Article:

Yusuf, S.M., James, J., Chong, B. et al. (2026) Antimicrobial dressings for the prevention of surgical-site infection: systematic review and meta-analysis. British Journal of Surgery (BJS), 113 (2). znaf277. ISSN: 0007-1323

https://doi.org/10.1093/bjs/znaf277

Antimicrobial dressings for the prevention of surgical site infection: a systematic review and meta-analysis

Suraya Mohamed Yusuf (MB BChir)[1], Jonathan James (MB BChir)[1], Bryant Chong (MBChB)[2], Esmee Dohle (MB BChir)[1], Luka Jovanovic (MB BChir)[3], Soma Farag (MBBS)[1], Ryckie George Wade (PhD)[4], Justin Conrad Rosen Wormald (DPhil) [1,5]

1- Oxford University Hospitals NHS Foundation Trust
2- Buckinghamshire NHS Foundation Trust
3- East and North Hertfordshire Teaching NHS Foundation Trust
4- Leeds Institute for Medical Research, University of Leeds
5- Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Science (NDORMS), University of Oxford

Corresponding author:
Miss Suraya Yusuf MA MBBChir (Cantab)
Address: Oxford University Hospitals NHS Foundation Trust, Headley Way, Headington, Oxford, OX3 9DU
Email: s.yusuf1605@gmail.com

Funding: Ryckie Wade and Justin Wormald, NIHR Academic Clinical Lecturers, are funded by the National Institute for Health and Care Research (NIHR). This study has been delivered through the NIHR Oxford Biomedical Research Centre (BRC). The views expressed are those of the authors and not necessarily those of the NIHR or the Department of Health and Social Care.

Category: Reviews

This work has not yet been presented in any meetings

The datasets analysed, and the analytic methods used during the current study are available from the corresponding author upon reasonable request.

Abstract

Background

Surgical site infections (SSI) are a leading cause of postoperative morbidity, prolonged hospitalisation, and significant healthcare costs. Antimicrobial dressings may mitigate SSI risk by minimising local microbial burden, but their effectiveness remains uncertain.

Methods

MEDLINE, EMBASE, CINAHL, and Cochrane CENTRAL were searched from inception to July 2024, supplemented by searches of clinical trial registries, grey literature, and citation chasing. Randomised controlled trials (RCTs) comparing antimicrobial dressings with any other inert dressing for closed incisional wounds following elective or emergency surgery were included. Data were extracted in duplicate, risk of bias was assessed with RoB 2, and certainty of evidence with GRADE. Pairwise random-effects meta-analyses were performed. The primary outcome was SSI within 30 days (90 days if prosthesis used); secondary outcomes included adverse events and costs.

Results:

Thirty-five RCTs involving 8718 participants were included. Meta-analyses were conducted for silver (21 studies, n=5504), dialkylcarbomyl chloride (DACC) (3 studies, n=892), and mupirocin (3 studies, n=1320). Compared to standard dressings, silver dressings reduced the risk of SSI by 22% (RR 0.78; CI 0.62-0.97; I^2=43%; moderate-certainty evidence). DACC dressings halved the risk of SSI (RR 0.49; CI 0.29-0.83; I^2=0%; moderate-certainty) compared to standard dressings. Mupirocin dressings were not associated with SSI prevention (RR 0.62; 95% CI 0.15-2.63; I^2=67%; very low-certainty evidence). Evidence for other agents was insufficient.

Conclusion:

Silver and DACC dressings probably reduce the risk of SSI in closed surgical wounds. There is residual uncertainty over the clinical effectiveness of other antimicrobial dressings.

Funding

NIHR.

Lay Summary

Surgical wounds sometimes become infected, which can delay healing and need extra treatment. Many hospitals use antimicrobial dressing to try to prevent infections, but it has been unclear how well they work and if they are worth the cost.
We reviewed 35 clinical trials involving over 8,700 patients to compare these dressings with standard ones.
We found that silver and DACC dressings probably reduce the risk of infection, while evidence on other antimicrobial dressings were unclear. Side effects were rare.
Overall, certain antimicrobial dressings appear helpful, but stronger research is still needed to guide routine use and ensure good value for the NHS.

Introduction

Surgical site infection (SSI) can compromise healing, leading to delayed recovery, poor wound cosmesis [1], deep tissue infection, or systemic complications [2]. SSI accounts for 20% of all hospital acquired infections (HAI):[3] they are associated with a 2–11 fold increase in mortality risk, prolong hospital stays by an average of 7–10 days, and contribute an estimated $3.5 to $10 billion annually in additional healthcare costs in the US.[4] SSI also negatively impacts patient-reported health-utility for up to 12 months post-operatively [5].

Despite extensive prevention guidelines, this remains a fundamental issue across all surgical specialities [6]. One area of ongoing interest is the role of antimicrobial dressings, incorporate agents such as silver, iodine, polyhexanide, and dialkylcarbamoyl chloride (DACC) to reduce bacterial load at the wound surface. With rising antimicrobial resistance, it is increasingly important to adopt strategies that reduce reliance on systemic antibiotics. More than 70% of pathogenic bacteria are now resistant to at least one common antibiotic, however these resistance mechanisms are not influenced by the use of common agents found in antimicrobial dressings such as silver and DACC.[7] Despite numerous trials, the comparative effectiveness of these dressings remains unclear, and guidelines for dressing choice after surgery are lacking.

This review aims to synthesise the available evidence on the effectiveness of antimicrobial dressings in preventing SSIs, to guide current practice and inform the future direction of research to optimise wound dressings in the post-operative period.

Methodology

This systematic review and meta-analysis has been conducted according to the Cochrane Handbook for Systematic Reviews of Interventions guidance and reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement.[8,9] The protocol was registered with PROSPERO (ID CRD42023410085).

Eligibility Criteria

We included randomised controlled trials (RCTs) comparing antimicrobial dressings to any other dressing in primary wound closures following elective or emergency surgery. We included studies in which patients had a single incisional wound. There were no restrictions on patient demographics, type of surgery, or language. We excluded studies involving secondary-intention healing, primarily infected wounds, mucosal surfaces, or non-randomised designs.

