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Incisional Wound Irrigation for the Prevention of Surgical Site Infection
A Systematic Review and Network Meta-Analysis

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IMPORTANCE Surgical site infections (SSIs) are common postoperative complications and associated with significant morbidity, mortality, and costs. Prophylactic intraoperative incisional wound irrigation is used to reduce the risk of SSIs, and there is great variation in the type of irrigation solutions and their use.

OBJECTIVE To compare the outcomes of different types of incisional prophylactic intraoperative incisional wound irrigation for the prevention of SSIs in all types of surgery.

DATA SOURCES PubMed, Embase, CENTRAL, and CINAHL databases were searched up to June 12, 2023.

STUDY SELECTION Included in this study were randomized clinical trials (RCTs) comparing incisional prophylactic intraoperative incisional wound irrigation with no irrigation or comparing irrigation using different types of solutions, with SSI as a reported outcome. Studies investigating intracavity lavage were excluded.

DATA EXTRACTION AND SYNTHESIS This systematic review and network meta-analysis is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement. Two reviewers independently extracted the data and assessed the risk of bias within individual RCTs using the Cochrane Risk of Bias 2 tool and the certainty of evidence using the Grading of Recommendations, Assessment, Development, and Evaluation framework. A frequentist network meta-analysis was conducted, and relative risks (RRs) with corresponding 95% CIs were reported.

MAIN OUTCOME AND MEASURE The primary study outcome was SSI.

RESULTS A total of 1587 articles were identified, of which 41 RCTs were included in the systematic review, with 17 188 patients reporting 1328 SSIs, resulting in an overall incidence of 7.7%. Compared with no irrigation, antiseptic solutions (RR, 0.60; 95% CI, 0.44-0.81; high level of certainty) and antibiotic solutions (RR, 0.46; 95% CI, 0.29-0.73; low level of certainty) were associated with a beneficial reduction in SSIs. Saline irrigation showed no statistically significant difference compared with no irrigation (RR, 0.83; 95% CI, 0.63-1.09; moderate level of certainty).

CONCLUSIONS AND RELEVANCE This systematic review and network meta-analysis found high-certainty evidence that prophylactic intraoperative incisional wound irrigation with antiseptic solutions was associated with a reduction in SSIs. It is suggested that the use of antibiotic wound irrigation be avoided due to the inferior certainty of evidence for its outcome and global antimicrobial resistance concerns.

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Invited Commentary

Supplemental content

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Surgical site infections (SSIs) account for the majority of postoperative complications and are associated with increased morbidity, mortality, costs, and prolonged hospital stay.[1,2] The risk of SSIs can be reduced by the use of prophylactic intraoperative incisional wound irrigation (pIOWI) in which debris, metabolic waste, and exudate (possibly contaminated with microbes) are washed away just before wound closure.[3] A wide variation in irrigation solutions and application methods are used.

International guidelines on the prevention of SSIs and previously published (network) meta-analyses provide contradictory recommendations regarding the use of pIOWI, potentially impairing wider implementation. The UK National Institute for Health and Care Excellence[4] guideline recommends against the use of pIOWI. In contrast, the guidelines from the US Centers for Disease Control and Prevention (CDC)[5] and the World Health Organization (WHO)[6,7] suggest performing irrigation with povidone iodine. Furthermore, the WHO[6,7] advises against using an antibiotic solution, whereas a Cochrane Review[8] states antibacterial irrigation may be superior to nonantibacterial irrigation.

Since publication of the international guidelines, a substantial number of randomized clinical trials (RCTs) on this topic have been published. The RCTs compare various irrigation solutions or assess the efficacy of a specific solution compared with no irrigation. A traditional pairwise meta-analysis is unable to compare the multiple different irrigation solutions in 1 single meta-analysis, as it can only compare 2 interventions. A network meta-analysis allows for simultaneous comparisons of multiple interventions, even in the absence of head-to-head comparisons between interventions.

