection. Chlorhexidine bathing did not significantly reduce overall incidence of surgical site infection compared with placebo, soap, or no shower or bath.

8-year surveillance summary

An update[4] of the Cochrane review identified in the Evidence Update[1] found no additional studies.

Topic expert feedback

Topic experts suggested that evidence of using antiseptics in showering was increasing. However; although several randomised trials were suggested for consideration in surveillance, they involved healthy volunteers and were thus not eligible for inclusion.

Impact statement

Studies consistently show no evidence of an effect of showering with antiseptics on the occurrence of surgical site infection.

Currently, showering before surgery is recommended but use of antiseptics in the shower is not recommended. The current evidence supports this recommendation.

New evidence is unlikely to impact on the guideline.

Timing and frequency of washing

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A systematic review[5] of 10 studies (n=7,351) examined the effect of number of antiseptic showers and type of antiseptic on surgical site infection. It included both randomised and non-randomised clinical trials in any healthcare setting. Included studies examined the effect of 1, 2 or 3 or more showers. No definitive conclusions could be drawn about the optimum number of preoperative showers.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

One identified systematic review was unable to make definitive conclusions about the effect of single or multiple showers on the occurrence of surgical site infection.

Currently, showering before surgery is recommended but multiple showers are not recommended. The current evidence supports this recommendation.

New evidence is unlikely to change guideline recommendations.

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74 – 03 What is the clinical effectiveness of preoperative hair removal from the operative site to reduce surgical site infection?

Subquestion

Does the timing of preoperative hair removal affect the rate of surgical site infection?

What is the cost-effective method of hair removal?

Recommendations derived from this question

1.2.2 Do not use hair removal routinely to reduce the risk of surgical site infection.

1.2.3 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.

Surveillance decision

This review question should not be updated.

Hair removal

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A Cochrane review[6] of 14 RCTs and quasi-RCTs examined preoperative hair removal versus no hair removal. There was no significant difference in surgical site infections with shaving (body or scalp hair) and clipping (scalp hair) compared with no hair removal. However, shaving led to significantly more surgical site infections compared with clipping.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A network meta-analysis[7] of 19 RCTs (number of participants not reported in the abstract) was identified. Shaving was used as the reference treatment. Fewer surgical site infections occurred with clipping, chemical depilation, and no depilation than with shaving. There was no

significant difference between no depilation and clipping or chemical depilation, and between clipping and chemical depilation.

Topic expert feedback

Topic experts have indicated that some hospitals may not be following the recommendation not to shave hair before surgery. However this suggests an issue with implementation of the guideline rather than a problem with the current recommendations.

Impact statement

Evidence consistently shows that shaving is associated with increased surgical site infections, and that other methods of hair removal may not reduce surgical site infection compared with no hair removal.

The evidence is consistent with current recommendations not to routinely remove hair, but if hair needs to be removed, that clipping should be used and shaving should not be used.

New evidence is unlikely to change guideline recommendations.

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74 – 04 Does patient theatre attire affect the incidence of surgical site infection?

Recommendations derived from this question

1.2.4 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. Consider also the patient's comfort and dignity.

Surveillance decision

No new information was identified at any surveillance review.

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74 – 05 What is the clinical effectiveness of theatre staff wearing non-sterile theatre wear (scrub suits, masks, hats, overshoes) for the prevention of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

This review question should not be updated.

Surgical masks

3-year surveillance summary

An RCT[8] (n=827) assessed the impact of non-scrubbed operating room staff wearing surgical face masks compared with no face masks on surgical site infection. Overall, surgical site infection rates did not increase when a face mask was not worn.

Evidence Update (2013)

A Cochrane review[9] of 3 RCTs and quasi-RCTs (n=2,113) examined whether surgical face masks could prevent surgical site infection compared with no face masks during clean

surgery. All three trials showed the wearing of masks to have no significant effect on postoperative surgical wound infection when compared with no masks.

6-year surveillance summary

An update[10] of the Cochrane review identified in the Evidence Update[9] found no additional studies.

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Evidence has not shown a benefit of surgical masks in preventing surgical site infection. Currently, there are no specific recommendations about what theatre wear should be used. Because there is no evidence of harm associated with surgical masks, a recommendation against wearing surgical masks is not necessary. Furthermore, these studies have not considered the role of surgical masks in protecting surgical staff from splashes of blood or other bodily fluids.

New evidence is unlikely to change guideline recommendations.

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74 – 06 Does staff exiting and re-entering the operating room affect the incidence of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

No new information was identified at any surveillance review.

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74 – 07 Does patient nasal decontamination to eliminate *Staphylococcus aureus* affect the rate of surgical site infection?

Subquestions

What is the contribution to clinical effectiveness of the timing of nasal decontamination for the prevention of surgical site infection?

What is the cost-effectiveness of mupirocin nasal ointment for the prevention of surgical site infection caused by *Staphylococcus aureus*?

Recommendations derived from this question

1.2.7 Do not use nasal decontamination with topical antimicrobial agents aimed at eliminating *Staphylococcus aureus* routinely to reduce the risk of surgical site infection.

Surveillance decision

This review question should be updated.

Nasal decontamination

3-year surveillance summary

No relevant evidence was identified; however, a study published in this period has since been identified.

An RCT[11] (n=917) assessed nasal decontamination with mupirocin nasal ointment and chlorhexidine soap before surgery in people with positive nasal swabs for *S aureus*. Nasal decontamination was associated with significantly lower rates of surgical site infections and deep surgical site infections caused by *S aureus*.

A UK-based cost-effectiveness analysis[12] suggested that the NHS could save £600,000 for every 70,000 patients tested and treated for nasal *S aureus*. In higher risk surgeries, savings could be greater.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A systematic review[13] of 17 studies (number of participants not reported in the abstract) assessed nasal decontamination or glycopeptide prophylaxis, or both, compared with standard care for preventing Gram-positive surgical site infections. Nasal decolonisation had a significant protective effect against surgical site infections associated with *S aureus*. In addition, a bundle including decontamination and glycopeptide prophylaxis for only patients colonised with meticillin-resistant *S aureus* (MRSA) was protective against surgical site infections with Gram-positive bacteria.

8-year surveillance summary

An RCT[14] (n= 1,697) assessed chlorhexidine wipes plus either mupirocin nasal ointment or povidone-iodine solution administered twice nasally in people undergoing arthroplasty or spinal fusion. In intention-to-treat analysis there was no difference between mupirocin and povidone-iodine in rates of deep surgical site infections or deep surgical site infections with *S aureus*. The authors concluded that povidone-iodine may be an alternative to mupirocin.

Topic expert feedback

The cost-effectiveness analysis[12] was highlighted by topic experts in 8-year surveillance. Topic expert feedback suggests that nasal decolonisation is a clinically important issue to address.

Impact statement

There is increasing evidence to support nasal decontamination of *S aureus* in patients before surgery.

During guideline development:

- The studies identified for this review question found no significant difference between mupirocin and placebo or no decontamination.
- The accompanying economic evaluation suggested that mupirocin decontamination had 50% chance of being cost effective.
- The topic experts were concerned about the lack of evidence of efficacy and potential for increased antibiotic resistance.

However, there is now sufficient new evidence to reassess this recommendation. An additional area of interest is the possibility of nasal decontamination using antiseptics rather than antibiotics.

NICE has guidance on antimicrobial stewardship (NICE NG15), which aims to slow the emergence of antimicrobial resistance. Although this guideline does not cover nasal mupirocin use, its principles would apply to any updated recommendations in this area.

New evidence identified that may change current recommendations.

74 – 08 Does mechanical bowel preparation reduce the rate of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

This review question should not be updated.

Mechanical bowel preparation

3-year surveillance summary

A Cochrane review[15] of 13 RCTs (n=4,777) investigated the effectiveness and safety of mechanical bowel preparation in colorectal surgery. Rates of anastomotic leakage or surgical site infection did not differ significantly between people who had mechanical bowel preparation and those who did not.

A further 4 systematic reviews[16-19] also found no benefit of mechanical bowel preparation in preventing surgical site infection.

An RCT[20] (n=149) assessed preoperative mechanical bowel preparation compared with no bowel preparation in elective colon surgery with intraperitoneal anastomosis. Surgical site infection rates did not differ significantly between people having or not having mechanical bowel preparation.

A post-hoc analysis[21] of an RCT (n=670) examined the effect of mechanical bowel preparation with polyethylene glycol compared with sodium phosphate on surgical site infection in people undergoing elective colorectal surgery who were randomly assigned to antibiotic prophylaxis with either ertapenem or cefotetan (not licensed in the UK). Sodium phosphate plus antibiotic prophylaxis was associated with significantly lower likelihood of surgical site infection compared with polyethylene glycol plus antibiotic prophylaxis.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A systematic review[22] of 2 RCTs and 2 cohort studies assessed comprehensive bowel preparation compared with limited bowel preparation in elective urinary diversion surgery. Wound infection did not differ significantly between comprehensive bowel preparation and limited bowel preparation.

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Evidence generally supports the guideline recommendations not to use mechanical bowel preparation routinely to reduce the risk of surgical site infection. One trial suggested possible differences between bowel preparation with sodium phosphate compared with polyethylene glycol, this was a post-hoc subgroup analysis of a trial designed to compare antibiotic regimens, not mechanical bowel preparation. Therefore, this trial alone is not sufficient to outweigh the many studies showing no effect of mechanical bowel preparation on surgical site infection.

New evidence is unlikely to change guideline recommendations.

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74 – 09 Does the removal of hand jewellery, artificial nails and nail polish reduce the incidence of surgical site infection?

Recommendations derived from this question

1.2.9 The operating team should remove hand jewellery before operations.

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

Surveillance decision

This review question should not be updated.

Nail polish and rings

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A Cochrane review[23] investigated the effects of wearing or removing nail polish and finger rings among surgical scrub teams. No trials looked at the primary outcome of infection rate, but 1 RCT (n=102) evaluated whether nail polish on scrub nurses affected the number of bacteria on hands after scrubbing before surgery. Recent nail polish, old nail polish and no nail polish had no impact on bacterial counts on hands before or after scrubbing. The authors concluded that evidence was insufficient to determine whether wearing nail polish affects bacterial counts after scrubbing.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

An update[24] of the Cochrane review[23] identified in the Evidence Update found no additional studies.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Although a small study suggested that nail polish did not affect bacterial counts on hands, this evidence is not likely to be considered sufficient to change the recommendation that surgical staff should remove nail polish before operations.

New evidence is unlikely to change guideline recommendations.

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74 – 10 What is the clinical effectiveness of parenteral or oral antibiotic prophylaxis for the prevention of surgical site infection compared with placebo or no antibiotic in patients undergoing surgery involving a skin incision?

Subquestions

For which types of surgery would prophylaxis be clinically and cost-effective?

When should antibiotic prophylaxis be given – pre/peri/postoperatively?

Recommendations derived from this question

1.2.11 Give antibiotic prophylaxis to patients before:

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

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

1.2.13 Use the local antibiotic formulary and always consider potential adverse effects when choosing specific antibiotics for prophylaxis.

1.2.14 Consider giving a single dose of antibiotic prophylaxis intravenously on starting anaesthesia. However, give prophylaxis earlier for operations in which a tourniquet is used.

1.2.15 Before giving antibiotic prophylaxis, consider 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.

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

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

Surveillance decision

This review question should not be updated.

An editorial or factual correction is needed. The NICE guideline on caesarean section (NICE CG132) contains 3 recommendations about antibiotic prophylaxis in caesarean section. A cross-reference should be added to the NICE version of NICE CG74 to acknowledge these recommendations.

Cholecystectomy

3-year surveillance summary

A Cochrane review[25] of 11 RCTs (n=1,664) assessed antibiotic prophylaxis compared with placebo or no prophylaxis in people undergoing elective laparoscopic cholecystectomy. Surgical site infection and extra-abdominal infection did not differ significantly between groups.

A systematic review[26] of 9 RCTs (n=1,437) evaluated prophylactic antibiotics compared with placebo or no antibiotics in people undergoing low-risk laparoscopic cholecystectomy. No statistically significant difference in surgical site infection was seen between people receiving prophylactic antibiotics and those who did not. Similarly there were no differences in overall infectious complications, major infection, distant infection, or length of hospital stay.

An RCT[27] (n=100) assessed a single dose of intravenous prophylactic antibiotics compared with placebo in people undergoing laparoscopic cholecystectomy. Surgical site infection was similar in the two groups.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

An RCT[28] (n=1,037) assessed antibiotic prophylaxis compared with no antibiotic prophylaxis in people undergoing laparoscopic cholecystectomy. Surgical site infections, distant infections and overall infections were significantly lower in the group receiving antibiotic prophylaxis compared with those who had no prophylaxis. Antibiotic prophylaxis was also associated with shorter hospital stay and lower costs.

A non-inferiority RCT[29] (n=414) compared antibiotic prophylaxis started preoperatively continuing for 5 days after surgery compared with preoperative prophylaxis in people undergoing cholecystectomy. There were no significant differences between groups in postoperative infection rates. The authors concluded that preoperative antibiotic prophylaxis was not inferior to continuing antibiotic prophylaxis after surgery.

An RCT[30] (n=310) assessed antibiotic prophylaxis compared with placebo in people undergoing low-risk laparoscopic cholecystectomy. People with complicated gall stones and those converting to open surgery were excluded. There were no significant differences in wound infections between the prophylaxis and no prophylaxis groups.

An RCT[31] (n=299) assessed intravenous antibiotic prophylaxis compared with placebo in people undergoing laparoscopic cholecystectomy. There was no significant difference in surgical site infection between groups.

A meta-analysis[32] assessed 19 RCTs (n=5,259) of prophylactic antibiotics compared with control in people undergoing laparoscopic cholecystectomy. Prophylactic antibiotics were not associated with reductions in surgical site infections or overall hospital-acquired infections

Topic expert feedback

Topic experts had concerns about possible unexpected contamination during laparoscopic surgery or the need to convert to open surgery. Both of these situations would benefit from preoperative antibiotics but neither can be predicted, so continuing to give antibiotic prophylaxis to people undergoing laparoscopic cholecystectomy was thought to be sensible.

Impact statement

Currently antibiotic prophylaxis is recommended in clean-contaminated surgery such as laparoscopic cholecystectomy. Most studies show no reduction in surgical site infection with antibiotic prophylaxis compared with placebo in this type of surgery.

However, topic expert concerns about unexpected contamination and conversion to open surgery suggests that the current recommendations remain valid.

New evidence is unlikely to change guideline recommendations.

Caesarean section

3-year surveillance summary

A second Cochrane review[33] of 86 studies (n>13,000) investigated antibiotic prophylaxis in caesarean section. Overall, prophylactic antibiotics substantially reduced surgical site infection and febrile morbidity, endometritis and serious maternal infectious complications. The findings were similar whether the caesarean section was elective or non-elective, and whether the antibiotic was given before or after umbilical cord clamping. No conclusions could be made about effects on the baby.

A Cochrane review[34] of 25 studies (n=6,367) assessed different classes of antibiotic given prophylactically to women undergoing caesarean section. Cephalosporins and penicillins had similar effects on surgical site infection and adverse effects in both elective and emergency caesarean.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A systematic review and meta-analysis[35] of 5 studies (n=1,777) investigated the timing of antibiotic prophylaxis in women undergoing caesarean section. Antibiotic administration before incision compared with after cord clamping showed no significant differences in surgical site infection.

A meta-analysis[36] of 6 RCTs (number of participants not reported in the abstract) investigated prophylactic cefazolin (not licensed in the UK) given before the procedure compared with after cord clamping in women undergoing caesarean section. Preoperative administration of cefazolin was not associated with a significant reduction in surgical site infection.

An additional systematic review and meta-analysis[37] of 6 RCTs (n=2,313) investigated the timing of prophylactic antibiotic administration in caesarean section. Preoperative antibiotics did not reduce surgical site infection compared with intraoperative administration.

8-year surveillance summary

An update[38] of a Cochrane review[33] identified in 3-year surveillance assessed 95 studies (n>15,000) of antibiotic prophylaxis compared with no prophylaxis in women undergoing caesarean section. Prophylactic antibiotics reduced wound infection, endometritis and maternal serious infectious complications compared with placebo or no antibiotics. The effects were similar whether antibiotics were administered before or after umbilical cord

clamping. No studies assessed effects on the infant.

