



Surveillance report 2017 – Surgical site infections: prevention and treatment (2008) NICE guideline CG74

Surveillance report

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Surveillance decision

We will plan an update of the guideline on [prevention and treatment of surgical site infections](#). The update will focus on:

- nasal decontamination of *Staphylococcus aureus*
- choice of preoperative skin antiseptics
- application of intraoperative topical antiseptics/antimicrobials before wound closure
- type of suture.

We will consider intraoperative perfusion and hydration, and intraoperative blood glucose control in a new guideline on perioperative care. Recommendations in the surgical site infection guideline will be withdrawn on publication of new recommendations in the perioperative care guideline.

During surveillance, editorial or factual corrections were identified. Details are included in [appendix A](#): summary of evidence from surveillance.

Reason for the decision

We found 330 studies through surveillance of this guideline. Topic experts, including those who helped to develop the guideline, advised us about whether the following sections of the guideline should be updated and any new sections added:

Preoperative phase

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

There is increasing evidence to support nasal decontamination of *Staphylococcus aureus* in patients before surgery. Topic experts thought that intranasal application of chlorhexidine had potential clinical utility, whereas there were concerns about antimicrobial resistance developing with widespread use of intranasal mupirocin. Antibiotic resistance was also a concern during development of the guideline.

Topic experts advised that the rate of surgical site infections caused by *Staphylococcus aureus* is low. Selective screening and decolonisation of *Staphylococcus aureus* in people at high risk of developing surgical site infections may be the optimum strategy. However, a full review of the evidence is necessary to determine whether current recommendations should change.

Decision: This review question should be updated.

Intraoperative phase

- Is the use of preoperative skin antiseptics clinically effective in the prevention of surgical site infection?

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. Topic experts indicated that the best choice of antiseptic is unclear. An update to this section of the guideline may provide clarity.

Decision: This review question should be updated.

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

In developing the guideline, 2 studies addressing the use of intraoperative 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. Topic experts had differing experiences of whether gentamicin-collagen sponges are used in their hospitals. This indicates a need to evaluate whether gentamicin-collagen sponges are clinically useful.

Decision: This review question should be updated.

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

The guideline evaluated the evidence for different suture materials but was unable to make any recommendations based on the evidence at that time. Topic experts thought that the evidence base has grown sufficiently to allow consideration of specific types of sutures for particular surgeries. There is considerable interest in antibiotic sutures in particular.

Decision: This review question should be updated.

Questions to be considered in other guidelines

In surveillance of this guideline, we identified several areas in which interventions could have wider effects on patients than influencing surgical site infections. With advice from topic experts, we decided that certain sections of the guideline should be covered in a new guideline to be developed on perioperative care. This will allow the interventions to be considered for their effects on wider clinical outcomes than surgical site infection alone. On publication of the guideline on perioperative care, any superseded recommendations in the guideline on surgical site infection should be withdrawn. The sections to be considered in the perioperative care guideline are:

- What is the clinical effectiveness of perioperative perfusion and hydration for the prevention of surgical site infection?
- What is the clinical effectiveness of strict blood glucose control to reduce surgical site infection?

Other clinical areas

We also found evidence that was not thought to have an effect on current recommendations. This evidence related to: preoperative hair removal; theatre attire; mechanical bowel preparation; hand jewellery and decorations; and hand decontamination.

Equalities

No equalities issues were identified during the surveillance process.

Overall decision

After considering all the evidence and views of topic experts, we decided that a partial update is necessary for this guideline.

See [how we made the decision](#) for further information.

Commentary on selected evidence

With advice from topic experts we selected 3 studies for further commentary.

Intraoperative phase – antiseptic skin preparation

We selected the studies by [Ngai et al. \(2015\)](#) and [Tuuli et al. \(2016\)](#) for full commentary because they assessed skin antisepsis with chlorhexidine in alcohol compared with povidone-iodine in alcohol. Previous studies, for example, [Darouiche et al. \(2010\)](#), compared chlorhexidine in alcohol with povidone-iodine in water, which may not have been a 'fair' comparison.