A recent network meta-analysis by Thom et al[9] found antibiotic and antiseptic solutions had the lowest odds of SSIs compared with no irrigation or nonantibacterial irrigation. However, this network meta-analysis is problematic as RCTs investigating either incisional wound irrigation or intracavity lavage (ie, intraperitoneal, intra-abdominal, or intramediastinal) have been pooled together, whereas these are distinct interventions with inherently different objectives. Incisional wound irrigation is a preventive measure, whereas intracavity lavage is considered to be part of a therapeutic intervention for infections. Therefore, further insights in pIOWI and its implications for the prevention of SSIs are warranted.[10]

We present a systematic review, network meta-analysis, and Grading of Recommendations Assessment, Development, and Evaluation (GRADE) assessment of published RCTs comparing different types of pIOWI solutions for the prevention of SSIs. In addition, we aimed to provide a recommendation, based on up-to-date evidence, on the use of pIOWI for current clinical practice for all types of surgery.

Key Points

Question What are the outcomes of different types of prophylactic intraoperative incisional wound irrigation solutions for the prevention of surgical site infections (SSIs) in all types of surgery?

Findings Results of this systematic review and network meta-analysis including 41 randomized clinical trials found high-certainty evidence that wound irrigation with aqueous antiseptic solutions was associated with a significant reduction in SSIs compared with no irrigation and low-certainty evidence that wound irrigation with antibiotic solutions was associated with a significant reduction in SSIs compared with no irrigation.

Meaning Incisional wound irrigation with aqueous antiseptic solutions was associated with a reduction in the risk of SSIs; results suggest that the use of antibiotic wound irrigation be avoided due to the inferior certainty of evidence for its outcome and global antimicrobial resistance concerns.

Methods

Search Strategy and Selection Criteria

This systematic review and network meta-analysis is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) reporting guidelines.[11] The study protocol is registered in the PROSPERO database (CRD42023403336).

We conducted a systematic review and network meta-analysis to evaluate the association of different types of pIOWI with the incidence of SSI. We included unpublished and published RCTs that investigated the effect of pIOWI on SSI rates in any type of surgery, using antiseptic, antibiotic, or saline solutions for irrigation, compared with each other or with no irrigation. The solutions were grouped based on their biochemical properties. All studies investigating irrigation of newly made incisions were included, irrespective of contamination level as described by the CDC.[12] Studies investigating intracavity lavage were excluded. In addition, studies examining any method of topical application of a nonsolution (eg, aerosols, powder, gels, sponges) were not included because no diluting effect of irrigation is present. We excluded RCTs from before the year 2000 because these likely do not adhere to the most recent standards for perioperative clinical care, as described by Mangram et al.[12] In addition, animal studies and studies investigating surgeries performed outside the operating suite were excluded. Information on patient race and ethnicity was not gathered because only a small number of studies reported these patient characteristics. There was no restriction on article language.

The literature search of the previous systematic review and meta-analysis performed by our research group was updated.[13] We carried out the search using MEDLINE (PubMed), Excerpta Medica Database (Embase), and Cochrane Central Register of Controlled Trials (CENTRAL) up to June 12, 2023. Additional articles were identified by backward and forward citation tracking of earlier published systematic reviews and included studies. The complete search strategy is presented in the eMethods in Supplement 1.

Two researchers (H.G. and N.B.) independently performed title and abstract screening and full-text review of potentially relevant studies. Disagreements were resolved by discussion or by consulting the senior author (M.A.B.).

Statistical Analysis

Two reviewers (H.G. and N.B.) independently extracted study data using a prespecified data abstraction form. Corresponding authors were contacted in case the data were unclear or missing from the original publication.

The primary outcome was SSI, defined at the discretion of the author of the original study. No secondary outcome was analyzed.

The frequentist method and a random-effects model were used to perform a network meta-analysis. Studies with no events in any of the arms were excluded from quantitative analysis.[14] The outcomes of the network meta-analysis are presented in pooled relative risks (RRs) with corresponding 95% CIs, displayed in forest plots and league tables containing all network RRs. Although a 2-sided P value <.05 was considered statistically significant, the results of all statistical tests are interpreted in context.[15]

The GRADE methodology was used to evaluate the certainty of the evidence using a minimally contextualized approach for direct, indirect, and the complete network meta-analysis evidence sequentially. The GRADE includes assessment on 5 domains: risk of bias, inconsistency, indirectness, imprecision, and publication bias.[16,17] Two reviewers (H.G. and N.B.) independently assessed risk of bias within individual RCTs using the Cochrane Risk of Bias 2 (RoB2) tool.[18] Inconsistency was assessed using I^2 and τ^2 statistics. Publication bias was evaluated with a comparison-adjusted funnel plot.[19] For the assessment of incoherence, both the point estimates, CIs, and outcomes from the Separate Indirect From Direct Evidence node-splitting analysis were interpreted in context.[20] A more elaborate explanation of the GRADE methodology is present in eTable 6 in Supplement 1.