An update[39] of a Cochrane review[34] identified in 3-year surveillance assessed 35 studies (n=7,697) of antibiotic classes used as prophylaxis in caesarean section. The main comparison of cephalosporins compared with penicillins showed no significant differences between these classes for maternal sepsis, endometritis, urinary tract infection, or wound infection. None of the studies assessed infant outcomes of sepsis or oral thrush.

A Cochrane review[40] of 10 studies (n=5,041) assessed antibiotic prophylaxis administered before skin incision compared with after neonatal cord clamping in women undergoing caesarean section. Preoperative administration was associated with significant reductions in maternal infections morbidity, endometritis and wound infection compared with administration after umbilical cord clamping. No clear differences in neonatal outcomes or other maternal outcomes were seen.

An RCT[41] (n=410) in China assessed antibiotics administered before skin incision compared with after umbilical cord clamping prophylaxis in women undergoing elective caesarean section. No differences were seen between groups for endometritis, wound infection, and neonatal sepsis.

An RCT[42] (n=414) in China assessed antibiotic prophylaxis compared with no antibiotics in women undergoing low-risk elective caesarean section. Antibiotic prophylaxis had no significant effects on endometritis or infectious morbidity (defined as fever, surgical site infection, endometritis or urinary tract infection).

An RCT in Uganda[43] (n=464) assessed antibiotics administered before compared with after skin incision in women undergoing caesarean section. Postoperative infections and endometritis were significantly lower with antibiotic administration before skin incision.

An RCT[44] (n=181) in Tanzania assessed single-dose versus multiple-dose antibiotic prophylaxis in women undergoing caesarean section. No significant differences in wound infections were seen between the 2 regimens.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Evidence generally finds that antibiotic prophylaxis reduces surgical site infections after caesarean section, with no differences between classes of antibiotics. Currently, routine prophylactic antibiotics given before skin incision are recommended in Caesarean section (NICE guideline CG132).

The 2016 surveillance review of caesarean section also identified much of this evidence and concluded that no update in this area is needed because new evidence supports the current recommendations.

New evidence is unlikely to change guideline recommendations.

Breast surgery

3-year surveillance summary

A Cochrane review[45] of 7 RCTs (number of participants not reported in the abstract) assessed the effect of prophylactic antibiotics on surgical site infection after breast cancer surgery. Prophylactic antibiotics reduced the risk of surgical site infection compared with no antibiotics or placebo in people undergoing surgery for breast cancer.

Evidence Update (2013)

An update[46] of the Cochrane review identified at 3-year surveillance[45] included 9 RCTs (n=2,260) of preoperative or perioperative antibiotic prophylaxis compared with no antibiotic prophylaxis or placebo. Prophylactic antibiotics significantly reduced surgical site infection incidence.

An RCT[47] (n=254), assessed intravenous cefazolin (not licensed in the UK) before incision compared with placebo in women undergoing modified radical mastectomy. No difference in infection rates within 30 days was found between groups. However, when the authors pooled their trial results with a subset of studies from a Cochrane review on mastectomy, the effect of antibiotic prophylaxis on infections was no longer significant in this patient group.

6-year surveillance summary

A systematic review[48] (n=2,971; number of studies not reported in the abstract) assessed systemic antibiotic prophylaxis for cosmetic

breast surgery. Antibiotics significantly reduced surgical site infection compared with control. For reduction mammoplasty, a single intravenous perioperative dose of antibiotics resulted in a reduction in surgical site infection risk but antibiotic prophylaxis did not affect infection rates in augmentation mammoplasty.

A Cochrane review[49] of 11 studies (n=2,867) investigated the effect of prophylactic preoperative or perioperative antibiotics on the incidence of surgical site infection after breast cancer surgery. Preoperative prophylactic antibiotics reduced the risk of surgical site infection for patients undergoing breast cancer surgery without reconstruction.

A systematic review[50] of 81 studies examined antibiotic regimens in breast reconstruction. Antibiotic treatment for more than 24 hours was not significantly better at preventing surgical site infection than antibiotic treatment for less than 24 hours.

8-year surveillance summary

A systematic review[51] of 13 studies (number of participants not reported in the abstract) assessed antibiotic prophylaxis compared with control in people undergoing mammoplasty with implants. Extended antibiotic prophylaxis (defined as more than 24 hours postoperatively) was associated with lower surgical site infection rates than prophylaxis ending within 24 hours of surgery. However, in subgroup analysis this effect was seen in reconstructive breast surgeries but not in aesthetic breast surgery. Topical antibiotic irrigation did not significantly reduce surgical site infections but did reduce capsular contractions.

An RCT[52] assessed antibiotic prophylaxis with single-dose intravenous cloxacillin (not licensed in the UK) or clindamycin compared with placebo in people undergoing breast reconstruction surgery. No significant difference in postoperative infections (defined as use of antibiotics after surgery) was seen between groups.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Generally, antibiotic prophylaxis is associated with lower rates of surgical site infection in breast surgery. Although the abstracts did not always specify that implants were used in reconstruction or augmentation surgeries, use of implants would generally be expected.

The guideline found evidence for use of prophylactic antibiotics in breast surgery to be insufficient. Therefore, evidence generally strengthens the current recommendation to give antibiotic prophylaxis in clean surgery involving the placement of a prosthesis or implant.

Other aspects of antibiotic prophylaxis in breast surgery remain questionable because of conflicting evidence. For example, non-implant surgeries such as mastectomy or breast reduction, and duration of antibiotic use.

New evidence is unlikely to change guideline recommendations.

Cardiac surgery

3-year surveillance summary

An RCT[53] (n=1,000) assessed prophylactic antibiotics compared with placebo in patients undergoing cardiac device implantation or replacement. Antibiotic prophylaxis significantly reduced infectious complications compared with placebo.

An RCT[54] (n=186) compared two antibiotic prophylaxis regimens for surgical site infection in patients who had undergone high-risk coronary artery bypass grafting. The intervention group received a regimen of gentamicin, rifampicin and vancomycin with 1 induction dose and 3 further doses at 12-hour intervals. The control group received cefuroxime with 1 induction dose and 3 further doses at 8-hour intervals. Results showed the multi-drug regimen significantly reduced surgical site infection compared with cefuroxime. The multi-drug regimen also had significantly lower hospital costs.

An RCT[55] (n=235) evaluated the duration of antibiotic prophylaxis in patients undergoing coronary bypass grafting or valve replacement. A 48-hour regimen of antibiotics was as effective as a 72-hour regimen for preventing surgical site infection.

Evidence Update (2013)

A systematic review and meta-analysis[56] assessed 15 studies (n=3,970) of prophylactic antibiotics and antiseptics after electronic cardiac device implantation. Surgical site infection was significantly reduced with systemic antibiotics plus skin antisepsis 1 hour before surgery compared with no antibiotics or postoperative antibiotics.

8-year surveillance summary

An RCT[57] (n=141) assessed prophylaxis with continuous cefazolin infusion (not licensed in the UK) for 24 hours compared with intermittent doses of cefazolin in people undergoing off-pump coronary artery bypass surgery. No significant differences in infection were seen between groups.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Current evidence supports the recommendation to give antibiotic prophylaxis in cardiac surgeries involving the placement of an implant or prosthesis.

Evidence addressing single versus multi-drug regimens or duration of treatment was identified; however, decisions on choice of antibiotic prophylaxis depends on local microbiological profiles and resistance patterns. Therefore, the recommendation to use the local antibiotic formulary and always consider potential adverse effects when choosing specific antibiotics for prophylaxis remains relevant.

New evidence is unlikely to change guideline recommendations.

Colorectal surgery

3-year surveillance summary

A Cochrane review[58] of 182 studies (n=30,880) assessed the effectiveness of prophylaxis with 50 different antibiotics on surgical site infection in patients undergoing colorectal surgery. Prophylactic antibiotics significantly reduced surgical site infection compared with control. Comparisons of short and long duration of prophylaxis or single versus multiple doses of antibiotics showed no significant differences. Regimens covering aerobic and anaerobic bacteria were significantly more effective than targeting only one of these categories as were regimens combining oral and intravenous antibiotic prophylaxis compared with only 1 route of administration.

An RCT[59] (n=100) assessed the effects of antibiotic prophylaxis compared with no antibiotics on surgical site infection in colorectal surgery. There was no significant difference in surgical site infection between the two groups.

An RCT[60] (n=384) assessed 1 dose of cefmetazole (not licensed in the UK) before skin incision compared with cefmetazole before skin incision then 2 further doses at 8-hour intervals in people undergoing colorectal surgery. Significantly fewer surgical site infections were seen with the 3-dose regimen.

An RCT[61] (n=275) investigated prophylaxis with oral kanamycin and erythromycin plus intravenous cefmetazole or cefotiam in people undergoing elective colon cancer surgery. People were randomly assigned to receive antibiotics on the day of surgery or for 3 days. There were no significant differences between groups in surgical site infection or methicillin-resistant *S aureus* infection.

An RCT[62] assessed oral plus intravenous antimicrobial prophylaxis compared with intravenous prophylaxis alone in people undergoing elective colorectal surgery. Surgical site infection was similar in the two groups.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

An update[63] of the Cochrane review[58] identified in 3-year surveillance assessed 260 studies (n=43,451) of prophylactic antibiotic use before colorectal surgery. Many studies had multiple variables so could not be compared with studies addressing a single variable. Overall, antibiotic prophylaxis was associated with lower surgical wound infection. Adding coverage for aerobic or anaerobic bacteria was associated with reductions in surgical wound infection. However coverage for aerobic organisms compared with anaerobic organisms showed no significant difference. Oral plus intravenous

administration was significantly better than intravenous administration alone. There was no significant difference in surgical wound infection when administering antibiotics before surgery compared with after surgery. Short-term antibiotic prophylaxis did not show significant differences compared with long-term prophylaxis. Single-dose prophylaxis also showed no significant difference compared with multiple-dose prophylaxis.

A meta-analysis[64] assessed local gentamicin compared with control for prophylaxis of surgical site infection. It was not clear in the abstract whether local gentamicin prophylaxis was administered before surgery or as part of wound care. No significant differences in wound infection or organ-space infection were seen between groups. However, subgroup analysis suggested that local gentamicin was associated with lower wound infection in Western European populations.

A non-inferiority RCT[65] (n=279) assessed 1 dose of prophylactic intravenous antibiotics during surgery compared with 5 additional doses in people undergoing elective rectal cancer surgery All participants received pre-surgical prophylaxis with kanamycin (not licensed in the UK) and erythromycin and mechanical bowel preparation. No significant differences in surgical site infection rates were seen between the group that had 1 dose of flomoxef and the group that had multiple doses.

An RCT[66] in China (n=599) suggested no difference between ertapenem plus metronidazole and ceftriaxone plus metronidazole in 'successful' prophylaxis of surgical site infection in people undergoing elective colorectal surgery.

An RCT[67] (n=1,073) assessed oral trimethoprim-sulfamethoxazole and metronidazole compared with intravenous cefuroxime and metronidazole in people undergoing elective colorectal surgery. The oral regimen was associated with significantly higher rates of surgical site infection.

Probiotics as prophylaxis

A 3-group RCT[68] (n=310) assessed probiotics compared with antibiotics and with no antibiotics or probiotics. Antibiotic prophylaxis effectively reduced surgical site infection, but probiotics did not.

An RCT[69] (number of participants not reported in the abstract) assessed a regimen of 4 probiotics compared with placebo as prophylaxis in people undergoing elective colorectal surgery. Probiotic prophylaxis reduced complications including surgical site infections and reduced hospital stay.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Evidence supports the current recommendations for use of antibiotic prophylaxis in clean-contaminated surgery such as colorectal surgery.

Evidence addressing single versus multi-dose regimens or assessing particular antibiotic regimens was identified; however, decisions on choice of antibiotic prophylaxis depends on local microbiological profiles and resistance patterns. Therefore, the recommendation to use the local antibiotic formulary and always consider potential adverse effects when choosing specific antibiotics for prophylaxis remains relevant.

New evidence is unlikely to change guideline recommendations.

Other gastrointestinal surgery

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A systematic review and meta-analysis[70] of 4 RCTs (n=1,095) assessed extended compared with intraoperative antimicrobial prophylaxis in gastric cancer surgery. No statistically significant difference in surgical site infection was seen between the two groups. Furthermore, multiple-dose antimicrobial prophylaxis did not reduce surgical site infection compared with a single dose.

A systematic review[71] of 8 RCTs (n=1,668) compared selective decontamination of the digestive tract with systemic antibiotics to systemic antibiotic prophylaxis alone in people undergoing gastrointestinal surgery. Selective decontamination was associated with a lower

rate of postoperative infection compared with non-selective antibiotic prophylaxis.

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Evidence suggests no benefit of extended antibiotic therapy in gastric cancer surgery compared with intraoperative antibiotics. However; selective decontamination was more effective than non-selective decontamination.

These findings support the recommendations to use antibiotic prophylaxis before clean-contaminated surgery such as gastrointestinal surgery, and to use the local antibiotic formulary.

New evidence is unlikely to change guideline recommendations.

Hernia repair

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A Cochrane review[72] included 17 RCTs of antibiotic prophylaxis in adults undergoing hernia repair (n=7,843). Antibiotic prophylaxis was associated with lower rates of surgical site infection overall. Subgroup analysis showed reduced infection rates in repairs using a mesh implant but not in repairs performed without a mesh implant.

6-year surveillance summary

A Bayesian and frequentist meta-analysis[73] of 12 studies (n=3,838) investigated antibiotic prophylaxis in open mesh inguinal or femoral hernia repair. Antibiotic prophylaxis significantly reduced surgical site infection compared with control.

8-year surveillance summary

An RCT[74] (n=237) assessed prophylactic cefazolin (not licensed in the UK) compared with no prophylactic antibiotic in people undergoing hernia repair with polypropylene mesh. There were no significant differences in surgical site infection between prophylaxis and control.

An RCT[75] (n=200) assessed intravenous antibiotic prophylaxis compared with placebo in people undergoing open mesh-plug hernia repair. Surgical site infections were significantly lower in the group receiving antibiotic prophylaxis compared with those receiving no prophylaxis.

A further study[76] related to antibiotic prophylaxis was identified at 8-year surveillance but was thought not to impact on current guidance.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Generally, evidence supports the use of antibiotic prophylaxis in hernia repair, and several trials looked specifically at mesh repair. Therefore, the recommendation to use antibiotic prophylaxis in clean surgery involving the placement of a prosthesis or implant, applies to such surgeries, and remains valid.

New evidence is unlikely to change guideline recommendations.

Hip and knee surgery

3-year surveillance summary

A systematic review and meta-analysis[77] of 26 RCTs (n=11,343) investigated antibiotic prophylaxis in people undergoing total hip or knee replacement. Antibiotic prophylaxis was associated with significantly lower rates of surgical site infection compared with no prophylaxis. Comparisons of systemic administration with antibiotics in cement; cephalosporins with glycopeptides; cephalosporins with penicillin-derivatives; and second-generation with first-generation cephalosporins showed no significant differences.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A systematic review and meta-analysis[78] of 8 studies (n=6,381) assessed antibiotic-impregnated bone cement compared with standard cement or systemic antibiotics in total hip or knee replacement. Antibiotic-impregnated bone cement was not associated with lower rates of superficial surgical site infection but significantly reduced deep infection rates. In subgroup analysis, gentamicin was superior to cefuroxime in reducing deep infections.

A systematic review[79] of 12 studies (123,788 surgeries) assessed strategies to prevent surgical site infection in total hip replacement. A strategy of systemic antibiotics plus antibiotic-impregnated cement plus conventional ventilation was associated with lower risk of surgical site infection compared with the reference strategy (no systemic antibiotics plus standard cement plus conventional ventilation). Furthermore, there was some evidence that laminar air flow could increase infection risk compared with conventional ventilation.

8-year surveillance summary

A systematic review and meta-analysis[80] of 4 RCTs (n=4,036) assessed postoperative antibiotic prophylaxis compared with placebo in people undergoing total hip and knee arthroplasty. Postoperative antibiotic prophylaxis was not associated with reductions in surgical site infection. Additionally, it was not clear from the abstract whether any preoperative prophylaxis was used in the included studies.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The new evidence does not contradict the current recommendation to use antibiotic prophylaxis in clean surgeries involving placement of a prosthesis or implant, such as in knee and hip replacement. However, there is no evidence of benefit of particular antibiotic regimens, and the evidence for antibiotic-impregnated cement is inconsistent.