What the guideline recommends

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

Methods

Both studies were randomised controlled trials that assessed skin antisepsis with chlorhexidine in alcohol compared with povidone-iodine in alcohol in women undergoing scheduled or unscheduled caesarean section. Both studies excluded emergency caesarean sections.

[Ngai et al. \(2015\)](#) compared 3 methods of skin antisepsis (n=1,404): povidone-iodine in alcohol (n=463); chlorhexidine in alcohol (n=474); and dual antisepsis with povidone-iodine then chlorhexidine in alcohol applied immediately after (n=467). The report did not specify the concentrations of antiseptics, or specific antiseptic products used in the study. The primary outcome was the rate of surgical site infections 30 days after delivery in the dual antisepsis group compared with the povidone-iodine-only or chlorhexidine-only control groups. Surgical site infection was defined as patient-reported use of antibiotics for a wound infection or documented wound infection at a post-discharge outpatient appointment.

[Tuuli et al. \(2016\)](#) compared povidone-iodine 8.3% in 72.5% isopropyl alcohol with

chlorhexidine 2% in 70% isopropyl alcohol. The primary outcome was surgical site infection (superficial or deep) diagnosed by the treating physician and validated by an investigator blind to treatment allocation. The surgical site infection had to be diagnosed within 30 days after the caesarean delivery.

Results

In Ngai et al. (2015), rates of surgical site infection were 4.6% in the povidone-iodine group (21 of 463); 4.5% in the chlorhexidine group (21 of 474); and 3.9% in the dual antiseptics group (18 of 467). There was no clear evidence of a difference in surgical site infection between the dual antiseptics group and the povidone-iodine-only group (odds ratio [OR] 0.85, 95% confidence interval [CI] 0.44 to 1.61) or the chlorhexidine-only group (OR 0.99, 95% CI 0.53 to 1.84).

Ngai et al. (2015) also conducted multivariable regression analyses to identify risk factors for surgical site infection, which were: estimated blood loss greater than 1,000 ml (OR 2.44, 95% CI 1.29 to 4.62) and pre-eclampsia (OR 2.61, 95% CI 1.25 to 5.44).

In Tuuli et al. (2016), rates of surgical site infection were 7.3% in the povidone-iodine group (42 of 575) and 4.0% in the chlorhexidine group (23 of 572). The rate of surgical site infection was significantly lower in the chlorhexidine group than in the povidone-iodine group (risk ratio [RR] 0.55, 95% CI 0.34 to 0.90, $p=0.002$). Subgroup analyses suggested that the effect was not affected by whether caesarean section was scheduled or unscheduled, type of skin closure, or by the presence of other chronic conditions including diabetes or obesity. When deep and superficial surgical site infections were analysed separately, there was no clear evidence of a difference between the antiseptics.

Strengths and limitations

Strengths

Both studies included a power calculation and recruited more participants into each group than the power calculation suggested was necessary. Additionally, both studies included all randomised participants in the analyses.

Both studies appeared to have low risk of bias in most aspects of study design. However, neither study blinded the operating team, which would be difficult because of differences in smell and colour of the antiseptics.

Limitations

Although Ngai et al. (2015) enrolled more people than necessary according to the power calculation, it was based on an expected rate of surgical site infections of 12%. The rate of surgical site infections was much lower than expected at around 4.5% in the 2 groups that had skin antisepsis with a single agent, meaning that the study was underpowered. The authors noted that a sample size of around 3,000 people would be needed to detect a significant difference.

Both studies were conducted at single institutions, so other aspects of care unique to the institution could have influenced the results.

Impact on guideline

The impact on the guideline is not clear because of the inconsistent results. The 2 trials do not have any obvious differences in design that would explain the higher rate of surgical site infection with povidone-iodine in 1 study but not the other. Therefore, a systematic review of studies of these antiseptic agents in an update to the guideline is necessary to determine whether there are significant differences in the effectiveness of povidone-iodine and chlorhexidine.

Intraoperative phase – triclosan sutures

We selected the systematic review by [Guo et al. \(2016\)](#) for a full commentary because studies of triclosan sutures have shown inconsistent results, so a systematic review and meta-analysis may give a robust estimate of the efficacy of this intervention.