Interventions and Outcomes

Eligible antimicrobial dressings were identified from the National Institute for Healthcare and Excellence (NICE) British National Formulary and recent literature. [10, 7] Dressings were grouped by active agent (e.g. silver, iodine, chlorhexidine, DACC). The primary outcome was SSI within 30 days (or 90 days with prosthesis). [11] SSI definitions were taken as reported in each study. Secondary outcomes included adverse reactions and cost data.

Search Strategy

MEDLINE, EMBASE, CINAHL and Cochrane CENTRAL were searched from inception up to 5th July 2024 (see supplementary material), supplemented by manual searches of the grey literature using related key words (ClinicalTrials.gov, WHO international Clinical Trials Registry Platform, and the first 200 results of google scholar ranked by relevance), and forward and backward citation chasing using CitationChaser[12]. Studies were screened by at least 2 independent reviewers (SY, JJ, ED , LJ) and disagreements were resolved via discussion with the senior author (JW).

Data extraction

Data relating to study design, patient demographics and outcomes of interest were extracted and cross-checked by a second reviewer. When a single trial was reported in more than one publication, these were treated as multiple reports of the same study rather than independent datasets. As a result, we consulted 37 reports of 35 studies. The most complete and detailed report was used as the primary data source, and supplementary reports were consulted only to clarify methods or outcomes. Clinical data from each trial were included once only to avoid double-counting, e.g., Stanirowski et al.'s 2016 RCT and subsequent 2019 economic evaluation were handled as a single study.

Risk of bias and confidence assessments

Risk of bias (RoB) was assessed using the Cochrane ROB-2 tool by two independent reviewers. [13] Certainty of evidence was rated using GRADE.

Statistical Analysis

We originally planned a network meta-analysis (NMA) to compare all available antimicrobial dressings, however, due to poor network connectivity , this was not feasible (Figure S1). Therefore, we used the meta (v7.0.0) package within R (v4.4.0) to conduct pairwise random-effects meta-analyses to yield risk ratios (RR) with 95% confidence intervals (CI), using intention-to-treat denominators. Between-study variance (τ^2) was estimated using the restricted maximum likelihood method. Heterogeneity was assessed using the I^2 statistic. Sensitivity analyses were performed with exclusion studies at high or unknown RoB where feasible.

Subgroup analyses were performed based on surgical site and wound contamination class. Studies were assigned a Centres for Disease Control and Prevention (CDC) wound class if >80% of procedures clearly fit a single category. A prevalence meta-analysis of adverse events was performed using metafor (v4.6.0) and meta (v7.0.0), with the Freeman-Tukey transformation. Funnel plots and Egger's test were used to explore small-study effects. The unit of analysis was the patient rather than individual surgical incisions.

<u>Results</u>

Study selection and characteristics

The search returned 6729 papers after deduplication, with a further 595 papers identified through citation chasing. Of these, 35 RCTs (8718 participants) met inclusion criteria (Figure S2).[14–46,47] Study characteristics are summarised in Table S1. Silver, DACC and mupirocin dressings had sufficient data for meta-analysis.

Risk of Methodological Bias Within Studies

RoB is summarised in Figure 1.[48] Three studies were published as abstracts only and did not provide sufficient detail to assess RoB.[43,45,46] Most RCTs had aspects at moderate or high RoB; only eight were judged low risk. Additional important sources of bias not accounted for in Cochrane's RoB 2 tool included inadequate follow up periods and subjective definitions of SSI (Table S2).

Meta-analysis

Silver

Twenty-one studies (n=5504) were included. One study was excluded as silver was compared directly against framycetin; two double zero studies did not contribute. Silver dressings significantly reduced SSI risk vs. standard dressings (RR 0.78; CI 0.62-0.97; p=0.03; I^2=43% (Figure 2). Sensitivity analyses (exclusion of high- and unknown RoB studies; inclusion of studies uses CDC or NHSN definitions of SSI) supported robustness (Figure S3).

Subgroup analyses showed no effect in clean (RR 0.96; CI 0.76-1.22) or clean-contaminated wounds (RR 0.77; CI 0.57-1.05). There appeared to be benefit in general surgery operations (RR 0.59; CI 0.39–0.88). Visual inspection of the funnel plot suggests some evidence of small-study effects (Figure S4) in which smaller studies tend to show slightly more protective effect, however Egger's regression test was non-significant (t = –1.68, df = 19, p = 0.11). The certainty of evidence was moderate as per GRADE (Table 1).

Three studies reported cost outcomes (Table S3).[23,40,45] Struik et al, 2018 also reported mean-wound related treatment costs, derived from a model incorporating dressing cost, dressing change rates, and a fixed attributable cost per SSI.[40] Mean wound-related treatment costs were significantly lower in the silver group compared to standard dressings, both under a high-cost SSI model (€265.42 [SD = 908] vs. €470.65 [SD = 1223], $p < 0.001$) and a low-cost model (€59.12 [SD = 129] vs. €67.55 [SD = 172], $p < 0.001$).

Adverse reactions to dressings were reported in 12 studies, including blistering, local allergic reactions and irritation requiring dressing removal. The pooled prevalence was 0.14% (CI 0.00-0.54%) in the silver group and 0.51% (CI 0.00-2.14%) in controls (Figure S5).

DACC

Three studies (n = 892) were included. DACC dressings were associated with a statistically significant reduction in SSI (RR 0.49; CI 0.29-0.83; p = 0.008; I^2=0%) (Figure 3). The certainty of evidence was moderate as per GRADE (Table 1).

A cost-effectiveness analysis (Stanirowski et al, 2019) using NHS unit costs demonstrated statistically significant savings of £24–£119 per patient with DACC dressings after caesarean section.[49]

No adverse events were reported in DACC studies.

Mupirocin

Three studies (n=1320) were included. Results were highly imprecise and non-significant (RR 0.62; 95% CI 0.15-2.63; p = 0.52; I^2=67% (Figure 4). Heterogeneity may reflect differences in wound contamination status and surgical fields (colorectal vs. skin surgery). The certainty of evidence was very low as per GRADE (Table 1).