New evidence is unlikely change guideline recommendations.

Cosmetic and reconstructive surgery

3-year surveillance summary

An RCT[81] (n=150) evaluated single-dose compared with single-day antibiotic prophylaxis in patients undergoing orthognathic surgery. Results showed no significant difference in surgical site infection between groups.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A meta-analysis[82] of 12 RCTs (n=2,395) assessed antibiotic prophylaxis in people undergoing clean and clean-contaminated cosmetic and reconstructive surgery. Antibiotic prophylaxis was associated with significantly lower surgical site infection rates than placebo.

8-year surveillance summary

A Cochrane review[83] of 11 studies (overall number of participants not reported in the abstract) assessed antibiotic prophylaxis in orthognathic surgery. Long-term antibiotic prophylaxis (defined as before or during surgery and longer than 1 day after surgery) was associated with lower rates of surgical site infection. However, it was not clear whether the comparator was short-term antibiotic prophylaxis (defined as before or during surgery or during the same day of surgery) or placebo.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Current evidence supports use of antibiotics in cosmetic and reconstructive surgery, including orthognathic surgery. This is consistent with the recommendations to use antibiotic prophylaxis before clean surgery involving the placement of a prosthesis or implant; clean-contaminated surgery; and contaminated surgery, which should account for most cosmetic and reconstructive surgeries. The recommendation to choose antibiotic regimens using local formularies remains valid.

New evidence is unlikely change guideline recommendations.

Neurosurgery

3-year surveillance summary

An RCT[84] (n=483) assessing cefoperazone plus sulbactam compared with cefazoline (none of these drugs is licensed in the UK) for antimicrobial prophylaxis found no statistically significant difference between the groups in overall infection rate after neurosurgery.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A meta-analysis[85] of 5 RCTs (n=2,209) investigated third-generation cephalosporins as prophylactic antibiotics in neurosurgery. No significant difference in surgical site infection was identified between third-generation cephalosporins and the alternative regimen (not specified in the abstract).

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Currently, use of routine antibiotic prophylaxis is not recommended for clean non-prosthetic uncomplicated surgery such as neurosurgery. The new evidence compared the efficacy of different antibiotics, without a placebo or no antibiotic comparison group so cannot inform the question of whether to use antibiotics in neurosurgery.

New evidence is unlikely to change guideline recommendations.

Other types of surgery

3-year surveillance summary

Hand surgery

An RCT[86] (n=1,340) assessed antibiotics compared with placebo in people undergoing hand surgery. There was no significant difference in infection. They also did not find any differences between elective or emergency procedures or in crush and dirty wounds.

Urological surgery

An RCT[87] (n=207) assessed intravenous cefotiam (not licensed in the UK) compared with intravenous fosfomycin for preventing infection associated with urological surgery. Similar efficacy was seen between these drugs in preventing infection.

Minor dermatological surgery

An RCT[88] (n=972) investigated a single application of topical chloramphenicol ointment compared with paraffin ointment control in preventing wound infection after minor dermatological surgery. Incidence of infection was significantly lower in the chloramphenicol group than in the control group.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

Dermatological surgery

A systematic review and meta-analysis[89] of 4 trials (number of participants not reported in the abstract) assessed topical antibiotics in dermatological surgery. Topical antibiotics did not reduce postsurgical wound infections compared with petrolatum or paraffin.

Hand surgery

A meta-analysis[90] of 13 studies (n=2,578) assessed antibiotic prophylaxis compared with no prophylaxis in people with hand injuries treated with surgery. Open fractures, crush injuries and bite wounds were excluded. No significant difference in infection rates were seen between antibiotic prophylaxis and no prophylaxis.

Lower limb vascular surgery

An RCT[91] (n=178) assessed antibiotic prophylaxis with vancomycin compared with daptomycin in people undergoing lower limb vascular surgery. There were no differences in early vascular surgical site infection between the 2 antibiotics. Significantly fewer Gram-positive infections were seen in the vancomycin group, but there was no significant difference in rates of MRSA.

Liver transplantation

A Cochrane review[92] assessed 1 RCT (n=180) of antibiotic prophylaxis in people undergoing liver transplantation. The single study identified was assessed as being at high risk of bias and reported no numerical data. The authors concluded that the benefits and harms of antibiotic prophylaxis in liver transplantation remain unclear.

Neck surgery

An RCT[93] (n=2,164) assessed intravenous antibiotic prophylaxis with piperacillin (not licensed as a single product in the UK) or cefazolin (not licensed in the UK) compared with no prophylaxis in people undergoing thyroid and parathyroid surgery. There was no difference in surgical site infections with prophylaxis compared with no prophylaxis, but urinary tract infections were significantly lower with prophylaxis.

Perforated appendicitis

An RCT[94] (n=107) assessed ertapenem compared with a three-drug antibiotic regimen in children with perforated appendicitis. Ertapenem was associated with significantly fewer infectious complications and less likelihood of bowel colonisation with resistant bacteria.

Non-perforated appendicitis

An RCT[95] (n=390) assessed antibiotic prophylaxis given in 2 doses before and after surgery compared with 1 dose before surgery only in people undergoing surgery for non-perforated appendicitis. No significant difference in surgical site infection was seen between groups.

Urological surgery

An RCT[96] (n=42) assessed antibiotic prophylaxis compared with placebo in people undergoing clean urological surgery. There was no significant difference in surgical site infection when using prophylactic antibiotics.

Additional studies

A further 2 studies[97,98] related to antibiotic prophylaxis were identified at 8-year surveillance but were not thought to impact on current guidance.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Several studies of antibiotic prophylaxis in various types of surgery have been identified, but there is no clear evidence that any individual type of clean surgery should receive antibiotic prophylaxis. This would be inconsistent with current guidance not to give antibiotic prophylaxis in such surgeries. Studies of specific antibiotic regimens also cannot over-ride the need to use local formularies when choosing antibiotics.

New evidence is unlikely change guideline recommendations.

Studies of mixed surgery types

3-year surveillance summary

Mixed surgeries

A meta-analysis[99] of 90 RCTs (number of participants not reported in the abstract) investigated ceftriaxone antibiotic prophylaxis in various types of surgery. Ceftriaxone reduced surgical site infection, urinary tract infection and pneumonia compared with other prophylactic antibiotics.

Implantation procedures

An RCT[100] (n=89) assessed intravenous ceftriaxone, cefuroxime, and ciprofloxacin in patients undergoing implantation procedures. These drugs had similar efficacy and safety in preventing surgical site infection. However, cost–benefit assessment showed that ciprofloxacin cost less.

Proximal femoral and other closed long bone fractures

A Cochrane review[101] of 23 RCTs or quasi-RCTs (n=8,447) examined prophylactic antibiotics with no prophylaxis, placebo or a regimen of a different duration in people undergoing surgical management of hip or other closed long bone fractures. Single-dose antibiotic prophylaxis significantly reduced deep surgical site infection, superficial surgical site infection, and urinary infection. Multiple-dose prophylaxis had similar effects on deep surgical site infection but no significant effects on urinary and respiratory infections.

Clean and clean-contaminated surgical procedures

A systematic review[102] of 14 RCTs compared glycopeptide antibiotics with alternative antibiotic regimens for prophylaxis in adults undergoing clean or clean-contaminated surgical procedures. No evidence was found to support preferencial use of glycopeptides over other antibiotics for surgical site infection and MRSA prevention.

Evidence Update (2013)

Surgery needing tourniquets

An RCT[103] (n=106) in Nigeria examined administering antibiotics before compared with after tourniquet application in elective orthopaedic surgery. Surgical site infection rates were significantly lower in people receiving antibiotics after tourniquet inflation.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A meta-analysis[104] of 14 studies (n=8,952) assessed antibiotic prophylaxis with glycopeptides compared with beta-lactams in people undergoing cardiac, vascular, and orthopaedic surgeries. Overall, surgical site infection did not differ between groups. Glycopeptides were associated with reductions in enterococcal and resistant staphylococcal surgical site infections. However, glycopeptides were associated with increased respiratory tract infections.

Topic expert feedback

In developing the Evidence Update in 2013, topic experts considered that the study assessing antibiotic administration before or after tourniquet administration had methodological limitations.

Impact statement

Several studies of antibiotic prophylaxis in various types of surgery have been identified, but there is no clear evidence that any individual type of surgery should receive antibiotic prophylaxis. Studies of mixed types of surgery are difficult to consider against current recommendations that divide surgery by contamination status. Studies of specific antibiotic regimens also cannot over-ride the need to use local formularies when choosing antibiotics.

The study assessing antibiotic administration before or after tourniquet administration is unlikely to affect the recommendation to administer antibiotics before surgery, and earlier than non-tourniquet surgeries because of methodological limitations of the study.

New evidence is unlikely to change guideline recommendations.

Intraoperative phase

74 – 11 What is the clinical hand decontamination strategy to use between subsequent surgeries?

Subquestion

What is the cost-effective hand decontamination strategy to use between subsequent surgeries?

Recommendations derived from this question

1.3.1 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.

1.3.2 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.

Surveillance decision

This review question should not be updated.

Pre-surgical hand preparation

3-year surveillance summary

A Cochrane review[105] of 1 study (n=4,387) assessed pre-surgical hand antisepsis of varying duration, methods and antiseptic solutions. There was no difference between scrubs in alcohol solutions and scrubs in aqueous solutions in reducing surgical site infections. A narrative summary of 9 studies, measuring bacterial counts on the hands before and after surgery, suggested that chlorhexidine in was more effective in reducing the amount of bacteria in an aqueous solution than povidone iodine.

A Kenyan cluster-RCT[106] (n=3,317) assessed plain soap and water compared with an alcohol-based hand-rub for surgical hand preparation. No statistically or clinically significant difference in surgical site infection rate was found between groups at 30 days, with little cost difference between the methods.

An RCT[107] (n=146) assessed chlorhexidine compared with chlorhexidine plus nail picks or chlorhexidine plus brushes for pre-surgical hand decontamination. No statistically significant differences in bacterial numbers were found between any of the groups.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

An update[108] of the Cochrane review identified in 3-year surveillance[105] included 14 studies (total number of participants not reported in the abstract) assessing hand antisepsis before surgery. Surgical site infection was reported as an outcome in 4 studies, but all showed no significant difference between agents. The studied agents included soap and water versus alcohol rub plus hydrogen peroxide, alcohol-based rubs versus water-based rubs.

Chlorhexidine gluconate scrubs resulted in fewer colony-forming units than povidone iodine scrubs immediately after scrubbing, 2 hours after the initial scrub and 2 hours after subsequent scrubbing. However, the authors noted that the evidence was of low or very low quality. Other studies investigated other types of scrub, duration of scrub and use of scrubbing tools. The authors concluded that 'generally, almost all evidence available to inform decisions about hand antisepsis approaches that were explored here were informed by low or very low quality evidence'.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

When formulating the recommendations on hand decontamination, topic experts were concerned because only 1 study had been identified, which was difficult to extrapolate to all types of surgical procedures.

However, new evidence does not add any clarity because of absence of significant effects of alternative hand decontamination methods and generally low quality studies.

New evidence is unlikely to change guideline recommendations.

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74 – 12 Is the use of incise drapes clinically and cost-effective in reducing the incidence of surgical site infection?

Subquestion

Which incise drapes are clinically and cost-effective in reducing the incidence of surgical site infection?

Recommendations derived from this question

1.3.3 Do not use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection.

1.3.4 If an incise drape is required, use an iodophor-impregnated drape unless the patient has an iodine allergy.

Surveillance decision

This review question should not be updated.

Adhesive drapes

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A Cochrane review[109] of 7 studies (n= 4,195) assessed the effect of adhesive drapes used during surgery. A significantly higher proportion of patients in the adhesive drape group developed a surgical site infection compared with no drapes. Furthermore, iodine-impregnated adhesive drapes had no effect on the surgical site infection rate.

8-year surveillance summary

An update[110] of the Cochrane review[109] identified in 6-year surveillance found no additional studies.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Evidence supports the recommendation not to use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection. The recommendation to use an iodophor-impregnated drape, if needed, unless the patient has an iodine allergy, remains valid because iodine-impregnated drapes were not associated with increased surgical site infections.

New evidence is unlikely to change guideline recommendations.

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74 – 13 Is the use of gowns clinically effective in reducing the incidence of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

No new information was identified at any surveillance review.

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74 – 14 Is the use of reusable or disposable surgical drapes and gowns related to surgical site infection?

Recommendations derived from this question

No recommendations were made for this question. A research recommendation was made (see RR – 08 later in this document).

Surveillance decision

This review question should not be updated.

Disposable or reusable drapes

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

An RCT[111] (n=102) assessed reusable compared with disposable drapes in breast reconstruction surgery with implants. Significantly fewer postoperative infections occurred in the disposable drape group.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Evidence suggests that disposable drapes may be associated with fewer postoperative infections than reusable drapes. However, the number of participants in the trial was small when considered with the larger trials identified when developing the guideline. Therefore, this trial is unlikely to be sufficient to address the review question or the research recommendation.

New evidence is unlikely to change guideline recommendations.

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74 – 15 Is there a difference between double-versus single-gloving affecting the incidence of surgical site infection?

Subquestion

Does the puncture rate of gloves correlate to the incidence of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

No new information was identified at any surveillance review.

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74 – 16 Is the use of preoperative skin antiseptics clinically effective in the prevention of surgical site infection?

Recommendations derived from this question

1.3.7 Prepare the skin at the surgical site immediately before incision using an antiseptic (aqueous or alcohol-based) preparation: povidone-iodine or chlorhexidine are most suitable.

1.3.8 If diathermy is to be used, ensure that antiseptic skin preparations are dried by evaporation and pooling of alcohol-based preparations is avoided.

Surveillance decision

This review question should be updated.

Skin antisepsis

3-year surveillance summary

A Cochrane review[112] assessed 1 RCT (n=177) of microbial sealants compared with no microbial sealant in people undergoing clean surgery. No significant differences in surgical site infection were seen between groups.

A meta-analysis[113] of 24 RCTs (n=5,004) assessed povidone-iodine compared with no antiseptic solution on surgical site infection rate. Povidone-iodine reduced surgical site infections compared with no antiseptic.

A systematic review[114] of 9 RCTs (n=3,614) assessed chlorhexidine skin antisepsis compared with iodine. Preoperative skin antisepsis with chlorhexidine was more effective than iodine for preventing surgical site infection, and resulted in cost savings.

A meta-analysis[115] of 6 studies (n=5,031) assessed chlorhexidine skin antisepsis compared with povidone-iodine. Chlorhexidine significantly reduced postoperative surgical site infection compared with povidone-iodine.

An RCT[116] (n=849) assessed chlorhexidine-alcohol skin antisepsis compared with povidone-iodine scrub and paint in adults undergoing clean-contaminated surgery. Surgical site infections were significantly lower in the chlorhexidine-alcohol group. Furthermore, chlorhexidine-alcohol was significantly more protective against superficial incisional infections and deep incisional infections but not against organ-space infections. Adverse events were similar between the groups.

An RCT[117] (number of participants not reported in the abstract) investigated chlorhexidine-alcohol compared with povidone-iodine in people undergoing open hernia repair. The results showed that the antibacterial efficacy of chlorhexidine-ethanol and povidone-iodine was comparable.

Evidence Update (2013)

A systematic review[2] of 20 studies (n=9,520) examined antiseptic skin preparations and application techniques. The authors noted: 'given the heterogeneity of the studies and the results, conclusions about which antiseptic is more effective at reducing surgical site infections cannot be drawn'. However, one RCT showed that an alcohol based solution of chlorhexidine was better at preventing surgical site infection than povidone-iodine antisepsis when used before clean-contaminated surgery.

The evidence update concluded that the most effective antiseptic for skin preparation before surgical incision was uncertain from the current evidence.

6-year surveillance summary

A Cochrane review[118] of 13 studies (n=2,623) examined preoperative skin antisepsis immediately before surgical incision for clean surgery. The antiseptics differed between the included studies but all trials included some form of iodine. Preoperative skin preparation with 0.5% chlorhexidine in methylated spirits was associated with lower rates of surgical site infections than alcohol-based povidone-iodine paint; however, the authors noted that the study showing this result was poorly reported.