We conducted a planned subgroup analysis according to the CDC wound classification.[12] Studies focusing on clean surgery exclusively were compared with all other studies (studies investigating nonclean surgery or clean and nonclean surgery mixed). Another, nonplanned, subgroup analysis was done on the income level of the country where the study was conducted, based on World Bank data, with a division between lower-income countries (low or lower middle) and higher-income countries (upper middle or high).[21]

A sensitivity analysis was conducted excluding studies with high risk of bias based on the RoB2 tool.[14] In another sensitivity analysis, we excluded studies that did not explicitly describe the use of systemic antibiotic prophylaxis.[7] All quantitative analyses were done using R, version 4.2.1 (R Core Team), using the packages meta, netmeta, metaphor, and tidyverse.

Results

We identified 1583 records in the initial search, and 4 additional articles were identified through backward and forward citation tracking for a total of 1587 articles identified. In total, 146 full-text reports were assessed for eligibility. The systematic review flowchart study selection is shown in **Figure 1**. Reasons for exclusion after full-text review are listed in eTable 1 in Supplement 1. We included 41 RCTs[22-62] in our systematic review and 37 RCTs in the network meta-analysis, due to lack of events in all arms in 4 studies.[46,53-55] The study characteristics of the RCTs included in the systematic review are listed in eTable 2 in Supplement 1. Irrigation solutions were grouped into antiseptic, antibiotic, or saline solutions.

The antibiotics applied in a solution in the different studies were cefazolin,[32,48,51] gentamicin,[31,38,51,53,55] rifampicin,[40-42,44] imipenem,[56,61] clindamycin,[53] ceftriaxone,[52] metronidazole,[25] and bacitracin.[51] All but 2 studies[44,48] described the antibiotic solutions to be aqueous. All antiseptic solutions studied were aqueous, with 18 RCTs[22,27-30,33,37-43,45,47,57,60,62] investigating iodine solutions ranging from 0.1% to 10% in concentration. Other antiseptics used were polyhexanide,[49,50,58] chlorhexidine,[51] hydrogen peroxide,[46] and electrolyzed strongly acidic aqueous solution.[59] In the saline irrigation group, all studies described irrigation with saline 0.9%, except for 1 RCT[50] in which Ringer lactate was used. Volume of irrigation and application method varied among all studies and irrigation groups (eTable 3 in Supplement 1).

Data Analysis

The resulting network meta-analysis consisted of 51 comparisons, which are visualized in a network graph presented in **Figure 2**. In total, 17 188 patients were included in the systematic review, reporting 1328 SSIs, which corresponds to an overall incidence of 7.7%.

Figure 3 shows the forest plot for the efficacy of the different types of irrigation solutions compared with no irrigation; the league table for these data is presented in **Figure 4**. Antibiotic (RR, 0.46; 95% CI, 0.29-0.73) and antiseptic (RR, 0.60; 95% CI, 0.44-0.81) solutions were both associated with a significant reduction in SSIs when compared with no irrigation. Similarly, wound irrigation with antibiotic or antiseptic solutions was favorable compared with irrigation with saline (antibiotic irrigation: RR, 0.56; 95% CI, 0.37-0.83; antiseptic irrigation: RR, 0.72; 95% CI, 0.57-0.93). Saline irrigation showed no significant association (RR, 0.83; 95% CI, 0.63-1.09) with SSIs compared with no irrigation. The association between SSI reduction and antibiotic and antiseptic solutions was not significantly different (RR, 0.77; 95% CI, 0.50-1.19).

Moderate heterogeneity between studies was found (I^2 = 42.9%; τ^2 = 0.11). The I^2 and τ^2 statistics for each comparison are presented in eTable 2 in Supplement 1. The results for node splitting are shown in eTable 4 in Supplement 1.