Dixon raised concerns about increased incidence of skin necrosis in the mupirocin group compared to controls (6/262 vs 1/516; p=0.007),[43] although Ruiz-Tovar and Ahmad reported no adverse events related to mupirocin use.[14,31]

Narrative review

Chlorhexidine

A single study (Saad et al, 2022) compared chlorhexidine impregnated dressings against standard for caesarean sections in patients with a BMI >35, however there were no SSIs recorded in either group, likely due to the small sample size (n=77 per arm).[33]

Copper

A single study (Arendsen et al, 2020) compared copper impregnated dressings (n=159) against standard (n=165**)** for caesarean sections.[16] Although the paper reports that copper dressings significantly reduced the overall incidence of SSI (RR 0.61; CI 0.41-0.92), the incidence of superficial/deep SSI was not significantly different between study groups (p = 0.257). A significant relative risk reduction of 80.3% for Organ/Space SSI was observed in the study group (12.7% vs. 2.5%, P = 0.002), contributing to the overall reduction in SSI.

Framycetin impregnated

There were no RCTs directly comparing framycetin impregnated dressings to non-antimicrobial dressings. Kuo et al, 2017 compared framycetin impregnated dressings to silver dressings, reporting a statistically significant higher rate of superficial SSI (8.3%) compared to the silver group (0.8%), p=0.01.[26]

Povidone-Iodine

Lim et al, 2019 compared povidone iodine-soaked dressings to standard gauze for patients undergoing breast surgery.[46] This study was underpowered with 28 patients in each arm. Only one SSI was detected in the control group, although this is not enough evidence to base any conclusions.

Polyhexamethylene biguanide impregnated dressing

Seibert et al, 2009 compared a polyhexamethylene biguanide impregnated dressing (n=141) to a standard dressing (n=134) in patients undergoing hip and knee surgery.[50] Five surgical infections were detected in the control group and two in the study group, which was non-significant (p=0.40); this study may have been too underpowered to reach statistical significance.

Vitamin E-Silicone

Ruiz-Tovar et al, 2019 compared vitamin E-silicone dressings against standard to cover Pfannestiel wounds after elective laparoscopic colorectal surgery (n=60 per arm).[32] SSI rate was 3.4% in the E-Sil group and 17.2% in the control group (P = 0.013). This study had a low risk of bias and suggests that vitamin E-silicone dressings may be beneficial to reduce SSI, however it is limited by a small sample size and is not generalisable.

Discussion

There is wide variation in dressing use in clinical practice, perpetuated by unclear guidelines. The UK NICE advise health care professionals to "cover surgical incisions with an appropriate interactive dressing at the end of the operation" with no further recommendations.[3] The United States CDC evidence-based review recommendations state "antimicrobial dressings applied to surgical incision following primary closure is an unresolved issue with no current recommendations"; the American College of Surgeons and Surgical infection Society SSI guidelines state "Mupirocin topic antibiotic application can decrease SSI compared with a standard dressing".[50,51] Consequently, dressing selection is often influenced by individual clinician experience and preferences.[53] When a dressing cannot be adequately justified on clinical grounds, the least costly option is often chosen.[53] Given that antimicrobial dressings are more expensive than standard, their cost-effectiveness must be robustly demonstrated before they can be incorporated into clinical guidelines.

Our systematic review and meta-analysis demonstrated a modest but statistically significant reduction in the rate of SSI with the use of silver containing dressings compared to standard for closed incisional wounds. This is in agreement with Younes (2025)[54] but our review incorporated non-English studies and twice as much data on silver. The effect of silver is biologically plausible as silver ions possess broad-spectrum antimicrobial activity and can reduce local bioburden at the wound surface.[7] However, the included studies varied in comparator dressings—some used simple gauze, while others used advanced occlusive dressings, which may themselves alter

SSI risk by preserving moisture balance and preventing maceration.[55] Despite potential sources of clinical heterogeneity, there was minimal statistical heterogeneity which endorses the interpretation.

Our meta-analysis of DACC-impregnated dressings found a reduction in the risk of SSI compared to standard dressings. It should be noted that this moderate certainty evidence is drawn from a small number of trials with high to intermediate risk of bias, and follow-up periods <30 days, introducing indirectness. DACC-impregnated dressings irreversibly bind and remove pathogens from the wound surface without releasing chemical agents.[56] They are being used increasingly across the UK following guidance released by NICE in 2021 supporting its use for closed surgical wounds after caesarean section and vascular surgery.[57] The DRESSINg trial, a multicentre RCT assessing the clinical and cost effectiveness of (DACC) coated dressings in clean or clean-contaminated vascular surgery is currently recruiting, and may further build on this evidence base.[58]

Despite recommendations by the American College of Surgeons,[3] the evidence for mupirocin dressings remains highly uncertain, limited by imprecision, heterogeneity, and indirectness. Vitamin E-silicone dressings and polyhexamethylene biguanide impregnated dressings may reduce the risk of SSI, although evidence is limited by small sample sizes.[32,50]

One study found copper dressings to significantly reduce deep/organ space infections, without affecting the rate of superficial SSI.[16] This is biologically implausible and likely reflects confounding or bias. Antimicrobial dressings act locally at the wound surface by reducing bacterial colonisation and superficial contamination;[7] it is unlikely that they penetrate to deeper tissue layers or anatomical spaces.[59] A deep or organ-space SSI is typically caused by endogenous flora introduced during surgery, contamination of deep tissues, or systemic risk factors (e.g. immunosuppression, diabetes, prolonged operative time). They may also develop through contiguous spread from superficial sites.[11] It is therefore counterintuitive that a topical intervention would selectively reduce deep infections. This anomaly may be explained by methodological limitations such as baseline imbalances (e.g. more contaminated cases in the control group), inconsistent application of SSI definitions, or chance findings in this underpowered trial.