An update[119] of a Cochrane review[112] included in 3-year surveillance identified 2 new trials.

Microbial sealants were associated with fewer surgical site infections than control sealant. However, the authors concluded that, due to the small number of participants in each trial and the quality of studies, the findings should be treated with caution.

8-year surveillance summary

An update[120] of a Cochrane review[118] included in 6-year surveillance found no additional studies.

An RCT[121] (n=56) assessed povidone-iodine compared with chlorhexidine in an alcohol base in men undergoing surgery for benign prostatic hyperplasia. The type of antiseptic used did not affect the rates of surgical site infection.

An RCT[122] (n=388) assessed skin antisepsis using povidone-iodine compared with chlorhexidine gluconate in alcohol in people undergoing clean or clean-contaminated surgery. No significant difference in surgical site infection was seen.

An RCT[123] (n=100) assessed chlorhexidine gluconate compared with saline control in people undergoing elective resection of hepatic tumours. No significant differences in surgical site infection were seen between groups.

An RCT[124] (n=100) assessed chlorhexidine 0.5% in isopropyl alcohol compared with chlorhexidine 2.0% in isopropyl alcohol as skin antisepsis in people undergoing coronary artery bypass grafting. Although the more concentrated solution resulted in lower bacterial counts, there was no significant difference in surgical site infection between the groups.

An RCT[125] (n=351) assessed chlorhexidine gluconate compared with povidone iodine in people undergoing clean-contaminated upper abdominal surgeries. Overall surgical site infections did not differ significantly between groups. Subgroup analysis suggested that in the first week after surgery, significantly more people in the povidone-iodine group had surgical site infection; however there were no differences in the second week after surgery.

An RCT[126] assessed application of pre-heated skin antiseptic with chlorhexidine compared with room-temperature antiseptic in people undergoing pacemaker implantation. There were no significant differences in surgical site infections or bacterial colonisation between groups.

Topic expert feedback

Topic experts suggest that further analysis of skin antisepsis is necessary to address issues such as whether chlorhexidine and povidone-iodine are equivalent.

Impact statement

Currently both chlorhexidine and povidone iodine are recommended for skin antisepsis and both alcohol and water-based solutions may be used.

The evidence to inform the choice of antiseptic in surgical procedures is inconsistent. There is a lack of clarity in some abstracts about what solvents are used in the antiseptic preparations. Several studies specified the use of chlorhexidine in alcohol but did not state whether the comparator, povidone-iodine, was in alcoholic or aqueous solution. Because alcohol is a well-known antiseptic agent, a chlorhexidine-alcohol preparation has 2 active ingredients whereas aqueous povidone-iodine has only 1 active ingredient. An update of this review question is needed to determine whether chlorhexidine and povidone-iodine should both be recommended for skin antisepsis, and whether alcohol solvents should be preferred over aqueous solvents.

New evidence identified that may change current recommendations.

Antiseptics in caesarean section

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A Cochrane review[127] of 5 trials (n=1,462) compared different types of preoperative skin antisepsis in women undergoing caesarean section. Two studies compared incisional drapes with no drapes in women who had received the same preoperative skin antisepsis and 3 trials compared different antiseptic preparations. Use of drapes versus no drapes did not make a significant difference to surgical site infection rate in people who received skin antisepsis. There was also no significant difference in infection between those receiving parachlorometaxylenol plus iodine versus iodine alone. One trial compared alcohol scrub plus iodophor drape to iodophor scrub without

drape but no infections were reported in either group.

6-year surveillance summary

A Cochrane review[128] of 5 trials (n=1,946) investigated cleansing the vagina with an antiseptic solution before caesarean delivery. Vaginal preparation immediately before caesarean delivery significantly reduced the incidence of endometritis compared with placebo or standard care control.

8-year surveillance summary

An update[129] of a Cochrane review[128] included in 6-year surveillance identified 7 studies (n=2,815) assessing cleansing the vagina with an antiseptic solution before caesarean delivery. Vaginal preparation immediately before caesarean delivery significantly reduced the incidence of endometritis compared with placebo or standard care control. This effect was particularly strong in women who were in labour at the time of caesarean delivery and those with ruptured membranes.

An update[130] of a Cochrane review[127] included in the Evidence Update (2013) identified 6 trials (n=1,522) assessing preoperative skin preparation in women undergoing caesarean section. No significant differences in wound infection or endometritis were seen in comparisons including drape versus no drape, alcohol scrub plus iodophor drape versus iodophor scrub with no drape, parachlorometaxylenol plus iodine versus iodine alone.

An RCT[131] (n=400) assessed vaginal povidone-iodine plus abdominal scrub compared with abdominal scrub alone in women undergoing non-emergent caesarean section. Vaginal povidone-iodine was associated with lower rates of endometritis, but did not affect postoperative fever or wound infection.

An RCT[132] (n=1,404) assessed chlorhexidine with alcohol, povidone-iodine with alcohol, and both applied sequentially in women undergoing caesarean section. There was no significant difference in surgical site infection between the groups.

An RCT[133] (n=1,147) assessed chlorhexidine in alcohol compared with povidone-iodine in alcohol in women undergoing caesarean section. Surgical site infections were significantly more common in the iodine in alcohol group.

Topic expert feedback

The role of intravaginal antisepsis before caesarean section was thought to need further investigation.

Impact statement

Evidence for the choice of agent for skin antisepsis in caesarean section remains unclear, with conflicting results from trials of chlorhexidine in alcohol compared with povidone-iodine in alcohol. However, this issue should be considered in an update to NICE guideline CG74, which, as already noted above, should investigate current evidence on antiseptic skin preparation in other types of surgery.

There are currently no recommendations about vaginal preparation in caesarean section. This technique is also not covered by 'Caesarean section (NICE guideline CG132)'. However, evidence suggests that this intervention may reduce surgical site infection; therefore, this intervention could be considered in a future update of the NICE guideline on caesarean section.

New evidence is unlikely to change guideline recommendations.

74 – 17 Does use of diathermy for surgical incisions affect the rate of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

This review question should not be updated.

Diathermy and electrocautery

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A Cochrane review[134] of 9 RCTs (n=1,901) assessed abdominal incision with scalpel compared with electrodiathermy. No difference in overall wound complication rate was seen between incisions with a scalpel and incisions using diathermy.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

An RCT[135] (n=133) assessed electrocautery compared with scalpel incisions in women undergoing abdominal surgery for gynaecological cancer. No difference in surgical site infection was seen between groups.

An RCT[136] (n=66) assessed diathermy compared with scalpel incisions in people undergoing bowel resection. There was no significant difference in wound infection between groups.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

New evidence is consistent with the current recommendation, namely that diathermy is not useful in reducing surgical site infection.

New evidence is unlikely to change guideline recommendations.

74 – 18 Maintaining patient homeostasis

Recommendations derived from this question

1.3.10 Maintain patient temperature in line with 'Inadvertent perioperative hypothermia' (NICE clinical guideline 65).

Surveillance decision

This review question should not be updated.

An editorial correction is needed to update the wording of the title of NICE guideline CG65 from ‘Inadvertent perioperative hypothermia’ to ‘Hypothermia: prevention and management in adults having surgery’. Additionally a hyperlink should be added to improve the link between the guidelines.

Temperature manipulation

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A Cochrane review[137] of 4 RCTs (n=1,219) assessed induced hypothermia compared with normothermia in people undergoing brain surgery. People in the induced hypothermia group had a significantly higher risk of infection. No significant difference in other outcomes was seen including mortality, poor neurological outcome, adverse events, and cardiovascular events.

An RCT[138] (n=146) assessed local incision warming compared with no warming in people undergoing bariatric, colon, or gynaecological cancer surgery. No differences in surgical site infection were seen between the groups.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Although therapeutic hypothermia is used to prevent brain injury in some circumstances, such as after cardiac arrest, evidence suggests that it has no beneficial effects in neurosurgery, and may increase the risk of infection.

Furthermore, active warming of the surgical site also shows no effect on infections.

New evidence is unlikely to change guideline recommendations.

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74 – 19 Is patient perioperative oxygenation clinically effective for the prevention of surgical site infection?

Recommendations derived from this question

1.3.11 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.

Surveillance decision

This review question should not be updated.

Oxygen supplementation

3-year surveillance summary

A meta-analysis[139] of 4 RCTs (number of participants not reported in the abstract) investigated the efficacy of supplemental perioperative oxygenation versus standard care in people undergoing colorectal surgery. Supplemental oxygen significantly reduced surgical site infection.

An RCT[140] (n=143) assessed high compared with low concentration supplemental oxygen in women undergoing caesarean section. High-concentration perioperative oxygen was not associated with reductions in surgical site infection.

An RCT[141] (n=1,400) in Denmark assessed 80% oxygen compared with 30% oxygen during and for 2 hours after surgery in people undergoing acute or elective laparotomy. No difference in surgical site infection was found between the 80% oxygen group and the 30% oxygen group.

Evidence Update (2013)

A meta-analysis[142] of 7 RCTs (n=2,728) investigated perioperative oxygen supplementation (80% oxygen during surgery plus at least 2 hours postoperatively) with controlled oxygen concentrations (30% or 35% oxygen). No significant difference was found between groups surgical site infection rate. However, in two subgroup analyses supplemented oxygenation was found to be beneficial for surgical site infection: first an analysis excluding studies of neuraxial anaesthesia; and second including studies of colorectal surgery only.

6-year surveillance summary

A systematic review[143] of 6 RCTs (n=2,585) compared high- and low- concentration oxygen in adults undergoing open abdominal surgery. High-concentration oxygen was not associated with a significant reduction in surgical site infection.

A meta-analysis[144] of 22 RCTs (n=7,001) assessed intraoperative high (80–100%) inspired oxygen in people undergoing surgery. The incidence of surgical site infection showed some evidence of reducing surgical site infection, but the upper limit of the confidence interval reached 1.00, so no effect remains a possibility.

A meta-analysis[145] of 5 studies (n=1,966) investigated high compared with low

concentration oxygen in women undergoing caesarean section. Perioperative high-concentration oxygen supplementation was not associated with reductions in surgical site infection.

8-year surveillance summary

A Cochrane review[146] of 28 RCTs (n=9,330) assessed high-concentration inspired oxygen (60–90%) compared with standard oxygen concentration (30–40%) in adults undergoing surgery. No significant differences were seen in mortality, surgical site infection, respiratory insufficiency or adverse events.

An RCT[147] (n=239) assessed 80% inspired oxygen compared with 30% inspired oxygen in people undergoing surgery for perforated peptic ulcers. The effects of 80% oxygen were not clear from the abstract because the p-value indicated a significant reduction in surgical site infection, but the confidence interval crossed 1.00, indicating no significant effect.

Topic expert feedback

Topic expert feedback on the Evidence Update (2013) suggested that further research was needed to examine whether supplemental oxygenation has benefits in particular surgical populations, such as people undergoing colorectal surgery.

Impact statement

New evidence does not show benefit of high-concentration oxygen during or after surgery. Therefore, the current recommendation to ensure an oxygen saturation of 95% remains valid.

New evidence is unlikely to change guideline recommendations.

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74 – 20 What is the clinical effectiveness of perioperative perfusion and hydration for the prevention of surgical site infection?

Recommendations derived from this question

1.3.12 Maintain adequate perfusion during surgery.

Surveillance decision

This review question should be updated.

Haemodynamic therapy

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A meta-analysis[148] of 26 RCTs (n=4,188) assessed the effect on surgical site infection of goal-directed versus standard haemodynamic therapy in patients undergoing abdominal, cardiac or orthopaedic surgery. Goal-directed therapy significantly reduced surgical site infection rate compared with standard therapy.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

Topic experts agreed with the proposal to update this question as part of the new guideline on perioperative care, which should consider more outcomes than surgical site infection.

Impact statement

There is evidence to suggest that haemodynamic goal-directed therapy may reduce surgical site infection compared with standard treatment.

NICE has guidance on CardioQ-ODM, an oesophageal doppler monitor that assesses cardiac output and intravascular fluid status.

The remit of NICE guideline CG74 is limited to surgical site infection, but the benefits of Doppler monitoring include additional outcomes

such as reducing postoperative complications, central venous catheters and hospital stay. NICE will be developing a guideline on perioperative care. This question should be updated as part of the new guideline on perioperative care, which should consider more outcomes than surgical site infection.

New evidence identified that may change current recommendations.

74 – 21 What is the clinical effectiveness of strict blood glucose control to reduce surgical site infection?

Recommendations derived from this question

1.3.13 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.

Surveillance decision

This review question should be updated.

Glycaemic control

3-year surveillance summary

A Cochrane review[149] of 5 RCTs investigated the impact of perioperative glycaemic control in people undergoing surgery. Meta-analysis was not possible due to heterogeneity. Overall, there was insufficient evidence to support strict glycaemic control versus conventional management for surgical site infection prevention.

An RCT[150] (n=120) assessed Braithwaite protocol or simple sliding scale methods (randomly assigned in a 2:1 ratio) of managing blood glucose levels in people with diabetes who were undergoing heart surgery. The Braithwaite protocol for managing blood glucose reduced wound infection and hospital stay.

An RCT[151] (n=483) assessed intensive compared with conventional insulin therapy in people undergoing brain surgery. Hypoglycaemic episodes were more frequent with intensive insulin therapy. However, the length of stay in the intensive care unit was shorter and the infection rate was lower in the intensive insulin group.

An RCT[152] (n=109) assessed intensive compared with conventional glucose control in people undergoing cardiac surgery with cardiopulmonary bypass. No differences were found between the groups in clinical outcomes including postoperative infection.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A systematic review[153] of 6 studies (number of participants not reported in the abstract) assessed distinct perioperative glycaemic targets in patients with diabetes. Results showed no difference in wound infection between moderate and liberal glycaemic targets or between moderate and strict glycaemic targets.

8-year surveillance summary

A systematic review[154] of 10 studies (number of participants not reported in the abstract) assessed tight glycaemic control in people with diabetes who had undergone cardiac surgery. Surgical site infections were significantly reduced with tight insulin control. However, the comparator intervention was not clear in the abstract.

An RCT[155] (n=447) assessed intensive insulin therapy compared with intermediate insulin therapy in people who underwent liver, biliary or pancreatic surgery. Intensive insulin was associated with significantly fewer surgical site infections and significantly shorter stay in hospital. However, in subgroup analysis, this effect was seen only in participants with

diabetes, not in people without diabetes. There was no significant difference in hypoglycaemia between groups.

An RCT[156] (n=199) assessed intensive compared with conventional insulin therapy in people undergoing cardiopulmonary bypass surgery. This study was stopped early because of significantly higher hypoglycaemia in the intensive insulin group. There was no significant difference in surgical site infection between the groups.

Topic expert feedback

Topic experts suggested that management of glycaemia needs to be addressed. Topic experts agreed that this issue should be addressed in a new guideline on perioperative care, which should consider more outcomes than surgical site infection.

Impact statement

The role of intensive insulin therapy in either people with diabetes or no diabetes is not clear. First, abstracts did not always specify whether study participants had diabetes or not. Second, the results are inconsistent between studies. Some find significant reductions in surgical site infection without increases in hypoglycaemia. Other studies find the opposite: no effect on surgical site infections and significant increases in hypoglycaemia with intensive insulin.

In developing the guideline, only 2 small studies (n=139) were identified. There is now substantially more evidence in this area, therefore an update is warranted to clarify whether insulin therapy is associated with reductions in surgical site infections balanced with the potential for hypoglycaemia in people without diabetes.

People with type 1 diabetes undergoing surgery should have their blood glucose managed in line with NICE's guideline on type 1 diabetes. NICE's guideline on type 2 diabetes does not cover management of blood glucose during surgery. Evidence suggests that tight glucose control may reduce surgical site infection in people with diabetes, so recommendations for intra-operative blood glucose management in people with type 2 diabetes may be warranted.

NICE will be developing a guideline on perioperative care. Consideration should be given to updating this new question as part of the new guideline on perioperative care, which should consider more outcomes than surgical site infection.

New evidence identified that may change current recommendations.

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74 – 22 Is intracavity lavage or wound irrigation clinically effective for the prevention of surgical site infection?

Recommendations derived from this question

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

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

Surveillance decision

This review question should not be updated.