Subgroup and Sensitivity Analyses

We carried out a subgroup analysis on the 15 studies[27-30,33,37,38,43,46,51-55,57] that investigated clean surgery (eFigure 1A in Supplement 1).[12] Eleven[27-30,33,37,38,43,51,52,57] of these 15 RCTs reported at least 1 SSI and were, therefore, included in the network meta-analysis. The only significant benefit was found for antiseptic solutions compared with saline solutions, as seen in the league table (RR, 0.21; 95% CI, 0.08-0.51). For the remaining RCTs that did not exclusively evaluate clean surgery, a significant association between the use of antibiotic and antiseptic solutions and the reduction of SSIs

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flowchart of Study Selection

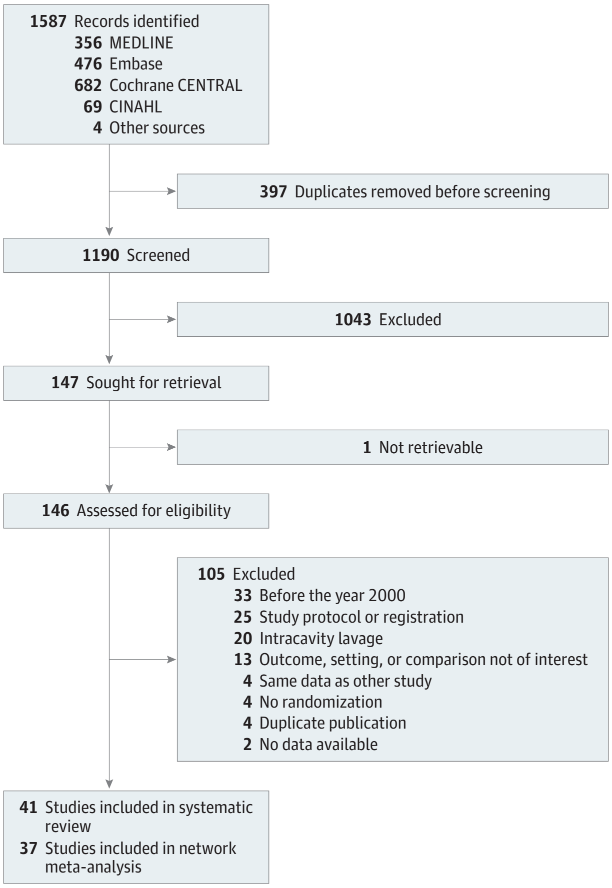
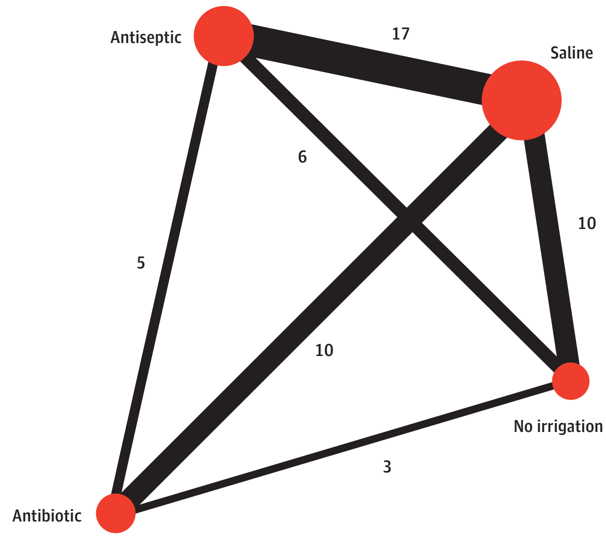


Figure 2. Network Graph of the 41 Randomized Clinical Trials Included in the Network Meta-Analysis



The network graph shows the number of studies investigating the direct comparison of the different methods of prophylactic intraoperative incisional wound irrigation for the prevention of surgical site infections. The size of the nodes and the thickness of the lines correspond with the number of studies.

was found, similar to the results of the main analysis (eFigure 1B in Supplement 1).