The SSI rate reported in this study was 24.1%, the highest amongst the studies included in this systematic review and far greater than the global pooled SSI incidence following caesarean section of 5.63%.[60] Of note, only 6.2% of SSIs were detected in hospital with the remainder detected after discharge. This is in keeping with systematic review findings that over 60% of SSIs occur after discharge and may be managed outside hospitals.[61] In light of this, it is especially important to note that 2 of 3 studies included in the DACC meta-analysis only followed patients up for 14 days after caesarean sections. The importance of adequate follow up has been highlighted in recent literature. It can be seen in many studies that longer follow up equates to higher rates of SSI detection, for example, a nation-wide analysis of antibiotic prescribing following hand trauma surgery showed SSI rates of 6.2% within 30 days, rising to 14.4% by 90 days.[62] In the studies identified by this systematic review, only 23 of 35 studies followed patients up for at least 30 days.

Adverse events to dressings were rare and mild, and not significantly different between silver and control groups. The observed variation may reflect differences in dressing location; for example, Chugaev reported higher blistering rates with standard dressings applied over the knee joint, a site subject to frequent movement and friction.[20]

Cost-analysis

Kadar et al, 2015 evaluated the cost of silver dressings in orthopaedic surgery and reported that their use increased dressing costs by 408% and 292% at postoperative days 5 and 7, respectively, compared to standard dressings—raising concerns about affordability and value for money.[23] In contrast, Struik et al, 2018 suggested that the use of a silver carboxymethylcellulose dressing in breast cancer surgery may reduce total wound-related costs, estimating mean costs of €265.42 versus €470.65 in the control group under a high-cost SSI model.[40] The interpretation of these findings is limited by very large standard deviations in cost estimates – exceeding the mean – suggesting considerable variability and likely skew from a small number of costly cases. The analysis was based on assumed SSI costs rather than patient-level resource use and did not incorporate probabilistic sensitivity analysis. In the absence of a statistically significant reduction in SSI incidence in the study, these economic conclusions should be interpreted with caution.

In contrast, the cost-effectiveness analysis of DACC dressings by Stanirowski et al, 2019 demonstrated several methodological strengths. Using patient-level resource data from a randomised trial of DACC-impregnated dressings following caesarean section, the authors applied UK NHS unit costs and showed statistically significant cost savings of £24–£119 per patient, depending on the model used. Importantly, the analysis incorporated both a granular, itemised costing approach and a fixed per-episode model, and was supported by comprehensive sensitivity analyses, including probabilistic modelling. This supports the conclusion that DACC dressings are likely to be cost saving when used in high-volume procedures such as caesarean sections. While the trial was conducted outside the UK, the economic model was explicitly tailored to NHS practice.

Limitations

Variation in how SSIs were defined, diagnosed, and reported is likely to bias results. In addition, follow up duration was inconsistent: although most studies reported 30-day outcomes, 5/21 and 2/3 studies including in the silver and DACC meta-analyses had shorter follow up periods. This heterogeneity in outcome timing and ascertainment introduces indirectness and detection bias. Despite this, sensitivity analyses for silver limited to studies with ≥30 day follow up and CDC/NHSN definition of SSI remained significant. Concerns about indirectness as well as overall concerns about risk of bias in included studies, led to downgrading of the certainty of evidence to moderate for both groups. Modelling rare events (SSI) is challenging and risks type II error and back-transformation inaccuracies. There is a possibility of publication bias in which smaller studies that did not find silver dressings to be effective may not have been published, although this finding was not statistically significant. The absence of head-to-head comparisons between most antimicrobial agents means that ranking (e.g. via network methods) is impossible and so the clinical application remains debatable.

Implications for future practice and research

GRADE assessment indicated moderate-certainty evidence supporting both silver and DACC dressings for reducing SSI. This suggests that current evidence is sufficiently robust to inform practice, although future high-quality trials may refine the precision of effect estimates. For silver dressings, subgroup analyses hinted at variation by wound contamination status, with a signal towards greater benefit in procedures with higher baseline SSI risk. This pattern aligns with biological plausibility and suggests that silver dressings may be most appropriate in contexts where contamination risk is elevated. However, the overall cost-effectiveness of silver dressings remains uncertain, with existing economic evaluations offering mixed conclusions.

In contrast, the evidence for DACC dressings supports both clinical effectiveness and potential cost savings, particularly for high-volume procedures such as caesarean section. Nonetheless, the generalisability of these findings to other surgical specialties remains unclear. Although follow-up in DACC trials was relatively short, longer surveillance may reveal an even greater reduction in SSI, given the evidence presented that suggests a significant proportion of SSI develops post-discharge.

Perhaps the strongest signal from this review is that, despite widespread commercial and clinical enthusiasm, the overall evidence base for antimicrobial dressings remains limited. High-quality, comparative research is urgently needed to guide clinical decision-making and ensure that these increasingly promoted interventions are truly beneficial, cost-effective, and appropriately targeted.

To inform clinical guidelines and support routine adoption of antimicrobial dressings, future research should prioritise multi-arm, multi-stage randomised controlled trials across a range of surgical specialties. Such trials should stratify by SSI risk (e.g., clean vs contaminated procedures) and include both patient-centred outcomes and detailed economic evaluations from a health system perspective. Ideally, such trials should adopt a pragmatic design with broad inclusion criteria, adequate follow-up (≥30 days), and consistent use of CDC definitions for SSI to ensure generalisability and comparability. Cost-effectiveness analyses should be embedded prospectively using individual-level resource use and quality-of-life measures to assess value alongside effectiveness.

Conclusion

Silver-containing and DACC-impregnated dressings reduce the risk of SSI in closed surgical wounds compared to non-antimicrobial dressings. Based on current RCT micro-costing, DACC is likely to save costs in high-volume obstetric surgery. Cost effectiveness data for silver dressings are inconsistent, model-based, and sensitive to assumed SSI costs. The evidence for mupirocin dressings remains highly uncertain with suggested increased risk of skin necrosis. There is residual uncertainty over the clinical effectiveness of other antimicrobial dressings. Further high-quality, multicentre trials are needed to determine the comparative clinical and cost effectiveness of antimicrobial dressings across surgical specialties and patient groups.

Declarations

Ethics approval and consent to participate.