Irrigation

3-year surveillance summary

An RCT[157] (n=520) investigated saline wound irrigation before wound closure compared with no irrigation in 520 women undergoing caesarean section. Saline wound irrigation did not reduce infection rate.

An RCT[158] (n=102) investigated surgical site irrigation with topical cefazolin in people undergoing non-laparoscopic cholecystectomy. The control group was not clearly described. No significant difference in incidence of surgical site infection was seen.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A systematic review and meta-analysis[159] of 41 studies (n>9,000) assessed intraoperative wound irrigation in people undergoing open abdominal surgery. Intraoperative irrigation was associated with lower risk of surgical site infection compared with no lavage. However, the authors noted that all included studies were considered to be at 'considerable' risk of bias.

A systematic review and meta-analysis[160] of 3 RCTs (n=862) assessed intra-abdominal saline irrigation in women undergoing caesarean section. No significant differences were seen between groups for: wound infection, urinary tract infection and endometritis. Irrigation was associated with significantly higher intraoperative and postoperative nausea and increased use of postoperative antiemetic drugs.

An RCT[161] (n=128) assessed pressurised pulse irrigation compared with saline in people undergoing laparoscopic liver, biliary or pancreatic surgery more than 2 hours in duration. Significantly fewer surgical site infections were seen in the pressurised pulse irrigation group.

An RCT[162] (n=166) assessed irrigation with povidone-iodine compared with no irrigation in people undergoing appendectomy. There was no significant difference in surgical site infection rates between groups.

An RCT[163] (n=81) assessed irrigation compared with suction alone in adults undergoing laparoscopic appendectomy. Irrigation demonstrated statistical equivalence with suction alone.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

New evidence does not show clear evidence of a reduction in surgical site infection with use of wound irrigation whether or not antibiotics are used. Therefore, the recommendation that irrigation should not be used to prevent surgical site infection remains valid.

New evidence is unlikely to change guideline recommendations.

Intracavity lavage

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

An RCT[164] (n=44) assessed strong-acid electrolysed water compared with saline for peritoneal lavage in children undergoing surgery for perforated appendicitis. Surgical site infection was significantly lower with strong-acid electrolysed water compared with saline.

An RCT[165] (n=193) investigated intraperitoneal lavage compared with no lavage in people undergoing liver resection. There were no differences between groups in surgical site infections, but organ-space infections were

significantly more common in the lavage group compared with no lavage.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

From the identified studies, there is no clear evidence of benefit of peritoneal lavage, and there may be potential harms of this procedure. Therefore, the current recommendation to not use intracavity lavage to reduce the risk of surgical site infection remains valid.

New evidence is unlikely change guideline recommendations.

NQ – 01 What is the effectiveness of post-surgical drains after surgery for preventing surgical site infection

Surveillance decision

This question should not be added.

Drainage

3-year surveillance summary

A Cochrane review[166] of 36 studies (n=5,697) evaluated the effectiveness of closed suction drainage systems for orthopaedic surgery. The authors concluded evidence to support the routine use of closed suction drainage was insufficient.

An RCT[167] (n=402) assessed closed-suction drainage compared with no drainage in people undergoing elective abdominal surgery. Overall incisional surgical site infection rate was not significantly different between the groups.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A meta-analysis[168] of 20 RCTs (n=3,186) assessed closed-suction drainage compared with no drainage in people undergoing total hip arthroplasty. No significant difference between groups in the incidence of infection was found.

A meta-analysis[169] of 16 studies (n=2,705) investigated closed suction drainage compared with no drainage in people undergoing primary hip arthroplasty. There was no significant difference in surgical site infection between the two groups. However, drainage was associated with significantly increased blood loss and need for transfusion.

A Cochrane review[170] of 10 trials (n=5,248) investigated wound drainage compared with no drainage in women undergoing caesarean section. No evidence of a difference in wound infection risk was found between groups. However, 1 trial suggested that subcutaneous drains may increase wound infection compared with sub-sheath drains.

A Cochrane review[171] of 1 trial (n=24) assessed wound drainage during surgery to repair incisional hernias. The study compared electrified compared with a corrugated drain, but no statistically significant differences in wound infection were found.

A meta-analysis[172] (n=1,202; number of studies not reported in the abstract) assessed drainage compared with no drainage after surgery for pilonidal sinus. Authors concluded that drainage was not associated with better outcomes. No significant differences were seen in intra-abdominal infection

8-year surveillance summary

A Cochrane review[173] of 2 RCTs (n=316) assessed drains compared with no drains in people undergoing pancreatic surgery. Both trials were assessed as being at high risk of bias. No significant differences were seen in intra-abdominal infection or wound infection.

A Cochrane review[174] of 5 RCTs (n=453) assessed abdominal drains compared with no drains in people undergoing appendectomy. All included trials were assessed as being at high risk of bias. Drains were not associated with lower rates of intraperitoneal abscess or wound

infection, but were associated with longer stay in hospital.

A Cochrane review[175] of 4 RCTs (n=438) assessed abdominal drainage compared with no drain in people undergoing resection of gastric cancer. No significant differences in wound infection or intra-abdominal abscess were seen. However, drains were associated with increased surgical time and stay in hospital. The authors assessed the evidence as being very low quality.

A meta-analysis[176] of 12 RCTs (n=1,939) assessed drainage compared with no drainage in people undergoing laparoscopic cholecystectomy. Surgical site infection, morbidity and abdominal pain were significantly lower in the group that did not have drainage.

A systematic review and meta-analysis[177] of 25 RCTs (n=2,939) assessed wound drains compared with no drains in people undergoing thyroid or parathyroid surgery. Wound infections were significantly more common in the drain group, and stay in hospital was significantly longer.

A systematic review[178] of 10 studies (number of participants not reported in the abstract) assessing wound drains in people undergoing posterior spinal surgery. The comparator group was not clear from the abstract. Drains were not associated with improved wound healing or infection rates.

A meta-analysis[179] of 8 studies (number of participants not reported in the abstract) assessed closed-suction drains compared with no drains in people undergoing posterior spinal surgery. No significant differences in wound infection were identified.

A systematic review and meta-analysis[180] of 12 RCTs (n=1,763) assessed drains compared with no drain in people undergoing laparoscopic cholecystectomy. No significant differences were seen in rates of wound infection or in length of stay in hospital.

An RCT[181] (n=62) assessed postoperative drains in people undergoing open abdominal surgery. No significant differences in surgical site infections, surgical time or stay in hospital were found.

An RCT[182] (n=160) assessed postoperative drains versus no drain in people undergoing laparoscopic cholecystectomy. No significant differences in intra-abdominal abscess rate were seen between groups, but hospital stay was significantly longer in the drain group.

An RCT[183] (n=101; 202 drains) assessed drainage plus chlorhexidine antisepsis compared with standard drainage in people undergoing double mastectomy with immediate reconstruction using implants. Each participant had drainage plus chlorhexidine antisepsis on one side and standard drainage on their other side. Surgical site infection did not differ between groups at 30 days or at 1 year after surgery.

An RCT[184] (n=260) assessed subcutaneous drains compared with no drain in people undergoing liver resection. No significant differences were seen in wound infection, stay in hospital, postoperative complications, or costs.

An RCT[185] (n=263) assessed subcutaneous passive drainage compared with no drain in people undergoing laparoscopic or open colorectal surgery. Significantly fewer people who had drainage developed a surgical site infection.

An RCT[186] (n=168) assessed drainage compared with no drainage in people undergoing total hip arthroplasty. People in the no drainage group had significantly higher rates of superficial infection. There was no significant difference between groups in blood transfusions.

An RCT[187](n=314) assessed duration of antibiotic use in people with drains after spinal surgery. All participants received drains and were randomly allocated to receive antibiotics for 24 hours or for the duration of drain placement. There were no significant differences in surgical site infections between groups.

An RCT[188] (n=42) assessed closed-suction subcutaneous drains compared with progressive tension suturing in people undergoing mesh repair of hernia. No significant differences in seroma or wound infection were seen.

Topic expert feedback

Topic experts suggested that drains are being used less frequently in the UK, so there is no clear need for new guidance on use of drains.

Impact statement

NICE guideline CG74 did not make any recommendations about use of drains after surgery. Evidence generally shows that drain placement after various types of surgery does not result in lower surgical site infection rates – only 1 study, in colorectal surgery, showed a

reduction in surgical site infection. However, in several studies drains were associated with longer surgical times and stay in hospital.

There is a substantial body of evidence to suggest that drain placement is not beneficial. However, topic experts indicated that there is no clear need for guidance on use of post-surgical drains.

New evidence is unlikely to change guideline recommendations.

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74 – 23 Is the application of intraoperative topical antiseptics/antimicrobials before wound closure clinically effective in reducing surgical site infection rates?

Recommendations derived from this question

1.3.16 Do not use intraoperative skin re-disinfection or topical cefotaxime in abdominal surgery to reduce the risk of surgical site infection.

Surveillance decision

This review question should be updated.

Gentamicin-collagen sponges

3-year surveillance summary

An RCT[189] (n=1,502) investigated implantable gentamicin-collagen sponges compared with no intervention in people undergoing cardiac surgery. No significant effect on 90-day sternal wound infection rate was found.

An RCT[190] (n=2,000) assessed implantable collagen-gentamicin sponges plus intravenous isoxazolyl penicillin compared with isoxazolyl penicillin alone in people undergoing cardiac surgery. Collagen-gentamicin sponges significantly reduced sternal wound infection.

Evidence Update (2013)

A German RCT[191] (n=720) investigated implantable gentamicin-collagen sponges compared with placebo sponge in people undergoing heart surgery. Significantly fewer deep sternal wound infections within 30 days were seen with the gentamicin sponge than with placebo.

6-year surveillance summary

A meta-analysis[192] of 15 RCTs (n=6,979) assessed gentamicin-collagen sponges in people undergoing surgery. Gentamicin-collagen sponges significantly reduced surgical site infections overall and in subgroup analyses of both clean and clean-contaminated surgery.

A systematic review[193] of 12 studies (n=1,172) investigated adjunctive antimicrobial treatments in people undergoing surgery for pilonidal disease. Gentamicin-collagen sponges were not beneficial compared with no sponge; however heterogeneity between studies meant that meta-analysis was not possible.

8-year surveillance summary

A meta-analysis[194] of 13 studies (number of participants not reported in the abstract) assessed implantable gentamicin-collagen sponges in people undergoing surgery. The control group was not clear from the abstract. Implantable gentamicin-collagen sponges were associated with significantly lower rates of surgical site infection. However, in subgroup analyses significant effects on surgical site infections were seen for cardiac surgery but not for colorectal surgery.

A meta-analysis[195] of 14 studies (n=22,135) assessed of implantable gentamicin-collagen sponges compared with control in people undergoing heart surgery. Four of the studies were RCTs (n=4,672). Implantable gentamicin-collagen sponges were associated with significantly reduced overall sternal wound infection and superficial and deep sternal infection.

A systematic review and meta-analysis[196] of 6 studies (n=669) assessed implantable gentamicin-collagen sponges compared with no sponge in people undergoing surgery for pilonidal sinus disease. There was no significant difference between groups in surgical site infection or wound healing.

An RCT[197] (n=176) assessed implantable gentamicin-collagen sponges compared with no sponge in people undergoing total mesorectal excision of rectal cancer after radiotherapy. Surgical site infections and organ-space infections did not differ significantly between groups. In a subgroup analysis of people who had no anastomotic leakage, gentamicin-collagen sponges were associated with significantly lower rates of organ-space infection.

An RCT[198] (n=739) assessed implantable gentamicin-collagen sponges plus antimicrobial prophylaxis compared with antimicrobial prophylaxis alone in people undergoing hemiarthroplasty. No significant differences in overall surgical site infections were seen. Similarly, there was no significant difference in superficial or in deep wound infections in subgroup analyses.

Topic expert feedback

Topic expert feedback on the Evidence Update (2013) suggested that findings were unlikely to affect the guideline because of limitations of the evidence.

Topic expert feedback on 8-year surveillance indicated a need to evaluate the use of gentamicin-collagen sponges in the NHS.

Impact statement

NICE guideline CG74 did not make any recommendations about the use of implantable gentamicin-collagen sponges. In developing the guideline, 2 RCTs addressing the use of gentamicin-collagen sponges were considered. However, the topic experts had concerns about potential for antimicrobial resistance and wished to see further studies in this area.

New evidence generally suggests that gentamicin-collagen sponges may reduce surgical site infections. Therefore an update to the guideline should reconsider this intervention.

Gentamicin-collagen sponges did not reduce surgical site infections after surgery for pilonidal sinus disease or colorectal surgery, but did seem to be effective in a range of other types of surgery. Consideration should be given to whether gentamicin-collagen sponges should be used:

- in primary closure
- in delayed closure.

New evidence identified that may change current recommendations.

Other topical antimicrobial treatments

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A meta-analysis[199] of 10 studies (n=5,888) evaluated local vancomycin powder compared with no local antibiotic in people undergoing spinal surgery. Local vancomycin was associated with significantly lower rates of surgical site infection, deep incisional surgical site infections and surgical site infections caused by *S aureus*.

8-year surveillance summary

Four meta-analyses[200-203] assessed topical vancomycin powder in people undergoing spinal surgery. All showed that vancomycin had significant effects on surgical site infection or deep wound infection. Most analyses included many observational studies, and several authors questioned the quality of the evidence informing their results. The individual reports included differing numbers of studies:

- 8 studies (n=4,592)[203]
- 1 RCT and 9 cohort studies (n=2,574)[202]
- 14 studies (number of participants not reported in the abstract)[200]
- 1 RCT and 8 observational studies (number of participants not reported in the abstract.)[201]

Topic expert feedback

Topic experts indicated that vancomycin powder may currently be used in the NHS after some surgeries. There is a risk of bacteria developing resistance with widespread use of

vancomycin powder. Topic experts raised concerns in this area because vancomycin is important for treating MRSA.

Impact statement

NICE guideline CG74 did not make recommendations on the use of vancomycin powder. Several meta-analyses have found consistent beneficial effects on surgical site infection in spinal surgery. However, in several reports, the authors expressed concerns about the quality of the evidence available for analysis. No studies of vancomycin powder in other types of surgery were identified.

Because of the low quality of the evidence and the fact that results from spinal surgery could not be generalised to other types of surgery, an update to the guideline in this area is not necessary at this time.

New evidence is unlikely to change guideline recommendations.

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74 – 24 Which type of suture is clinically effective as a closure method?

Subquestion

Which type of suture is clinically and cost-effective as a closure method?

Recommendations derived from this question

No recommendations were made for this question. A research recommendation was made (see RR – 04 later in this document).

Surveillance decision

This review question should be updated.

Antimicrobial sutures

3-year surveillance summary

In a double-blind pilot trial[204] (n=26), women undergoing breast reductions were randomised to triclosan sutures or control on the right or left breasts (that is, each woman was her own control). Wound dehiscence occurred significantly more frequently with triclosan sutures.

An RCT[205] (n=100) evaluated the efficacy and safety of triclosan-coated sutures compared with conventional sutures in people undergoing appendectomy. There was no significant difference in surgical site infection between the two sutures.

Evidence Update (2013)

A meta-analysis[206] of 17 RCTs (n=3,720) assessed triclosan-coated sutures compared with conventional sutures in people undergoing surgery. Triclosan-coated sutures were associated with fewer surgical site infections compared with uncoated sutures. However, subgroup analysis by type of surgical procedure found beneficial effects only in abdominal surgery and not in breast or cardiac surgery.

A meta-analysis[207] of 13 RCTs (n=3,568) investigated triclosan-coated sutures compared with conventional sutures. Risk of surgical site infection was significantly reduced with triclosan-coated sutures.

6-year surveillance summary

A systematic review[208] of 7 RCTs (n=1,631) assessed antibacterial sutures compared with conventional sutures in people undergoing surgery. Antibacterial sutures were associated with reduced risk of developing surgical site infection and postoperative complications.

A systematic review and meta-analysis[209] of 7 RCTs (n=836) assessed triclosan-coated sutures. No significant effects on surgical site infections or wound breakdown were seen. The

population and control groups in the included studies were not clear in the abstract.

8-year surveillance summary

A systematic review and meta-analysis[210] of 15 RCTs (n=4,800) assessed triclosan-coated sutures compared with uncoated sutures in people undergoing surgery. Triclosan-coated sutures were associated with significantly lower risk of surgical site infection.