Twenty-six RCTs[22,24,26-30,33,35,36,40-45,47,49-51,53-55,58,59,62] were performed in either high- or upper-middle-income countries. Antibiotic (RR, 0.39; 95% CI, 0.18-0.83) as well as antiseptic (RR, 0.61; 95% CI, 0.41-0.92) solutions were associated with a reduction in SSIs for these countries compared with no irrigation (eFigure 1C in Supplement 1). The subgroup analysis of low- and lower-middle-income countries, comprising 14 RCTs[23,25,31,32,34,37-39,48,52,56,57,60,61] (eFigure 1D in Supplement 1), also showed that both antibiotic (RR, 0.50; 95% CI, 0.26-0.95) and antiseptic (RR, 0.51; 95% CI, 0.29-0.90) solutions were associated with a reduction in SSIs compared with no irrigation. Furthermore, saline irrigation was associated with a nonsignificant reduction in SSIs (RR, 0.80; 95% CI, 0.50-1.30) when compared with no irrigation in low-income countries.

The sensitivity analysis after exclusion of studies with high risk of bias comprised 33 RCTs[22,24,26-31,33-40,42-45,47-52,56-62] and showed a significant outcome for antibiotic (RR, 0.43; 95% CI, 0.24-0.76) and antiseptic (RR, 0.60; 95% CI, 0.43-0.82) solutions and no significant outcome for saline solution (RR, 0.80; 95% CI, 0.59-1.09) compared with no irrigation (eFigure 1E in Supplement 1).

We included 31 studies[22-32,35,36,38-45,47,49,51,52,57-62] in the sensitivity analysis that explicitly mention the administration of surgical systemic antibiotic prophylaxis, which is best practice. Here, results were also comparable with the main analysis (eFigure 1F in Supplement 1).

Risk of Bias

A detailed risk-of-bias assessment is shown in eTable 5 in Supplement 1. There was 1 RCT[49] with low risk of bias, 36 RCTs[22,24,26-40,42-48,50-62] had some concerns regarding bias, and 4 RCTs[23,25,32,41] had high risk of bias. The comparison-adjusted funnel plot (eFigure 2 in Supplement 1) showed no asymmetry, revealing publication bias to be unlikely.

Certainty of Evidence

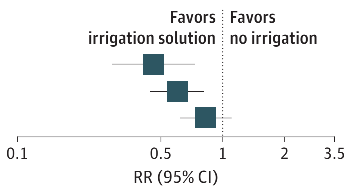
Full evaluation of the certainty of evidence and considerations for grading are detailed in the **Table** and eTable 6 in Supplement 1. GRADE assessment, incorporating minimally important difference, resulted in a high certainty of evidence for 1 comparison (antiseptic vs no irrigation) and moderate certainty for 3 comparisons (antiseptic vs saline irrigation, antibiotic vs saline irrigation, and saline vs no irrigation). Low certainty of evidence was found for the comparison of antibiotic vs no irrigation, and very low certainty was found for antibiotic vs antiseptic irrigation.

Discussion

This systematic review and network meta-analysis studied the outcomes of different pIOWI solutions for the prevention of

Figure 3. Forest Plot of the Outcomes of Different Wound Irrigation Solutions

Treatment	RR (95% CI)
Antibiotic	0.46 (0.29-0.73)
Antiseptic	0.60 (0.44-0.81)
Saline	0.83 (0.63-1.09)



The forest plot shows the outcomes of different wound irrigation solutions in the prevention of surgical site infections compared with no irrigation. Data are relative risk (RR) with corresponding 95% CI.

Figure 4. League Table of All Pairwise Comparisons in the Network Meta-Analysis

Antibiotic	1.07 (0.51-2.24)	0.57 (0.37-0.90)	0.19 (0.06-0.59)
0.77 (0.50-1.19)	**Antiseptic**	0.67 (0.51-0.88)	0.77 (0.52-1.13)
0.56 (0.37-0.83)	0.72 (0.57-0.93)	**Saline**	0.75 (0.54-1.04)
0.46 (0.29-0.73)	0.60 (0.44-0.81)	0.83 (0.63-1.09)	**No irrigation**

The league table is a square matrix showing all pairwise comparisons in the network meta-analysis. In the lower triangle of the league table, the network relative risks (RRs) with corresponding 95% CIs are shown. The upper triangle shows the RRs of only the direct comparisons (comparable with a regular pairwise meta-analysis). For instance, the first column (in the lower triangle) shows the network RR with corresponding 95% CI of antibiotic compared with the other irrigation solutions. The last column (upper triangle) shows the direct RR with corresponding 95% CI of no irrigation compared with the other irrigation solutions.