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Competing interests

All authors report no known conflicts of interest

Funding

Ryckie Wade (CL-2021-02-002) and Justin Wormald, NIHR Academic Clinical Lecturers, are funded by the National Institute for Health and Care Research (NIHR). This study has been delivered through the NIHR Oxford Biomedical Research Centre (BRC). The views expressed are those of the authors and not necessarily those of the NIHR or the Department of Health and Social Care.

Figures

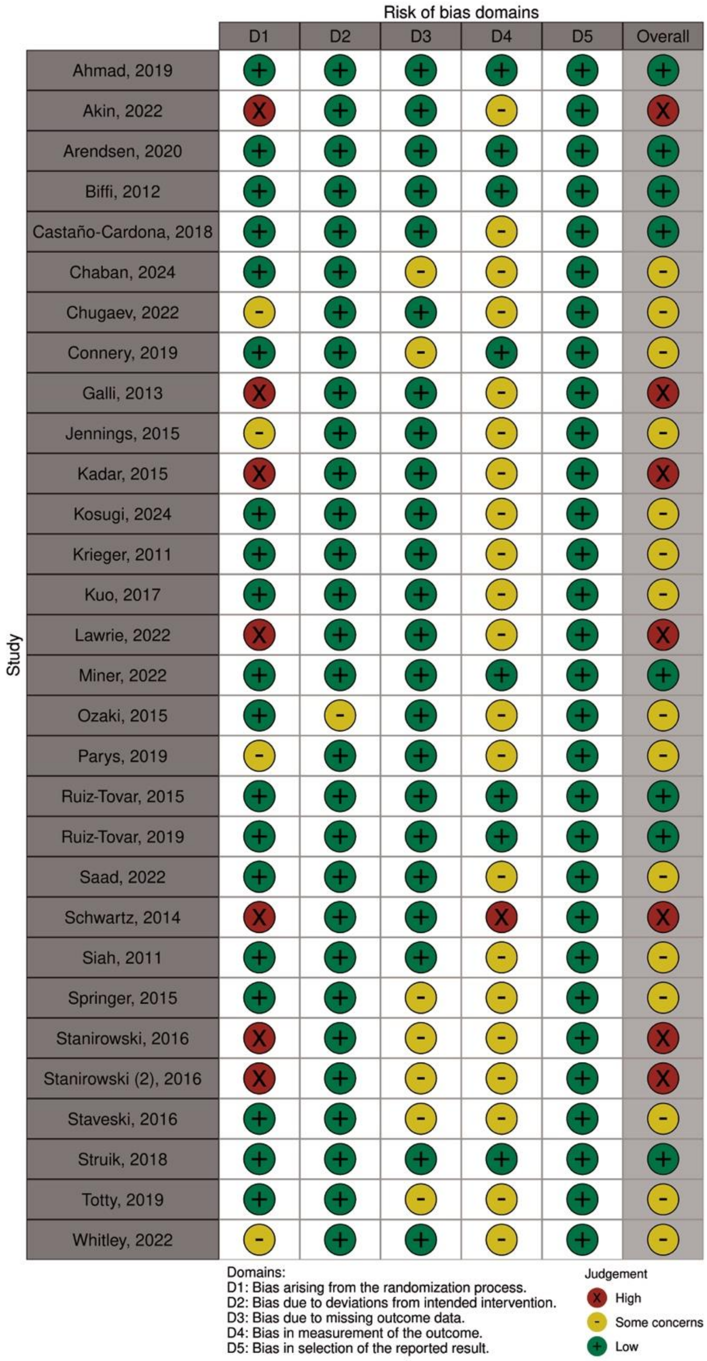

Figure 1: Risk of bias assessment according to Cochrane ROB2 tool

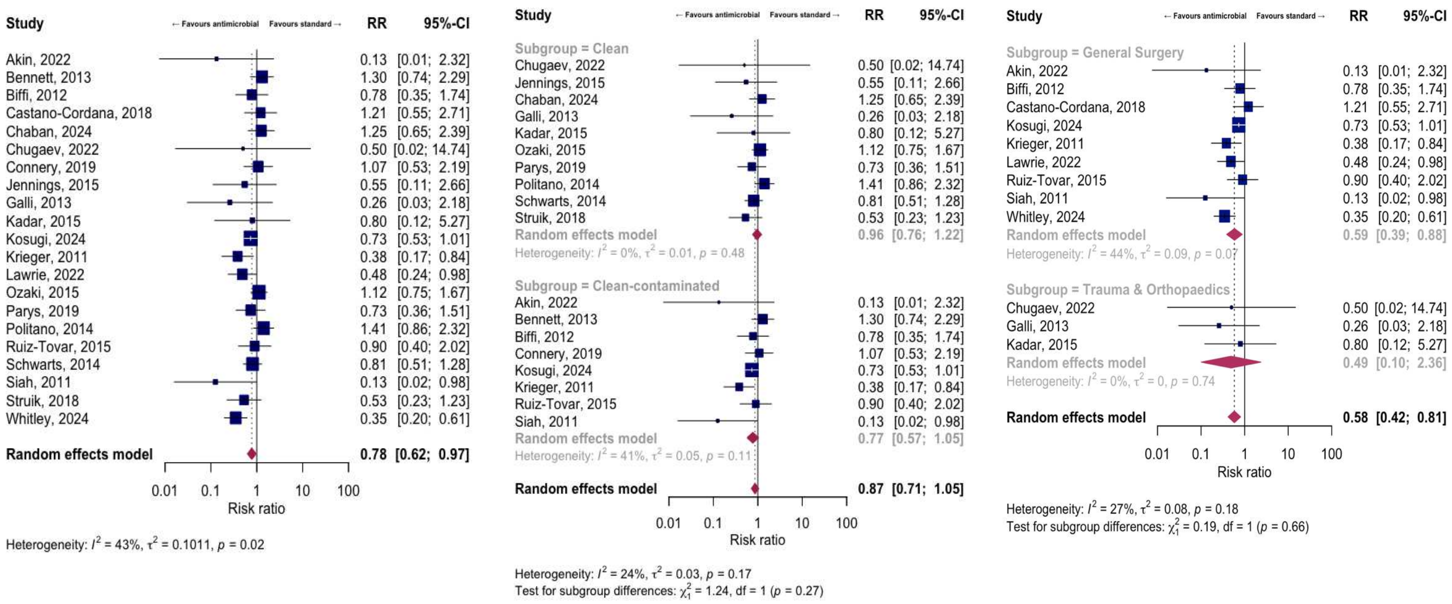

Figure 2: Forest plots showing results of meta-analysis for studies comparing silver dressings to standard, with subgroup analyses by wound contamination status (middle) and surgical speciality (right). RR = risk ratio; CI = confidence interval.