A systematic review and meta-analysis[211] of 29 studies (number of participants not reported in the abstract) assessed triclosan-coated sutures in people undergoing surgery. The control group was not clear from the abstract. Triclosan-coated sutures were associated with reductions in surgical site infections. The size of the effect was greater for abdominal surgery and studies that were not RCTs.

A systematic review and meta-analysis[212] of 13 RCTs (n=5,256) assessed triclosan-coated sutures compared with uncoated sutures in people undergoing surgery. Significantly lower rates of surgical site infections were seen with triclosan-coated sutures. Subgroup analyses suggested that triclosan-coated sutures were associated with reduced surgical site infection in abdominal surgeries but not in cardiac or breast surgeries. Additionally reductions in surgical site infection were seen when prophylactic antibiotics were used but not when no prophylaxis was used.

An RCT[213] (n=1,633) assessed antimicrobial sutures compared with standard absorbable sutures in children (under 18 years) undergoing any elective or emergency surgery. The rate of superficial or deep surgical site infections was significantly lower in the antimicrobial suture group compared with the standard absorbable suture group.

The PROUD trial[214] (n=1,224) assessed triclosan-coated sutures compared with uncoated sutures in people undergoing elective midline laparoscopic surgery. No significant differences in surgical site infections or serious adverse events were seen between groups.

An RCT[215] (n=281) assessed triclosan-coated sutures compared with uncoated sutures in people undergoing elective colorectal resection. No significant differences in surgical site infection were seen between groups.

An RCT[216] (n=101) assessed triclosan-coated sutures compared with uncoated sutures in people who had an intra-operative diagnosis of faecal peritonitis caused by acute diverticulitis. Surgical site infection was significantly lower in people who had triclosan-coated sutures.

An RCT[217] (n=357) assessed triclosan-coated sutures compared with uncoated sutures in people undergoing coronary artery bypass grafting. No differences in sternal wound infection were seen between groups.

Topic expert feedback

Topic expert feedback on the Evidence Update (2013) suggested that the effects of antimicrobial sutures may be specific to particular surgeries (such as abdominal procedures), which may affect current recommendations.

Impact statement

NICE guideline CG74 did not make any recommendations about use of antimicrobial-coated sutures. In developing the guideline, topic experts considered the evidence to be insufficient.

Since the guideline was published, many new studies of antimicrobial sutures have been published. However, the results of the various studies are inconsistent, there may now be sufficient evidence to reassess use of antimicrobial sutures.

New evidence identified that may change current recommendations.

Staples versus sutures

3-year surveillance summary

A Cochrane review[218] of 3 RCTs (n=323) examined staples compared with sutures for wound closure after saphenous vein graft harvesting for coronary artery bypass grafting. No significant differences in surgical site infection or wound dehiscence were seen between groups. The authors noted that included studies were of 'suboptimal' methodological quality.

A meta-analysis[219] of 6 studies (number of participants not reported in the abstract) assessed staples compared with sutures in people undergoing loop ileostomy. No statistically significant differences in wound infection were found between the techniques.

A meta-analysis[220] of 6 studies (n=683) assessed staples compared with sutures for skin closure in orthopaedic surgery. Risk of wound infection was significantly higher with staples. Subgroup analysis showed that the risk of wound infection with staples was particularly high in hip surgery. There were no significant differences between sutures and staples in the development of inflammation, discharge, dehiscence, necrosis, and allergic reaction. The authors noted that included studies had several major methodological limitations.

A meta-analysis[221] of 5 studies (n=1,487) assessed staples compared with sutures for transverse incisions in women undergoing caesarean section. Results suggested that staples were associated with shorter duration of surgery but greater risk of wound infection or separation.

Evidence Update (2013)

An update[222] of the Cochrane review identified in 3-year surveillance[218] found no additional studies.

6-year surveillance summary

A systematic review of 11 systematic reviews (n=13,661) with a 'panoramic' meta-analysis[223] assessed staples compared with sutures. The authors concluded that there was no clear evidence on whether staples or sutures were better for preventing surgical site infection.

A meta-analysis[224] of 4 RCTs (n=645) investigated stapled compared with sutured anastomosis in people undergoing ileostomy closure. The rate of surgical site infection was similar between groups.

A meta-analysis[225] of 14 studies (n=5,084) assessed stapled compared with wound sutured ileostomy. No significant difference was found between the groups in wound infection. Staples were associated with increased lower rates of small bowel obstruction and shorter operative time.

A Cochrane review[226] of 10 studies (number of participants not reported in the abstract) assessed skin closure techniques and materials in women undergoing caesarean section. Wound infection rates did not significantly differ between absorbable sutures and staples. However, staples were more likely to result in wound separation.

8-year surveillance summary

A systematic review and meta-analysis[227] of 13 studies (number of participants not reported in the abstract) assessed staples compared with sutures in orthopaedic surgery. There was no significant difference in surgical site infection between the groups.

An RCT[228] (n=219) assessed staples compared with sutures in people undergoing primary hip arthroplasty. No significant difference in wound complications was found between groups.

An RCT[229] (n=1,264) assessed staples compared with sutures in people undergoing elective colorectal cancer surgery. Surgical site infection did not differ significantly between groups, but surgery was significantly shorter with staples.

Topic expert feedback

Topic expert feedback on the Surgical site infection Evidence Update (2013) suggested that further research was needed in this area.

However, topic expert feedback on the Caesarean Section Evidence Update (2013), which included 2 studies[221,226] of staples compared with sutures in women undergoing caesarean section, suggested that an update of this area was needed.

Impact statement

The guideline did not make recommendations on choice of staples or sutures. Evidence considered during guideline development included many types of surgery, and found no significant difference between these techniques. New evidence generally shows no significant effect on surgical site infection whether staples or sutures are used in a variety of types of surgery. The evidence in orthopaedic surgery appears to be inconsistent; however, evidence appears to be more consistent in showing poorer outcomes with staples in caesarean section.

The evidence on staples compared with sutures for wound closure in caesarean section should be addressed in an update to NICE guideline CG74. The update should consider whether any other type of surgery shows worse outcomes with staples.

New evidence identified that may change current recommendations.

Tissue adhesives

3-year surveillance summary

A Cochrane review[230] of 14 RCTs (n=1,152) assessed various tissue adhesives compared with conventional skin closure techniques on the healing of surgical wounds. Sutures were associated with significantly lower dehiscence compared with tissue adhesives and were significantly faster to use.

A Cochrane review[112] of 1 study (n=177) assessed preoperative application of microbial sealants compared with no microbial sealant in people undergoing clean surgery. The authors concluded that there was insufficient evidence about the use of microbial sealants in reducing surgical site infection risk and stated that more rigorous RCTs were needed. The RCT[231] assessed in this Cochrane review was also identified in 3-year surveillance.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A Cochrane review[232] of 18 RCTs (n=1,252) assessed fibrin glue in people undergoing breast and axillary surgery. Fibrin glue did not influence the incidence of wound infection.

A meta-analysis[233] of 7 studies (n=897) investigated fibrin glue in people undergoing pancreatic surgery. There was no difference in wound infections between fibrin glue and standard care.

8-year surveillance summary

An update[234] of the Cochrane review identified at 3-year surveillance[230] included 33 studies (n=2,793) of tissue adhesives compared with conventional skin closure techniques for closure of surgical incisions. Tissue adhesives were significantly associated with increased dehiscence compared with sutures. No significant effects on infection were seen between tissue adhesives and either sutures or tape.

A systematic review and meta-analysis[235] of 6 RCTs (number of participants not reported in the abstract) assessed fibrin sealant compared with standard closure in people undergoing cancer-related groin dissection. No significant differences were seen for wound infection, seroma or complication rates.

An RCT[236] (n=140) assessed antimicrobial skin sealant compared with no sealant in people undergoing saphenous vein harvesting. No differences in bacterial growth or use of antibiotics at 2 months were seen.

An RCT[237] (n=103) assessed subcuticular sutures plus skin sealant compared with staples in people undergoing surgery for hip fracture. There were no significant differences in infection between groups.

An RCT[238] (n=100) assessed antimicrobial sealant compared with no sealant in people undergoing clean-contaminated colorectal surgery. All participants received the same mechanical bowel preparation, antibiotic prophylaxis and skin antisepsis. No significant differences in surgical site infections were seen overall, or in subgroup analysis of laparoscopic surgeries.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The guideline made no recommendations about use of tissue adhesives. Evidence consistently suggests that tissue adhesives do not reduce surgical site infections and may be associated with increased risk of dehiscence.

The evidence-base has grown substantially since the guideline was developed, therefore use of tissue adhesives should be considered in an update to the guideline.

New evidence identified that may change current recommendations.

Purse string sutures

3-year surveillance summary

An RCT[239] (n=40) investigated purse-string suture compared with control for closing the anus in people undergoing vaginal surgery involving the posterior compartment. The abstract did not adequately describe the type of closure used in the control group. No wound infections or healing abnormalities were noted in either group.

An RCT[240] (n=61) assessed purse-string closure technique compared with conventional linear closure in people undergoing ileostomy closure. Purse-string closure was associated

with significantly fewer surgical site infections compared with conventional closure.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A meta-analysis[241] of 6 studies (n=403) assessed purse-string approximation compared with primary skin closure in people undergoing stoma reversal. Purse string approximation significantly reduced surgical site infections.

8-year surveillance summary

A meta-analysis[242] of 4 RCTs (n=319) assessed purse-string closure compared with conventional primary closure in people undergoing stoma reversal. Purse-string closure was associated with lower rates of surgical site infection.

A systematic review and network meta-analysis[243] of 15 studies (n=2,921) assessed skin closure techniques in people undergoing stoma reversal. Included interventions were: primary closure; primary closure with drain; secondary closure; delayed primary closure; loose primary closure; and circular closure. Circular closure was associated with lowest risk of surgical site infection and had the highest probability of being the best technique, including in sensitivity analyses.

A systematic review and meta-analysis[244] of 3 RCTs (n=206) evaluated purse-string closure compared with conventional closure in people undergoing ileostomy reversal. Purse-string closure was associated with significantly lower rates of surgical site infection. There were no significant differences in length of operative time or hospital stay.

An RCT[245] assessed purse-string closure compared with conventional primary closure in people undergoing stoma reversal. Surgical site infection was significantly lower in the purse-string closure group. Time to healing was significantly longer in the purse-string closure group.

An RCT[246] (n=121) assessed circular subcuticular approximation compared with conventional closure in people undergoing stoma reversal. Differences in surgical site infection did not differ significantly. However, lower rates of surgical site infection in the circular subcuticular approximation appeared to be clinically important but the study may have been underpowered for the statistical analysis.

An RCT[247] (n=48) assessed purse-string approximation compared with primary linear closure in people undergoing stoma reversal. Surgical site infection was significantly lower with purse-string approximation, although time to wound healing was longer.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The guideline did not consider purse-string sutures as a closure method. Evidence consistently suggests that this method of closure is associated with reductions in surgical site infections when used to close stoma wounds. An update to the guideline should consider this area, including whether recommendations applying to a single type of surgery (stoma reversal) are appropriate for this guideline.

New evidence identified that may change current recommendations.

Absorbable sutures

3-year surveillance summary

An RCT[248] (n=174) assessed absorbable or non-absorbable sutures, using continuous or interrupted techniques for closure of laparotomy incision in people with peritonitis. Four groups were studied: absorbable continuous suturing; absorbable interrupted suturing; non-absorbable continuous suturing; and non-absorbable interrupted suturing. Suture material and closure technique did not influence wound outcome except for a significantly higher incidence of sinus formation when using non-absorbable sutures.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A systematic review[249] of 10 RCTs (n=1,354) assessed absorbable compared with non-absorbable sutures for closure of surgical incisions. Wound infection and operative morbidity did not differ significantly between

groups. Absorbable sutures were associated with significantly lower dehiscence.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The evidence reviewed during guideline development suggested that absorbable sutures were associated with less surgical site infection and dehiscence. However, topic experts thought that the evidence was insufficient to inform the choice of absorbable or non-absorbable sutures. New evidence has been identified, but the findings of an RCT were inconsistent with the findings of a systematic review. The systematic review did not include the RCT identified in 3-year surveillance.

An update of this guideline should consider the role of absorbable and non-absorbable suture materials.

New evidence identified that may change current recommendations.

Primary, secondary, and delayed healing intention

3-year surveillance summary

A Cochrane review[250] of 26 studies investigated stitching compared with natural healing in people undergoing pilonidal sinus surgery. There were no differences in surgical site infection between groups. However, recurrence was higher with stiches. When stiches were used, midline closure was associated with slower healing and more surgical site infections than off-midline closure.

An RCT[251] (n=81) investigated delayed primary closure using saline-soaked gauze dressing until closure at least 3 days after surgery compared with primary closure of dirty abdominal incisions. Delayed primary closure was associated with significantly lower rates of superficial surgical site infection, dehiscence, complete healing time and time in hospital.

An RCT[252] (n=533) investigated the effect of non-closure of the visceral and parietal peritoneum in women undergoing caesarean section. No significant differences in wound infection, postoperative analgesic usage or short-term morbidity were found between the groups.

An RCT[253] (n=3,033) in women undergoing caesarean section investigated: single-layer compared with double-layer closure of the uterine incision; closure compared with non-closure of the pelvic peritoneum; liberal compared with restricted use of a subrectus sheath. For each pair of interventions, there were no differences in maternal infectious morbidity. There were also no differences in secondary morbidity outcomes or adverse effects of any of the techniques used.

6-year surveillance summary

A meta-analysis[254] of 8 RCTs (n=623) assessed delayed primary skin closure compared with primary skin closure of contaminated and dirty abdominal incisions. Delayed primary skin closure significantly reduced surgical site infection. However, this effect was only significant in fixed-effects analysis, not in random effects analysis.

8-year surveillance summary

A systematic review and meta-analysis[255] of 8 studies (number of participants not reported in the abstract) assessed delayed primary closure compared with primary closure in complicated abdominal wounds including appendicitis. There was no significant difference in surgical site infection between groups, but delayed primary closure resulted in longer stay in hospital. However, the authors noted that the included studies were of low quality.

A meta-analysis[256] of 4 studies (n=367) assessed vacuum-assisted closure compared with no vacuum-assisted closure in people with fractures needing surgical stabilisation. Vacuum-assisted closure was associated with lower rates of surgical site infection. This report additionally addressed the use of vacuum-assisted closure in chronic wounds, which is not relevant to NICE guideline CG74.

An RCT[257] (n=158) assessed saline-soaked dressing and delayed primary closure on day 4 after surgery compared with primary closure in people with perforated appendicitis. Significantly higher rates of surgical site infection were seen with primary closure than with delayed primary closure.

An RCT[258] (n=70) assessed delayed primary closure compared with primary closure in

people undergoing laparotomy for peritonitis. Delayed primary closure was associated with lower rates of surgical site infection, with no significant difference in hospital stay between groups.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

No recommendations on delayed primary closure were made in NICE guideline CG74.

However, several new studies of closure methods have been identified.

There seems to be a consistent reduction in surgical site infection with delayed primary closure in dirty surgeries. Therefore, an update addressing this intervention may be warranted.

New evidence identified that may change current recommendations.

Interrupted and continuous closure

3-year surveillance summary

A meta-analysis[259] of 23 studies (n=10,900) investigated interrupted versus continuous wound closure in abdominal wound repair. Interrupted wound closure reduced the odds of dehiscence compared with continuous wound closure.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A Cochrane review[260] of 5 RCTs (n=827) assessed continuous compared with interrupted skin closure techniques in participants undergoing non-obstetric surgery. No significant difference in superficial surgical site infections was seen between groups, but dehiscence was significantly lower with continuous sutures. Most cases of dehiscence were reported in trials that assessed non-absorbable interrupted sutures compared with absorbable continuous sutures. The authors speculated that the effect may have been due to reduced support after removal of the non-absorbable sutures (thus, due to differences between materials rather than technique).

8-year surveillance summary

An RCT[261] (n=293) assessed interrupted subcuticular sutures compared with interrupted transdermal sutures in people undergoing elective resection of colon cancer. Absorbable suture material was used. There were no significant differences between groups in surgical site infection. Interrupted subcuticular suturing was noted to be non-inferior to interrupted transdermal sutures.