SSIs in any type of surgery from more recent data. We found high-certainty evidence that wound irrigation with aqueous antiseptic solutions was associated with a significant reduction in SSIs compared with no irrigation and moderate-certainty evidence when compared with irrigation with saline. There was low certainty of evidence that wound irrigation with antibiotic solutions was associated with a significant reduction in SSIs compared with no irrigation and moderate certainty of evidence when compared with irrigation with saline. These findings were robust to sensitivity analyses restricted to studies adequately describing the use of systemic antibiotic prophylaxis and without studies at high risk of bias.

International guidelines on the prevention of SSI[4-8] provide conflicting recommendations regarding the use of pIOWI. A considerable number of new RCTs have been conducted since the publication of these guidelines. These new RCTs often compare different irrigation solutions with one another or no irrigation, requiring network meta-analysis to efficiently use the existing evidence.

A recent network meta-analysis[9] on pIOWI analyzed studies with incisional wound irrigation and studies with intracavity lavage together. The authors found that antibiotic and antiseptic solutions were associated with a reduction in SSIs compared with no or inert (eg, saline) irrigation. However, pooling data on intracavity lavage and incisional wound irrigation likely leads to biased effect estimates of incisional wound irrigation. Intracavity lavage typically concerns part of a therapeutic intervention for infections, and complications unaffected by irrigation (eg, anastomotic leakage) contribute importantly to the incidence of organ-space infections. In contrast, an earlier meta-analysis by our group[13] discouraged the use of antibiotic solutions, and results suggested the use of aqueous antiseptic solutions for irrigation. Some data included in previous analyses are outdated and not representative of current standards of care. Fortunately, important new data have since emerged, rendering these old data redundant for the current perspective. In the present network meta-analysis, we solely included RCTs published after 1999 to ensure that the data were more homogenous with regard to infection prevention measures and more representative of the current perspective.

The most crucial aspect demanding attention when considering antibiotics is the rising concern of antimicrobial resistance.[63] The escalating ineffectiveness of antibiotics underscores a pressing need to limit their usage. Encouragingly, no indications of diminished bacterial sensitivity have been shown for antiseptics.[64,65]

A subgroup analysis for different CDC contamination categories was performed.[12] Not only is level of contamination a predicting factor for SSI occurrence, irrigation could also work differently in clean or nonclean wounds. A benefit of antiseptic solutions over saline solutions was the only significant outcome found in the exclusively clean surgery subgroup. The other comparisons show very wide CIs, most likely due to thinning of data and loss of statistical power, making it hard to draw conclusions. Moreover, meta-regression was not compatible with the frequentist method, and not using it may have influenced our subgroup analyses.

To determine the translational value of the outcomes of wound irrigation to countries of different prosperity levels, we performed a subgroup analysis wherein we divided RCTs by income level, according to the World Bank's income level data.[21] Results in both of the subgroups (higher and lower income) resembled that of our main analysis. Saline irrigation was associated with a nonsignificant reduction in SSIs when compared with no irrigation in lower-income countries. It may be worth considering the use of saline for irrigation when antiseptic or antibiotic irrigation is not readily available or is scarce.

Limitations

Interpretation of our data is challenged by the clinical and methodological heterogeneity of the body of evidence. Several studies did not report a definition for SSI or used definitions other than the diagnostic criteria outlined by the CDC.[12] We assumed that reported SSI was incisional in origin by considering the nature of the intervention. Additionally, various different application methods and exposure times were used in a range of populations (eTable 3 in Supplement 1). Despite this challenge, we strongly believe that this body of evidence is best interpreted as whole. The question at hand is relevant

Table. Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Assessment[a]