Figure 3: Forest plot showing results of meta-analysis for studies comparing DACC impregnated dressings to standard. RR = risk ratio; CI = confidence interval.

Figure 4: Forest plot showing results of meta-analysis for studies comparing Mupirocin ointment-impregnated dressings to standard. RR = risk ratio; CI = confidence interval.

Tables

Table 1: GRADE summary of findings table for antimicrobial dressings to prevent surgical site infections

CI: confidence interval; RR: risk ratio

Explanations for downgrading

a. Inclusion of studies at high risk of bias

b. Varying definitions of surgical site infections and follow up lengths <30 days

c. I^2 = 69%

d. Very wide confidence interval spanning both substantial benefit and harm; small number of events

Bibliography

1. Wright TI, Baddour LM, Berbari EF, et al. Antibiotic prophylaxis in dermatologic surgery: Advisory statement 2008. *J Am Acad Dermatol*. 2008;59(3):464-473. doi:10.1016/j.jaad.2008.04.031

2. Zabaglo M, Leslie S, Sharman T. *Postoperative Wound Infections*. StatPearls Publishing; 2024. https://www.ncbi.nlm.nih.gov/books/NBK560533/#

3. Ban KA, Minei JP, Laronga C, et al. American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update. *J Am Coll Surg*. 2017;224(1):59-74. doi:10.1016/j.jamcollsurg.2016.10.029

4. Anderson DJ, Podgorny K, Berríos-Torres SI, et al. Strategies to Prevent Surgical Site Infections in Acute Care Hospitals: 2014 Update. *Infect Control Hosp Epidemiol*. 2014;35(6):605-627. doi:10.1086/676022

5. McFarland AM, Manoukian S, Mason H, Reilly JS. Impact of surgical-site infection on health utility values: a meta-analysis. *Br J Surg*. 2023;110(8):942-949. doi:10.1093/bjs/znad144

6. Calderwood MS, Anderson DJ, Bratzler DW, et al. Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update. *Infect Control Hosp Epidemiol*. 2023;44(5):695-720. doi:10.1017/ice.2023.67

7. Yousefian F, Hesari R, Jensen T, et al. Antimicrobial Wound Dressings: A Concise Review for Clinicians. *Antibiotics*. 2023;12(9):1434. doi:10.3390/antibiotics12091434

8. Higgins JPT, Thomas J, Chandler J, et al., eds. *Cochrane Handbook for Systematic Reviews of Interventions*. 1st ed. Wiley; 2019. doi:10.1002/9781119536604

9. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. Published online March 29, 2021:n71. doi:10.1136/bmj.n71

10. NICE BNF. Antimicrobial Dressings [internet]. Accessed June 15, 2024. https://bnf.nice.org.uk/wound-management/antimicrobial-dressings/

11. Centre for Disease Control and Prevention: National Healthcare Safety Network. *Surgical Site Infection Event (SSI)*.; 2024. Accessed October 13, 2024. https://www.cdc.gov/nhsn/pdfs/pscmanual/9pscssicurrent.pdf

12. Haddaway NR, Grainger MJ, Gray CT. Citationchaser: A tool for transparent and efficient forward and backward citation chasing in systematic searching. *Res Synth Methods*. 2022;13(4):533-545. doi:10.1002/jrsm.1563

13. Sterne JAC, Savović J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ*. Published online August 28, 2019:l4898. doi:10.1136/bmj.l4898

14. Ahmad HF, Kallies KJ, Shapiro SB. The effect of mupirocin dressings on postoperative surgical site infections in elective colorectal surgery: A prospective, randomized controlled trial. *Am J Surg*. 2019;217(6):1083-1088. doi:10.1016/j.amjsurg.2018.11.033

15. Akin T, Kendirci M, Akgun AE, et al. Applying a Silver-containing Dressing to the Incision Site and Its Effect on the Development of Surgical Site Infection After Ostomy Closure: A Prospective Randomized Clinical Pilot Study. *Wound Manag Prev*. 2022;68(4):34-43. doi:10.25270/wmp.2022.4.3443

16. Arendsen LP, Thakar R, Bassett P, Sultan AH. The impact of copper impregnated wound dressings on surgical site infection following caesarean section: a double blind randomised controlled study. *Eur J Obstet Gynecol Reprod Biol*. 2020;251:83-88. doi:10.1016/j.ejogrb.2020.05.016

17. Biffi R, Fattori L, Bertani E, et al. Surgical site infections following colorectal cancer surgery: a randomized prospective trial comparing common and advanced antimicrobial dressing containing ionic silver. *World J Surg Oncol*. 2012;10(1). doi:10.1186/1477-7819-10-94

18. Castaño-Cardona AL, Pineda-Garcés C, Mendoza-Arango MC, Cruz-Morales HR. Infección de sitio operatorio en herida abdominal sucia. *Rev Colomb Cir*. 2018;33(4):390-397. doi:10.30944/20117582.86

19. Chaban R, Dohle K, Ghazy A, et al. Randomized Controlled Trial: Does the Use of Occlusive Hydrocolloid Silver-Containing Wound Dressing after Sternotomy Reduce Surgical Site Infection after Cardiac Surgery? *Life*. 2024;14(9):1061. doi:10.3390/life14091061

20. Chugaev DV, Konovalchuk NS, Kogan PG, Kornilov NN, Sorokin EP, Glaznyov DN. Adsorbent Dressings from Sodium Carboxymethyl Cellulose With Silver Ions in Primary Knee Arthroplasty: A Randomized Trial. *Traumatol Orthop Russ*. 2022;28(1):28-38. doi:10.17816/2311-2905-1709