What the guideline recommends

No recommendations on suture material or technique were made in the guideline because of insufficient and inconsistent evidence.

Methods

The systematic review included 13 randomised controlled trials (n=5,256) of triclosan-coated sutures compared with uncoated sutures in people older than 18 years who were having surgery. Studies that included additional measures to prevent surgical site infection were excluded. Subgroup and sensitivity analyses were performed.

Results

The overall analysis showed a significantly lower rate of surgical site infection with triclosan-coated sutures compared with uncoated sutures (RR 0.76, 95% CI 0.65 to 0.88, $p < 0.001$; 13 studies, $n = 5,256$). Heterogeneity was not significant and sensitivity analysis showed that removing any single study did not substantially affect the results.

In subgroup analysis, abdominal surgeries showed a significant reduction in surgical site infections with triclosan-coated sutures compared with uncoated sutures (RR 0.70, 95% CI 0.50 to 0.99, $p = 0.04$; 5 studies, $n = 3,020$). However, there was no significant effect of triclosan sutures in cardiac surgery (RR 0.77, 95% CI 0.54 to 1.08, $p = 0.13$; 3 studies, $n = 1,207$), breast surgery (RR 0.64, 95% CI 0.33 to 1.26, $p = 0.2$; 3 studies, $n = 303$), or 'other' types of surgery (RR 0.72, 95% CI 0.35 to 1.48, $p = 0.37$, 2 studies, $n = 726$).

Strengths and limitations

Strengths

This systematic review was generally well conducted, with many aspects quality-assured by a second author. The main results were explored further in subgroup and sensitivity analyses, which was useful in attempting to explain inconsistent results between individual studies.

Limitations

Studies that used additional measures to prevent surgical site infection were reported to be excluded from analysis; however, there was no information to explain what this meant. For example, several included studies used antibiotic prophylaxis, which may be considered to be an additional measure to prevent surgical site infection.

A funnel plot was included to assess possible publication bias, which the authors noted showed no evidence of publication bias. However, there was an absence of smaller studies showing no benefit of triclosan-coated sutures, which indicates possible publication bias. The authors excluded unpublished work, so it is not possible to tell whether any such studies exist.

Impact on guideline

The new evidence suggests that triclosan-coated sutures may be associated with lower rates of surgical site infections compared with uncoated sutures when used after abdominal surgery. The evidence-base on triclosan-coated sutures has grown substantially from the single study (n=135) considered when developing the guideline to the 13 studies (n=5,256) included in this systematic review. An update to this aspect of the guideline may result in the development of recommendations on the use of antimicrobial-coated sutures.

How we made the decision

We check our guidelines regularly to ensure they remain up to date. We based the decision on surveillance 8 years after the publication of [surgical site infections: prevention and treatment](#) (2008) NICE guideline CG74.

For details of the process and update decisions that are available, see [ensuring that published guidelines are current and accurate](#) in 'Developing NICE guidelines: the manual'.

Previous surveillance [update decisions](#) for the guideline are on our website.

New evidence

We found 167 new studies in a search for randomised controlled trials and systematic reviews published between 1 May 2014 and 18 April 2016. We also considered additional studies identified by members of the guideline committee who originally worked on this guideline. A further 2 studies were identified through post-publication communications.

Evidence identified in previous surveillance at 3 years and 6 years after publication of the guideline, and in an evidence update in 2013, was also considered. This included 160 studies identified by search and 1 study identified in comments received during consultation on the 3-year surveillance decision.

From all sources, 330 studies were considered to be relevant to the guideline.

We also checked for relevant ongoing research, which will be evaluated again at the next surveillance review of the guideline.

See [appendix A](#): summary of evidence from surveillance and references for all new evidence considered.

Views of topic experts

We considered the views of topic experts, including those who helped to develop the guideline and other correspondence we have received since the publication of the guideline.

Views of stakeholders

Stakeholders are consulted only if we decide not to update the guideline following checks at 4 and 8 years after publication. Because this was an 8-year surveillance review, and the decision was to update, we did not consult on the decision.

See [ensuring that published guidelines are current and accurate](#) in 'Developing NICE guidelines: the manual' for more details on our consultation processes.

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