Comparison	Direct evidence (classic)		Indirect evidence (transitivity)		Network meta-analysis (incoherence)		
	RR (95% CI)	Certainty of evidence	RR (95% CI)	Certainty of evidence	RR (95% CI)	Certainty of evidence	Target
Antibiotic vs antiseptic	1.07 (0.51-2.24)	⊕OOO Very low	0.64 (0.37-1.10)	⊕⊕OO Low	0.77 (0.50-1.19)	⊕OOO Very low	Trivial to no effect
Antibiotic vs saline	0.57 (0.37-0.90)	⊕⊕⊕O Moderate	0.59 (0.20-1.75)	⊕OOO Very low	0.56 (0.37-0.83)	⊕⊕⊕O Moderate	Minimally important benefit
Antibiotic vs no irrigation	0.19 (0.06-0.59)	⊕⊕OO Low	0.55 (0.34-0.90)	⊕OOO Very low	0.46 (0.29-0.73)	⊕⊕OO Low	Minimally important benefit
Antiseptic vs saline	0.67 (0.51-0.88)	⊕⊕⊕O Moderate	1.00 (0.61-1.65)	⊕OOO Very low	0.72 (0.57-0.93)	⊕⊕⊕O Moderate	Minimally important benefit
Antiseptic vs no irrigation	0.77 (0.52-1.13)	⊕⊕⊕O Moderate	0.40 (0.24-0.66)	⊕⊕OO Low	0.60 (0.44-0.81)	⊕⊕⊕⊕ High	Minimally important benefit
Saline vs no irrigation	0.75 (0.54-1.04)	⊕⊕⊕O Moderate	1.10 (0.59-2.08)	⊕OOO Very low	0.83 (0.63-1.09)	⊕⊕⊕O Moderate	Trivial to no effect

Abbreviation: RR, relative risk.

[a] Network evidence: for all comparisons, both direct and indirect evidence are available. Therefore, we used the highest of the 2 certainty ratings as the certainty rating for the network meta-analysis estimate. The certainty of the network estimate can be upgraded if precision is greater than direct or indirect estimates.

to all surgical specialties and given appropriate antimicrobial coverage of the irrigation agent used, there is no plausible biological mechanism for outcome modification for any specific surgical specialty. Thus, to avoid splintering of the data and to optimize the chance of finding the best available evidence, we deem the combining of specialty data justified. GRADE methodology provides important guidance on how to best interpret the data in cases of inconsistency, intransitivity, and incoherence that may result from this decision. In addition to the practical and statistical advantages, the decision to apply broad inclusion criteria leads to a very strong external validity and makes our analysis useful to surgical specialists in the broadest sense.

Interestingly, our findings suggest that the mechanical effect of irrigation itself may be of lesser importance compared with the antimicrobial properties of the fluids, as saline irrigation was not associated with a significant reduction in SSI compared with no irrigation.

Among the RCTs that investigated antiseptics for pIOWI, the majority focused on iodine solutions. However, a recent network meta-analysis on skin antiseptics found the use of chlorhexidine in alcohol to be associated with a reduction in SSI compared with iodine in alcohol.[66] In line with these findings, using aqueous chlorhexidine for prophylactic wound irrigation may be more effective than aqueous iodine in reducing SSI. We identified only 1 RCT that studied the irrigation effect of an aqueous chlorhexidine solution.[51] This might be because of concerns of potential negative effects of chlorhexidine on tissue healing from in vitro studies, although these concerns were never substantiated with clinical data.[67-69] Future studies may investigate the potential benefit of aqueous chlorhexidine solutions. Furthermore, other solutions investigated in the literature (eg, castile soap by Bhandari et al)[70] were not included because they did not fit into either an antiseptic or an antibiotic profile. The use of antibiotic wound irrigation remains controversial and should be avoided for the following reasons: (1) the certainty of evidence for its outcome is inferior compared with that of antiseptic irrigation, (2) present data show that there was trivial to no difference in outcome of SSI between antiseptic and antibiotic irrigation, and (3) there are serious concerns regarding antimicrobial resistance to antibiotics.[63] On the contrary, no signs of decreased bacterial sensitivity have been shown for either iodine or chlorhexidine over time.[64,65]

Conclusions

Results of this systematic review and network meta-analysis suggest that there was high certainty of evidence that incisional wound irrigation with aqueous antiseptic solutions was associated with a reduction in the risk of SSI. The use of antibiotic wound irrigation remains controversial and should be avoided due to the inferior certainty of evidence for its outcome, the trivial to no difference in outcome compared with antiseptics, and the rapid global antimicrobial resistance to antibiotics.

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