An RCT[262] (n=130) assessed intermittent mattress sutures compared with subcuticular sutures in obese women undergoing caesarean section. Non-absorbable sutures were used in both groups. There was no significant difference in surgical site infections between groups.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

In developing the guideline, only 2 studies of continuous compared with intermittent suturing were identified. Topic experts thought that the evidence was insufficient to determine whether there was a difference between these suture techniques.

Additional evidence on suturing techniques has become available, but there is no clear direction of effect.

New evidence is unlikely to change guideline recommendations.

Other suturing methods

3-year surveillance summary

Suture length

An RCT[263] (n=737) assessed short stitch length (less than 10 mm from wound edge) compared with long stitch length in midline incisions closed with a single-layer running suture. Surgical site infection was significantly higher in the long stitch group.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

Subcutaneous sutures

A Cochrane review[264] of 6 RCTs (n=815) investigated subcutaneous closure compared with no subcutaneous closure in people undergoing non-caesarean surgical procedures. The authors deemed the included studies to be 'very low quality evidence that was insufficient' to support or refute the use of subcutaneous suturing.

8-year surveillance summary

A meta-analysis[265] of 5 studies (number of participants not reported in the abstract) assessed barbed sutures compared with standard sutures in people undergoing knee arthroplasty. No significant difference in superficial infection, deep infection, or dehiscence was seen, although barbed sutures were associated with quicker closure.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The guideline does not currently make recommendations on stitch length or use of barbed suturing or subcutaneous sutures. Evidence did not suggest a need to update guidance on barbed or subcutaneous sutures. Recommendations on stitch length are unlikely to be made on the basis of 1 study because it is specific to midline incisions closed with single-layer running stitches.

New evidence is unlikely to change guideline recommendations.

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74 – 25 Which type of dressing is advocated for immediate postoperative wound/incision coverage?

Subquestion

Is it clinically and cost-effective to use interactive dressings in the immediate postoperative management of a surgical wound to prevent surgical site infection?

Recommendations derived from this question

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

Surveillance decision

This review question should not be updated.

Methods of dressing wounds

3-year surveillance summary

Silver dressings

A Cochrane review[266] of 26 studies (n=2,066) investigated silver containing wound dressings and topical agents for preventing wound infection. The authors noted that evidence was insufficient to establish whether silver-containing dressings and topical agents prevented infection or promoted wound healing.

Hydrocolloid dressing versus polyurethane foam dressing

An RCT[267] (n=253) investigated hydrocolloid dressing compared with polyurethane foam dressing in people with median sternotomy wounds after coronary artery bypass grafting. The hydrocolloid dressing was associated with fewer surgical site infections and cost less than the polyurethane foam dressing.

Occlusive versus gauze dressings

An RCT[268] (n=285) assessed occlusive, moist-environment dressing compared with gauze dressing in people with open wounds.

Occlusive dressings did not lead to quicker healing or less pain than gauze dressings. Occlusive dressings had higher daily costs but lower nursing time costs than gauze dressings. The total cost of local wound care per patient per day was also significantly higher in the occlusive dressing group. An analysis of home wound care in 76 people[269] found that occlusive dressings did not reduce costs or wound healing time.

An RCT[270] (n=134) assessed occlusive hydrocolloid dressing compared with gauze dressing in people who had abdominal surgery. There was no significant difference in incidence of infection.

Modern dressings

A systematic review[271] examined modern dressings in people with chronic and acute wounds healing by secondary intention. No evidence was found to suggest general superiority of any modern dressing compared with other modern dressings, or saline or paraffin gauze. The authors noted that weak evidence suggested that hydrocolloid dressings improved healing in chronic wounds compared with saline gauze or paraffin gauze.

Evidence Update (2013)

All dressings

A Cochrane review[272] of 16 RCTs (n=2,578) investigated wound dressings in people with surgical wounds healing by primary intention. The authors concluded that there was no evidence that covering wounds reduced surgical site infections, and stated that no particular wound dressing appeared to be better than the others, or than leaving the wound uncovered.

Silver dressings

An RCT[273] (n=110) evaluated silver-nylon dressings compared with gauze dressings in people undergoing elective colorectal surgery. Silver-nylon dressing reduced surgical site infections compared with gauze.

Negative pressure wound therapy

An RCT[274] (n=81) assessed negative pressure wound therapy compared with standard dry dressing in people with surgical wounds and multiple comorbidities. No significant difference in wound infection was found between the groups.

An RCT[275] (n=249) assessed negative pressure wound therapy compared with standard dressing in people with lower limb fracture. Significantly more infections occurred in the standard dressing group compared with negative pressure wound therapy.

6-year surveillance summary

Early dressing removal

A Cochrane review[276] of 4 studies (n=280) assessed early dressing removal (within 48 hours of surgery) compared with delayed dressing removal (later than 48 hours after surgery) in people who had primary closure of a surgical wound. All included studies were assessed to be at a high risk of bias. Early removal of dressings had no detrimental effect on surgical site infection or superficial wound dehiscence in clean or clean contaminated surgical wounds.

Aloe vera

A meta-analysis[277] of 15 RCTs (n=773) assessed aloe vera products for acute and chronic wounds. Aloe vera was associated with increased healing in acute surgical wounds compared with conventional therapy.

8-year surveillance summary

Early dressing removal

An update[278] of the Cochrane review[276] identified at 6-year surveillance found no additional studies.

All dressings

An update[279] of the Cochrane review[277] identified by the Evidence Update (2013) evaluated 20 studies (n=3,623) of wound dressings in people with surgical wounds healing by primary intention. No evidence was identified to suggest that any dressing significantly reduced the risk of developing an SSI compared with leaving wounds exposed or compared with alternative dressings.

Silver dressings

An RCT[280] (n=65) assessed silver gauze compared with saline gauze in people undergoing contaminated surgery. No differences in surgical site infection were seen between groups.

An RCT[281] (n=500) assessed sliver alginate dressings compared with standard gauze after leg arterial surgery. Silver alginate had no significant effect on wound complications (most commonly surgical site infection).

An RCT[282] (n=55) assessed silver-coated dressings compared with standard dressings in people undergoing surgery for hip fracture. There was no significant difference between

groups in signs of infection in the week after surgery.

An RCT[283] (n=147) assessed an occlusive silver-containing dressing compared with mupirocin ointment and with standard dressing in people undergoing elective colorectal surgery. Mupirocin ointment was associated with significantly fewer surgical site infections compared with silver or standard dressings. No significant difference was seen between silver and standard dressings.

Foam dressing versus gauze

An RCT[284] (n=80) assessed absorbent foam compared with gauze dressing in people undergoing tracheostomy. No significant difference in tracheostomy site infection was recorded between groups.

Negative pressure wound therapy

A Cochrane review[285] of 9 studies (n=785) assessed negative pressure wound therapy compared with control in skin grafts and surgical wounds healing by primary intention. In most included studies the control was standard dressing. No significant differences in surgical site infection or dehiscence were seen between groups.

A Cochrane review[286] of 2 studies (n=69) assessed negative pressure wound therapy in surgical wounds healing by secondary intention. The authors noted that the included studies 'reported limited outcome data on healing, adverse events and resource use'. Therefore, they concluded that the benefits and harms of negative pressure wound therapy remain largely uncertain.

An RCT[287] (n=90) assessed negative pressure wound therapy compared with conventional wound dressing in people with open fracture wounds. No significant difference in wound infection was seen between groups.

Topic expert feedback

Topic expert feedback suggested that the recommendation to use interactive dressings may not be well-implemented.

Topic experts advised that the evidence base for different dressings consisted of trials of variable size and quality. There were concerns that attempting to make recommendations on current evidence would not be clinically useful.

Impact statement

When developing the guideline, topic experts considered that there was 'no robust evidence' to guide choice of dressing to prevent surgical site infection. The recommendation to use an interactive dressing was made because the topic experts thought that gauze as a primary dressing should be avoided because of pain and disruption to healing tissue when dressings are changed.

The new evidence generally adds little to those considerations. Cumulative evidence on silver-based dressings and negative-pressure wound therapy suggest that these methods have no effect on surgical site infection. However, the guideline additionally noted: 'there are many reasons for choosing a wound dressing depending on the surgery, type of wound and characteristics of the patient'. Therefore, there is not likely to be a clear rationale to recommend against use of silver dressings or negative wound therapy if these are considered to be appropriate for the patient for reasons not related to surgical site infection.

New evidence is unlikely to change guideline recommendations.

Postoperative phase

74 – 26 Is there any clinical evidence to support the use of a postoperative non-touch dressing change technique rather than the use of a clean dressing change technique in relation to the incidence of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

No new information was identified at any surveillance review.

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74 – 27 Is it clinically and cost-effective to use a wound cleansing solution for the management of a surgical wound healing by primary or secondary intention to reduce the incidence of surgical site infection?

Subquestion

Is it cost-effective to use a wound cleansing solution for the management of a surgical wound healing by secondary intention to reduce the incidence of surgical site infection?

Recommendations derived from this question

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

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

1.4.4 Use tap water for wound cleansing after 48 hours if the surgical wound has separated or has been surgically opened to drain pus.

Surveillance decision

This review question should not be updated.

Postoperative cleansing

3-year surveillance summary

Water versus other solutions

A Cochrane review[288] of 11 studies examined water compared with other solutions for wound cleansing. There was no significant difference in infection rates between tap water and saline for cleansing acute wounds in adults. However, there was also no evidence of a difference between cleansing and not cleansing the wound.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

Postoperative showering or bathing

A Cochrane review[289] of 1 trial (n=857) assessed early compared with delayed postoperative bathing or showering in people with closed surgical wounds. This found no significant difference in surgical site infections between the two groups.

A systematic review[290] of 9 studies (n=2,150) examined wetting of surgical incision sites by showering or bathing before suture removal. The incidence of infection did not increase when allowing patients to shower or bathe as a part of normal daily hygiene before suture removal when compared with those who were instructed to keep the site dry until suture removal.

8-year surveillance summary

Postoperative showering or bathing

An update[291] of the Cochrane review[289] identified at 6-year surveillance found no additional studies.

An RCT[292] (n=444) assessed postoperative showering starting 48 hours after surgery compared with keeping the wound dry in people with clean and clean-contaminated wounds. No significant differences between groups were seen for surgical site infection.

Pressurised irrigation versus swabbing

An RCT[293] (n=256) assessed pressurised irrigation compared with swabbing in people with wounds healing by secondary intention. There was no difference in surgical site infection between groups, but pressurised irrigation was associated with shorter time to wound healing, lower pain and higher patient satisfaction.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The recommendation to use saline in the first 48 hours after surgery was developed by topic expert consensus; although a Cochrane review suggested that tap water may not increase infection rates compared with saline, it remains sensible to use saline in the immediate postoperative period, because microbiological contamination of tap water can happen.

New evidence is consistent with the recommendation in the guideline to advise patients that they may shower safely 48 hours after surgery.

Although a trial shows that pressurised irrigation may have some benefits over swabbing, it had no effects on surgical site infection. The guideline did not make recommendations about a preferred method of wound cleansing, and the identified study is unlikely to be sufficient to lead to a new recommendation in this area.

New evidence is unlikely to change guideline recommendations.

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74 – 28 What is the clinical effectiveness of topical antimicrobials to reduce surgical site infection?

Recommendations derived from this question

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

Surveillance decision

This review question should not be updated.

Topical agents

3-year surveillance summary

Honey

A Cochrane review[294] of 19 studies (n=2,554) investigated honey in acute and chronic wounds. There was insufficient evidence to determine the effect on acute non-burn wounds.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

Honey

An update[295] to the Cochrane review[294] (Jull et al. 2013) identified at 3-year surveillance included 25 trials (n=2,987). There was insufficient evidence to determine the effect of honey in acute non-burn wounds.

8-year surveillance summary

Mupirocin ointment

An RCT[283] (n=147) assessed an occlusive silver-containing dressing compared with mupirocin ointment and with standard dressing in people undergoing elective colorectal surgery. Mupirocin ointment was associated with significantly fewer surgical site infections compared with silver or standard dressings. No significant difference was seen between silver and standard dressings.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

New evidence is insufficient to show a role for honey in surgical wound care. However, an RCT showed a reduction in surgical site infection with mupirocin ointment. In developing the guideline, only 1 study was identified, finding no significant effect of chloramphenicol on surgical site infection. The study of

mupirocin ointment is fairly small and may not be sufficient to make recommendations on the use of mupirocin ointment. Additionally, because of topic experts' concerns about using mupirocin for prevention rather than treatment mean that an update in this area is not necessary at this time.

New evidence is unlikely to change guideline recommendations.

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74 – 29 Is it clinically effective to use topical antiseptics and antibiotics for the management of surgical wounds healing by secondary intention?

Subquestion

Which is the most clinically effective dressing in the management of surgical wounds healing by secondary intention?

Recommendations derived from this question

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

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

1.4.8 Refer to 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.

Surveillance decision

This review question should not be updated.

Topical antimicrobials for healing by secondary intention

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A Cochrane review[296] of 11 studies (n=886) assessed antibiotics and antiseptics for wounds healing by secondary intention. The authors noted that 'outcome data available were limited' and the evidence was 'low quality'. Although small studies found significant improvements from control in wound healing with sucralfate cream, triclosan, and honey-soaked gauze, the authors concluded that there was no robust evidence in this area.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

New evidence on topical antimicrobials was identified, but is insufficient to make any recommendations on use of sucralfate cream, triclosan, and honey-soaked gauze in wounds healing by secondary intention. These agents are not covered by current guidance.

New evidence is unlikely to change guideline recommendations.

Dressings and antimicrobials for healing by secondary intention

3-year surveillance summary

A Cochrane review[297] assessed 13 RCTs (number of participants not reported in the abstract) of dressings and topical agents in surgical wounds healing by secondary intention. The authors found insufficient evidence to determine whether choice of dressing or topical agents affected healing of surgical wounds by secondary intention.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Current recommendations on use of dressings or antimicrobials in wounds healing by secondary intention are broad, with no particular dressings or antimicrobials specified for use. New evidence is unable to inform use of dressings or antimicrobial agents.

New evidence is unlikely to change guideline recommendations.

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74 – 30 Antibiotic treatment of surgical site infection and treatment failure

Recommendations derived from this question

1.4.9 When surgical site infection is suspected (i.e. cellulitis), either de novo or because of 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.

Surveillance decision

No new information was identified at any surveillance review.

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74 – 31 Is the use of debridement techniques clinically effective in the prevention and management of surgical site infection?

Recommendations derived from this question

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

Surveillance decision

This review question should not be updated.

Debridement

3-year surveillance summary

A Cochrane review[298] of 5 RCTs (n=159) investigated methods of debridement on surgical wound healing. Meta-analysis could not be conducted because of the unique comparisons in each trial. The authors noted that there was a 'lack of large, high quality published RCTs evaluating debridement'.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

An update[299] of the Cochrane review[298] identified in 3-year surveillance found no additional studies.

8-year surveillance summary

No relevant evidence was identified.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The recommendations against use of Eusol and gauze, dextranomer or enzymatic treatments were made because 'the materials used do not reflect the underlying principles of modern wound management and debridement techniques, and are no longer routinely used'.

New evidence is unlikely to affect this viewpoint.

New evidence is unlikely to change guideline recommendations.

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74 – 32 Specialist wound care services

Recommendations derived from this question

The following recommendation has been taken unchanged from 'Guidance on the use of debriding agents and specialist wound care clinics for difficult to heal surgical wounds' (NICE technology appraisal 24).

1.4.11 Although there is no direct evidence to support the provision of specialist wound care services for managing difficult to heal surgical wounds, a structured approach to care (including preoperative assessments to identify individuals with potential wound healing problems) is required in order to improve overall management of surgical wounds. To support this, enhanced education of healthcare workers, patients and carers, and sharing of clinical expertise will be required.

Surveillance decision

No new information was identified at any surveillance review.

Areas not currently covered in the guideline

NQ – 02 What is the effectiveness of intraoperative wound-edge protection devices in preventing surgical site infection?

Surveillance decision

This review question should not be added.