21. Connery SA, Yankowitz J, Odibo L, Raitano O, Nikolic-Dorschel D, Louis JM. Effect of using silver nylon dressings to prevent superficial surgical site infection after cesarean delivery: a randomized clinical trial. *Am J Obstet Gynecol*. 2019;221(1):57.e1-57.e7. doi:10.1016/j.ajog.2019.02.053

22. Galli MM, Protzman NM, Brigido SA. Utilization of Silver Hydrogel Sheet Dressing on Postsurgical Incisions: A Pilot Study in Foot and Ankle Surgery. *Foot Ankle Spec*. 2013;6(6):422-433. doi:10.1177/1938640013507108

23. Kadar A, Eisenberg G, Yahav E, Drexler M, Salai M, Steinberg EL. Surgical site infection in elderly patients with hip fractures, silver-coated versus regular dressings: a randomised prospective trial. *J Wound Care*. 2015;24(10):441-445. doi:10.12968/jowc.2015.24.10.441

24. Kosugi C, Koda K, Shimizu H, et al. A Randomized Trial of Ionic Silver Dressing to Reduce Surgical Site Infection After Gastrointestinal Surgery. *Ann Surg Open*. 2024;5(1):e402. doi:10.1097/as9.0000000000000402

25. Krieger BR, Davis DM, Sanchez JE, et al. The Use of Silver Nylon in Preventing Surgical Site Infections Following Colon and Rectal Surgery. *Dis Colon Rectum*. 2011;54(8):1014-1019. doi:10.1097/dcr.0b013e31821c495d

26. Kuo FC, Chen B, Lee MS, Yen SH, Wang JW. AQUACEL® Ag Surgical Dressing Reduces Surgical Site Infection and Improves Patient Satisfaction in Minimally Invasive Total Knee Arthroplasty: A Prospective, Randomized, Controlled Study. *BioMed Res Int*. 2017;2017:1-8. doi:10.1155/2017/1262108

27. Lawrie K, Waldauf P, Baláž P, et al. Silver-Based Dressings in the Prevention of the Incisional Surgical Site Infection: A Prospective Multicenter Observational Controlled Trial. *Surg Infect*. 2022;23(7):682-690. doi:10.1089/sur.2022.084

28. Miner SA, Lee J, Protzman NM, Brigido SA. The effect of a silver hydrogel sheet dressing on postsurgical incision healing after foot and ankle surgery. *Scars Burns Heal*. 2022;8. doi:10.1177/20595131221122303

29. Ozaki CK, Hamdan AD, Barshes NR, et al. Prospective, randomized, multi-institutional clinical trial of a silver alginate dressing to reduce lower extremity vascular surgery wound complications. *J Vasc Surg*. 2015;61(2):419-427.e1. doi:10.1016/j.jvs.2014.07.034

30. Parys M, Jaźwiec T, Kowalczuk-Wieteska A, et al. Nanocrystalline-Coated Silver Dressings for Patients with Type 2 Diabetes after Surgical Coronary Revascularization. *Adv Skin Wound Care*. 2019;32(11):521-524. doi:10.1097/01.asw.0000582620.68148.cf

31. Ruiz-Tovar J, Llavero C, Morales V, Gamallo C. Total Occlusive Ionic Silver-Containing Dressing vs Mupirocin Ointment Application vs Conventional Dressing in Elective Colorectal Surgery: Effect on Incisional Surgical Site Infection. *J Am Coll Surg*. 2015;221(2):424-429. doi:10.1016/j.jamcollsurg.2015.04.019

32. Ruiz-Tovar J, Llavero C, Perez-Lopez M, Garcia-Marin A. Effects of the application of vitamin E and silicone dressings vs conventional dressings on incisional surgical site infection in elective laparoscopic colorectal surgery: a prospective randomized clinical trial. *J Hosp Infect*. 2019;102(3):262-266. doi:10.1016/j.jhin.2018.10.021

33. Saad AF, Salazar AE, Allen L, Saade GR. Antimicrobial Dressing versus Standard Dressing in Obese Women Undergoing Cesarean Delivery: A Randomized Controlled Trial. *Am J Perinatol*. 2022;39(09):0951-0958. doi:10.1055/s-0040-1721112

34. Schwartz J, Goss S, Facchin F, et al. A prospective two-armed trial assessing the efficacy and performance of a silver dressing used postoperatively on high-risk, clean surgical wounds. *Ostomy Wound Manage*. 2014;60(4):30-40.

35. Siah CJ, Yatim J. Efficacy of a total occlusive ionic silver-containing dressing combination in decreasing risk of surgical site infection: an RCT. *J Wound Care*. 2011;20(12):561-568. doi:10.12968/jowc.2011.20.12.561

36. Springer BD, Beaver WB, Griffin WL, Mason JB, Odum SM. Role of Surgical Dressings in Total Joint Arthroplasty: A Randomized Controlled Trial. *Am J Orthop Belle Mead NJ*. 2015;44(9):415-420.

37. Stanirowski PJ, Kociszewska A, Cendrowski K, Sawicki W. Dialkylcarbamoyl chloride-impregnated dressing for the prevention of surgical site infection in women undergoing cesarean section: a pilot study. *Arch Med Sci*. 2016;5:1036-1042. doi:10.5114/aoms.2015.47654

38. Stanirowski PJ, Bizoń M, Cendrowski K, Sawicki W. Randomized Controlled Trial Evaluating Dialkylcarbamoyl Chloride Impregnated Dressings for the Prevention of Surgical Site Infections in Adult Women Undergoing Cesarean Section. *Surg Infect*. 2016;17(4):427-435. doi:10.1089/sur.2015.223

39. Staveski S, Abrajano C, Casazza M, et al. Silver-Impregnated Dressings for Sternotomy Incisions to Prevent Surgical Site Infections in Children. *Am J Crit Care*. 2016;25(5):402-408. doi:10.4037/ajcc2016843