Wound-edge protection devices

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

A meta-analysis[300] of 12 studies (n=1,933) assessed wound-edge protection devices on surgical site infection after open abdominal surgery. Wound guards were significantly associated with reductions in surgical site infection.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A systematic review and meta-analysis[301] of 11 RCTs (n=2,344) assessed wound-edge protection devices in people undergoing laparotomy. Double-ring devices were associated with significant reductions in surgical site infection, but single-ring devices were not. There was also evidence that wound-edge protection devices were effective in contaminated surgeries but not in clean-contaminated or dirty surgeries. Control interventions were not described clearly in the abstract.

A systematic review and meta-analysis[302] of 4 RCTs (n=939) assessed wound-edge protection devices in people undergoing appendectomy. Wound-edge protection devices were associated with significantly lower rates of surgical site infection, and may be particularly effective in contaminated surgery. However, the authors noted that there were substantial differences between individual studies in their definitions of surgical site infection, skin preparation and prophylactic antibiotic regimens. Control interventions were not described clearly in the abstract.

A systematic review and meta-analysis[303] of 19 RCTs (n=4,229) assessed ring retractors in people undergoing abdominal surgery. Control interventions were not described clearly in the abstract. Overall, ring retractors were associated with lower rates of surgical site infection. However the authors noted that this result should be treated with caution because of poor quality or old trials and that many factors influence surgical site infections.

A systematic review and meta-analysis[304] of 16 RCTs (n=3,695) assessed wound-edge protection devices in people undergoing laparotomy. Wound-edge protection devices were associated with significant reductions in surgical site infections. However, control interventions were not clear in the abstract. Double-ring protectors had a greater effect size than single-ring protectors, although the authors noted that the evidence for double-ring devices was lower quality. A greater effect was seen in contaminated surgeries.

An RCT[305] (n=608) assessed circular plastic wound-edge protection devices compared with standard surgical towels in people undergoing open elective abdominal surgery. Significantly fewer people in the wound-edge protection group had surgical site infection.

An RCT[306] (n=301) assessed a barrier retractor compared with conventional retractor in obese women undergoing caesarean section. Surgical site infection did not differ between groups, however the barrier retractor was associated with lower rates or uterine exteriorisation.

An RCT[307] (n=209) assessed a hyaluronic acid and carboxymethylcellulose powder adhesion barrier compared with no barrier in people undergoing laparoscopic colorectal surgery. No significant differences in surgical site infections or in pelvic abscesses were seen, but adverse events and serious adverse events were significantly more common in the adhesion barrier group.

A cost-effectiveness analysis[308] of wound-edge protection devices was based on results of the ROSSINI trial (n=760) in people undergoing laparotomy. From an NHS perspective, wound-edge protection devices were more expensive and no more effective than standard care.

Topic expert feedback

Topic expert feedback highlighted the cost-effectiveness analysis[308]. However, topic experts were unsure of the extent of use of wound protection devices in the UK.

Impact statement

Several studies of intraoperative wound-edge protection devices were identified, with inconsistent results. Several studies found greater effects in contaminated surgeries. Wound-edge protection devices, would be an unnecessary use of NHS resources if they are found to be ineffective. However, topic expert feedback did not indicate widespread use of these devices in NHS hospitals. Therefore, this area was not considered to be a priority at this time, but will be considered again at the next surveillance review.

New evidence is unlikely to impact on the guideline.

NQ – 03 Treating surgical site infection

Surveillance decision

This review question should not be added.

Methods for treating surgical site infection

3-year surveillance summary

Silver dressings

A Cochrane review[309] of 3 RCTs (n=847) investigated topical silver and silver dressings for treating contaminated and infected acute or chronic wounds. All identified studies focused on chronic wounds. There was insufficient information to guide the choice of dressings or topical agents containing silver to treat infected or contaminated chronic wounds.

A systematic review[310] of 14 studies (n=1,285) examined silver-releasing dressings in infected chronic wounds. The authors found that silver dressings had positive effects on infected chronic wounds, but noted that additional well-designed trials are needed because of methodological problems with current evidence.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

Negative pressure wound therapy

A meta-analysis[311] of 12 cohort studies (n=873) investigated negative pressure wound therapy in people with surgical site infections, particularly post-sternotomy infection. The authors concluded that negative pressure wound therapy might be more effective than standard therapy for healing of deep surgical site infections, but that RCTs are needed to confirm these findings.

8-year surveillance summary

Re-closure of infected surgical sites

An RCT[312] (n=223) assessed 'needle-free' closure compared with 'butterfly tape' and with sutures in people with wound infection after liver or biliary surgery. The needle-free closure method led to significantly shorter healing time than either butterfly tape or sutures.

Negative pressure wound therapy

Two reports[313,314] were identified that appeared to come from the same study; however information in the abstracts was not clear. The first report[314] (n=15) assessed negative pressure wound therapy compared with alginate dressings in people with deep perivascular groin infection. Wound healing was significantly shorter in the negative pressure wound therapy group.

The second report was an interim analysis of 20 people in an RCT[313] (n=66) which assessed vacuum-assisted wound closure compared with alginate dressings in people who had undergone surgical revision of deep infected

groin wounds after vascular surgery. Time to healing was significantly shorter with vacuum-assisted wound closure. The study was stopped early because these findings meant that assigning additional people to alginate would not be ethical.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Current evidence for wound care in people who have developed surgical site infection does not appear to be robust or generalisable enough to formulate recommendations on use of silver dressings, negative-pressure wound therapy, or butterfly tape.

New evidence is unlikely to impact on the guideline.

NQ – 04 Probiotics and nutrition for preventing surgical site infection

Surveillance decision

This review question should not be added.

Probiotics or synbiotics

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

A meta-analysis[315] of 6 studies (n=361) assessed probiotic and synbiotic agents in people undergoing colorectal resection. Probiotics and synbiotics were associated with reductions in postoperative diarrhoea, total infections and pneumonia, but no significant differences were seen for sepsis, incisional infection or intra-abdominal infection. The control group was not clear in the abstract.

A meta-analysis[316] of 13 RCTs (n=962) assessed probiotic and synbiotic agents compared with control in elective surgery. Probiotics and synbiotics were associated with reductions in sepsis but no significant differences were seen in wound infection, urinary tract infection, or pneumonia.

8-year surveillance summary

A Cochrane review[317] of 7 trials (n=614) assessed methods of preventing bacterial sepsis and wound complications in people undergoing liver transplantation. Four trials evaluated selective bowel decontamination compared with placebo or no treatment. Other interventions were probiotics, prebiotics, and granulocyte-colony stimulating factor. Infections were significantly less common with prebiotics plus probiotics compared with selective bowel decontamination in 1 study (n=63). The authors concluded that 'there is no clear evidence for any intervention offering significant benefits in the reduction of bacterial infections and wound complications in liver transplantation'.

A systematic review and meta-analysis[318] of 20 RCTs (n=1,374) assessed the use of probiotics or synbiotics in people undergoing abdominal surgery. Probiotics and synbiotic use was associated with lower rates of surgical site infection, urinary tract infections and combined infections. However, the authors noted that the overall quality of evidence was low.

A systematic review and meta-analysis[319] of 4 studies (n=246) assessed enteral nutrition with fibre (prebiotics) plus probiotics compared with enteral nutrition with fibre alone in people undergoing liver transplantation. Infections including intra-abdominal infections and urinary tract infections were significantly less common in the group receiving probiotics. Duration of antibiotic use and stay in hospital were significantly shorter with probiotics.

An RCT[320] (n=79) assessed synbiotics compared with placebo in people undergoing surgery for chronic pancreatitis. Postoperative infectious complications, duration of antibiotic

use and stay in hospital were all lower in the synbiotics group.

An RCT[321] (n=46) assessed probiotics plus synbiotics compared with placebo in people undergoing surgery for periamupllary neoplasms. Probiotics plus synbiotics were associated with lower rates of postoperative infection and shorter duration of antibiotic use.

An RCT[322] (n=379) assessed synbiotics compared with control in people undergoing laparoscopic colorectal surgery. No significant differences in surgical site infection were seen between groups.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

Although the evidence on probiotics and synbiotics is promising, trials have included small numbers of participants, and the largest meta-analysis found the quality of evidence to be low. The largest and most recent RCT identified found no significant effect on surgical site infection, so when added to previous meta-analyses the likely outcome may be no significant effect. Therefore, use of probiotics and prebiotics should not be considered at this time.

New evidence is unlikely to impact on the guideline.

Nutritional supplements

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A systematic review and meta-analysis[323] of 15 RCTs (n= 1,456) assessed preoperative nutritional supplementation in people undergoing surgery. Preoperative immunonutrition did not significantly affect wound infection, infectious complications, all complications, or stay in hospital compared with standard oral nutrition supplements. Immunonutrition was associated with reduced infectious complications and stay in hospital compared with standard diet. The authors noted that oral nutritional supplementation may be effective in reducing infectious complications, but there was no direct comparison of oral nutrition supplements and standard diet.

A systematic review[324] assessed perioperative oral nutrition supplementation in elderly people undergoing hip surgery. The numbers of studies and participants informing the analysis were not reported in the abstract. Perioperative oral nutrition supplementation was associated with significant reductions in complications, including wound infection, respiratory infection and urinary tract infection.

A systematic review and meta-analysis[325] of 6 studies (n=397) assessed immunonutrition in people undergoing surgery for head and neck cancer. Control interventions were not clear in the abstract. There were no significant differences in wound infection, other infections or diarrhoea.

A network meta-analysis[326] of 74 studies (n=7,572) assessed methods of nutrition in people undergoing gastrointestinal surgery. Immunoenhancing enteral nutrition was ranked first of 7 nutrition strategies for reducing any infection, wound infection, intra-abdominal abscess and other complications. The comparator nutrition regimens were immunoenhancing parenteral nutrition, standard parenteral nutrition, and standard enteral nutrition.

A network meta-analysis[327] of 27 RCTs assessed enteral immunonutrition in people undergoing surgery for gastrointestinal cancer. Pair-wise meta-analyses suggested that enteral immunonutrition was associated with lower rates of postoperative infectious complications compared with standard enteral nutrition. The network meta-analysis suggested that perioperative enteral immunonutrition was the best strategy (compared with preoperative or postoperative use).

An RCT[328] (n=89) assessed supplementation with glutamine, L-carnitine vitamin C, vitamin E and selenium compared with placebo in people undergoing coronary artery bypass grafting. The trial had 4 arms: supplement before surgery and placebo after; placebo before

surgery and supplement after; supplement before and after surgery; and placebo before and after surgery. Superficial wound infections were significantly lower in the groups that had supplementation compared with placebo.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The new evidence for nutritional supplementation or immunonutrition shows promise, but is characterised by small studies that are unlikely to be robust enough for developing recommendations.

NICE has guidance on use of nutrition support in adults, and many people undergoing surgery are likely to be covered by recommendations in that guideline.

New evidence is unlikely to impact on the guideline.

NQ – 05 Administrative improvements in surgical practice

Surveillance decision

This review question should not be added.

Checklists

3-year surveillance summary

No relevant evidence was identified.

Evidence Update (2013)

No relevant evidence was identified.

6-year surveillance summary

No relevant evidence was identified.

8-year surveillance summary

A systematic review and meta-analysis[329] of 7 cohort studies (n=37,339) assessed use of safety checklists in people undergoing surgery. Use of checklists in surgery was associated with reductions in wound infection, any complications, blood loss, mortality, pneumonia or unplanned return to theatre.

A systematic review and meta-analysis[330] of 13 studies (n=8,515) assessed surgical care bundles in people undergoing colorectal surgery. Most studies evaluated care bundles including antibiotic administration, appropriate hair removal, glycaemic control, and normothermia. Care bundles were associated with significantly lower rates of surgical site infection compared with standard care.

Topic expert feedback

No topic expert feedback was relevant to this evidence.

Impact statement

The evidence on surgical checklists and care bundles broadly supports the need to adequately implement existing guidance, although it does not inform the use of new interventions for preventing surgical site infection.

New evidence is unlikely to impact on the guideline.

Research recommendations

RR – 01 Is it cost-effective to use mupirocin for nasal decontamination? In which patients is it most effective?

New evidence was found and an update of the review question is planned.

Surveillance decision

This research recommendation will be considered again at the next surveillance point unless a new research recommendation is made as part of the update process.

RR – 02 What is the value of supplemented oxygenation in the recovery room in the prevention of surgical site infection? What are the likely mechanisms of action?

New evidence was found but an update of the review question is not planned because the new evidence did not suggest benefits of oxygen supplementation in reducing surgical site infection.

Surveillance decision

This research recommendation will be considered again at the next surveillance point.

RR – 03 What are the possible benefits of improved postoperative blood glucose control on the incidence of surgical site infection?

New evidence was found and an update of the review question is planned.

Surveillance decision

This research recommendation will be considered again at the next surveillance point unless a new research recommendation is made as part of the update process.

RR – 04 What types of closure method will reduce the risk of surgical site infection?

New evidence was found and an update of the review question is planned.

Surveillance decision

This research recommendation will be considered again at the next surveillance point unless a new research recommendation is made as part of the update process.

RR – 05 What is the benefit and cost-effectiveness of different types of post-surgical interactive dressing for reducing the risk of surgical site infection?

New evidence was found but an update of the review question is not planned because the new evidence did not show clear effects of any dressing method in reducing surgical site infection in wounds healing by primary intention.

Surveillance decision

This research recommendation will be considered again at the next surveillance point.

RR – 06 What are the most appropriate methods of chronic wound care (including alginates, foams and hydrocolloids and dressings containing antiseptics such as antimicrobial honey, cadexomer iodine or silver) in terms of management of surgical site infection as well as patient outcomes?

New evidence was found but an update of the review question is not planned because the new evidence did not show clear effects of any dressing method in reducing surgical site infection in wounds healing by secondary intention.

Surveillance decision

This research recommendation will be considered again at the next surveillance point.

RR – 07 Would a risk assessment tool developed by consensus methodology help predict the risk of surgical site infection?

No new information was identified at any surveillance review.

This research recommendation was made based on the background information section of the guideline and does not have a related review question. At 8-year surveillance consideration was given to studies addressing risk assessment, including any studies identified in searches that were not RCTs or systematic reviews. Although studies identifying risk factors were identified in searches, these were numerous and none covered development or validation of risk assessment tools. Studies that simply identified risk factors were not eligible for inclusion in surveillance.

Surveillance decision

This research recommendation will be considered again at the next surveillance point.

RR – 08 What is the cost-effectiveness of new materials used in reusable and disposable operative drapes and gowns in reducing the incidence of surgical site infection?

New evidence was found but is unlikely to impact on guideline recommendations.

Surveillance decision

This research recommendation will be considered again at the next surveillance point.

RR – 09 Does irrigation with modern antiseptics and saline under pressure with or without added antiseptics in a broader range of surgery allow the development of a strategy less dependent on antibiotic prophylaxis to reduce the incidence of surgical site infection?

New evidence was found but is unlikely to impact on guideline recommendations.

Surveillance decision

This research recommendation will be considered again at the next surveillance point.

RR – 10 Does the use of antiseptic products applied to the wound prior to closure in elective clean non-prosthetic surgery reduce the reliance on antibiotic prophylaxis to reduce the incidence of surgical site infection?

New evidence was found and an update of the review question is planned.

Surveillance decision

This research recommendation will be considered again at the next surveillance point unless a new research recommendation is made as part of the update process.

RR – 11 What is the cost-effectiveness of collagen implants with antibiotics or antiseptics in the reduction in the incidence of surgical site infection?

New evidence was found and an update of the review question is planned.

Surveillance decision

This research recommendation will be considered again at the next surveillance point unless a new research recommendation is made as part of the update process.

RR – 12 What is the effectiveness of modern methods of debridement in surgical wounds healing by secondary intention?

New evidence was found but is unlikely to impact on guideline recommendations.

Surveillance decision

This research recommendation will be considered again at the next surveillance point.

Editorial and factual corrections identified during surveillance

During surveillance editorial or factual corrections were identified.

- The NICE guideline on caesarean section (NICE CG132) contains 3 recommendations about antibiotic prophylaxis in caesarean section. A cross-reference should be added to the NICE version of NICE CG74 to acknowledge these recommendations.
- In recommendation 1.3.10, the wording of the title of NICE guideline CG65 should be updated from 'Inadvertent perioperative hypothermia' to 'Hypothermia: prevention and management in adults having surgery'. Additionally a hyperlink should be added to improve the link between the guidelines.

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