40. Struik GM, Vrijland WW, Birnie E, Klem TMAL. A randomized controlled trial on the effect of a silver carboxymethylcellulose dressing on surgical site infections after breast cancer surgery. Leff D, ed. *PLOS ONE*. 2018;13(5):e0195715. doi:10.1371/journal.pone.0195715

41. Totty JP, Hitchman LH, Cai PL, et al. A pilot feasibility randomised clinical trial comparing dialkylcarbamoylchloride-coated dressings versus standard care for the primary prevention of surgical site infection. *Int Wound J*. 2019;16(4):883-890. doi:10.1111/iwj.13113

42. Whitley A, Baláž P, Kavalírek J, Hanusová J, Gürlich R. Evaluating the impact of an anti-microbial silver-impregnated surgical dressing on wound infections and healing: A randomised clinical trial. *Wound Repair Regen*. 2024;32(1):67-73. doi:10.1111/wrr.13142

43. Dixon. Paraffin ointment or mupirocin ointment did not differ from no ointment under moist occlusive dressings on non-contaminated surgical wounds for wound infections. *Evid Based Nurs*. 2007;10(1):20-20. doi:10.1136/ebn.10.1.20

44. Dickinson Jennings C, Culver Clark R, Baker JW. A prospective, randomized controlled trial comparing 3 dressing types following sternotomy. *Ostomy Wound Manage*. 2015;61(5):42-49.

45. Bennett K, Kellett W, Braun S, et al. 803: Silver ion-eluting dressings for prevention of post cesarean wound infection: a randomized, controlled trial. *Am J Obstet Gynecol*. 2013;208(1):S337. doi:10.1016/j.ajog.2012.10.141

46. Lim LI, Mastan S, Matsumoto K, Harkness R, Deshpande A. P061. Effect of Povidone-Iodine dressings on surgical site infection rate: A Randomised Controlled Trial. *Eur J Surg Oncol*. 2019;45(5):901. doi:10.1016/j.ejso.2019.01.083

47. Haddaway NR, Page MJ, Pritchard CC, McGuinness LA. *PRISMA2020* : An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. *Campbell Syst Rev*. 2022;18(2):e1230. doi:10.1002/cl2.1230

48. McGuinness LA, Higgins JPT. Risk-of-bias VISualization (robvis): An R package and Shiny web app for visualizing risk-of-bias assessments. *Res Synth Methods*. 2021;12(1):55-61. doi:10.1002/jrsm.1411

49. Stanirowski PJ, Davies H, McMaster J, et al. Cost-effectiveness of a bacterial-binding dressing to prevent surgical site infection following caesarean section. *J Wound Care*. 2019;28(4):222-228. doi:10.12968/jowc.2019.28.4.222

50. Seibert. Measured Impact of Two Strategies to Lower Surgical Site Infection Rates. *Am J Infect Control*. 2009;37(5):E48-E49. doi:10.1016/j.ajic.2009.04.059

51. National Institute for Health and Care Excellence. Surgical site infections: prevention and treatment [internet]. Published online April 11, 2019. Accessed June 15, 2024. https://www.nice.org.uk/guidance/ng125/chapter/Recommendations#closure-methods

52. Berríos-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. *JAMA Surg*. 2017;152(8):784. doi:10.1001/jamasurg.2017.0904

53. National Institute for Health and Care Excellence. *Chronic Wounds: Advanced Wound Dressings and Antimicrobial Dressings*.; 2016. Accessed June 15, 2024. https://www.nice.org.uk/advice/esmpb2/resources/chronic-wounds-advanced-wound-dressings-and-antimicrobial-dressingspdf-1502609570376901

54. Younes S, Younes N, Abunasser S, Tamimi F, Nasrallah G. Silver-based dressings for the prevention of surgical site infections: evidence from randomized trials. *J Hosp Infect*. 2025;162:293-300. doi:10.1016/j.jhin.2025.04.026

55. Tan ST, Winarto N, Dosan R, Aisyah PB. The Benefits Of Occlusive Dressings In Wound Healing. *Open Dermatol J*. 2019;13(1):27-33. doi:10.2174/1874372201913010027

56. Ljungh Å, Yanagisawa N, Wadström T. Using the principle of hydrophobic interaction to bind and remove wound bacteria. *J Wound Care*. 2006;15(4):175-180. doi:10.12968/jowc.2006.15.4.26901

57. National Institute for Health and Care Excellence. *Leukomed Sorbact for Preventing Surgical Site Infection | Medical Technologies Guidance*.; 2021. Accessed July 18, 2025. https://www.nice.org.uk/guidance/mtg55

58. Totty JP, Harwood AE, Cai PL, Hitchman LH, Smith GE, Chetter IC. Assessing the effectiveness of dialkylcarbamoylchloride (DACC)-coated post-operative dressings versus standard care in the prevention of surgical site infection in clean or clean-contaminated, vascular surgery (the DRESSINg trial): study protocol for a pilot feasibility randomised controlled trial. *Pilot Feasibility Stud*. 2019;5(1). doi:10.1186/s40814-019-0400-2

59. Lansdown ABG. A Pharmacological and Toxicological Profile of Silver as an Antimicrobial Agent in Medical Devices. *Adv Pharmacol Sci*. 2010;2010:1-16. doi:10.1155/2010/910686

60. Farid Mojtahedi M, Sepidarkish M, Almukhtar M, et al. Global incidence of surgical site infections following caesarean section: a systematic review and meta-analysis. *J Hosp Infect*. 2023;139:82-92. doi:10.1016/j.jhin.2023.05.019

61. Woelber E, Schrick EJ, Gessner BD, Evans HL. Proportion of Surgical Site Infections Occurring after Hospital Discharge: A Systematic Review. *Surg Infect*. 2016;17(5):510-519. doi:10.1089/sur.2015.241

62. Wormald JC, Lane JC, Català M, et al. The burden of hand trauma surgery on primary care in the United Kingdom: a nation-wide analysis of antibiotic and opioid prescriptions. *J Hand Surg Eur Vol*. Published online May 8, 2025:17531934251338120. doi:10.1177/17531934251338120