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Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients (Review)

Strippoli GFM, Tong A, Johnson DW, Schena FP, Craig JC

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[Intervention Review]

Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Giovanni FM Strippoli[1], Allison Tong[2], David W Johnson[3], Francesco Paolo Schena[4], Jonathan C Craig[5]

[1]a) School of Public Health, University of Sydney, b) Cochrane Renal Group, c) Diaverum Medical Scientific office, d) Mario Negri Sud Consortium, Italy, Westmead, Australia. [2]Centre for Kidney Research, The Children's Hospital at Westmead, Westmead, Australia. [3]Department of Nephrology, Princess Alexandra Hospital, Woolloongabba, Australia. [4]Department of Emergency and Organ Transplantation, University of Bari, Bari, Italy. [5](a) Cochrane Renal Group, Centre for Kidney Research, The Children's Hospital at Westmead, (b) School of Public Health, The University of Sydney, Westmead, Australia

Contact address: Giovanni FM Strippoli, a) School of Public Health, University of Sydney, b) Cochrane Renal Group, c) Diaverum Medical Scientific office, d) Mario Negri Sud Consortium, Italy, Locked Bag 4001, Westmead, NSW, 2145, Australia. Giovanni.Strippoli@diaverum.com. strippoli@negrisud.it.

A B S T R A C T

Background

Peritoneal dialysis (PD) is used as substitutive treatment of renal function in a large proportion (15-50%) of the end-stage kidney disease (ESRD) population. The major limitation is peritonitis which leads to technique failure, hospitalisation and increased mortality. Oral, nasal, topical antibiotic prophylaxis, exit-site disinfectants and other antimicrobial interventions are used to prevent peritonitis.

Objectives

The objective of this systematic review of randomised controlled trials (RCTs) was to evaluate what evidence supports the use of different antimicrobial approaches to prevent peritonitis in PD.

Search methods

The Cochrane CENTRAL Registry (issue 1, 2004), MEDLINE (1966-May 2003), EMBASE (1988-May 2003) and reference lists were searched for RCTs of antimicrobial agents in PD.

Selection criteria

Trials of the following agents were included: antibiotics by any route (oral, nasal, topical), exit-site disinfectants (chlorhexidine, povidone iodine, soap and water), vaccines, and ultraviolet germicidal devices.

Data collection and analysis

Two reviewers extracted data on the number of patients with one or more episodes and rates of peritonitis and exit-site/tunnel infection, catheter removal, catheter replacement, technique failure, toxicity of antibiotic treatments, all-cause mortality. Statistical analyses were performed using the random effects model and the results expressed as risk ratio (RR) with 95% confidence intervals (CI).

Main results

Nineteen trials, enrolling 1949 patients met our inclusion criteria. Nasal mupirocin compared with placebo significantly reduced the exit-site and tunnel infection rate (one trial, 2716 patient months, RR 0.58, 95% CI 0.40 to 0.85) but not peritonitis rate (one trial, 2716 patient months, RR 0.84, 95% CI 0.44 to 1.60). Perioperative intravenous antibiotics compared with no treatment significantly reduced the risk of early peritonitis (four trials, 335 patients, RR 0.35, 95% CI 0.15 to 0.80) but not exit site and tunnel infection (three trials, 114 patients, RR 0.32, 95% CI 0.02 to 4.81). No intervention reduced the risk of catheter removal or replacement.

Authors' conclusions

This review demonstrates that nasal mupirocin reduces exit-site/tunnel infection but not peritonitis. Preoperative intravenous prophylaxis reduces early peritonitis but not exit-site/tunnel infection. No other antimicrobial interventions have proven efficacy. Given the large number of patients on PD and the importance of peritonitis, the lack of adequately powered RCTs to inform decision making about strategies to prevent peritonitis is striking.

PLAIN LANGUAGE SUMMARY

The nasal antibiotic prophylactic mupirocin reduces exit-site/tunnel infection and preoperative intravenous antibiotic prophylaxis reduces early peritonitis in peritoneal dialysis

People with advanced kidney disease may be treated with peritoneal dialysis where a catheter is permanently inserted into the peritoneum (lining around abdominal contents) through the abdominal wall and sterile fluid is drained in and out a few times each day. The most common serious complication is infection of the peritoneum - peritonitis. This may be caused by bacteria accidentally being transferred from the catheter. This review found that nasal mupirocin reduces exit-site/tunnel infection but not peritonitis while preoperative intravenous antibiotic prophylaxis reduces early peritonitis but not exit-site/tunnel infection. More large scale trials are needed.

BACKGROUND

Peritoneal dialysis (PD) is used as substitutive treatment of renal function in a large proportion (15-50%) of the end-stage kidney disease (ESRD) population. There is variability across different countries with the United States (15%) being at the lowest and Canada (35%) and the United Kingdom (50%) at the highest range of PD use (Heaf 2004; Mendelssohn 2001). Because PD and haemodialysis have similar outcomes and patients' rating of PD care is higher, PD should probably be used more frequently but the risk of peritonitis may prevent this occurring (Heaf 2004).

Peritonitis, particularly due to *Staphylococcus aureus*, is the major complication of PD leading to technique failure, hospitalisation (Churchill 1997) and increased mortality (Annigeri 2001; Digenis 1990; Piraino 2000). There has been a dramatic decrease in the rates of peritonitis from the inception of continuous ambulatory PD (CAPD), but rates above 0.5 episodes/patient/ year are still common (Oxton 1994; Salusky 1997; Zelenitsky 2000). Peritonitis tends to be recurrent, with a very high rate of relapse (approximately 0.5 episodes/patient/year) (Vas 2001).

The incidence of peritonitis varies with age (Oxton 1994; Salusky 1997), coexisting diseases such as diabetes, PD modality (Yishak 2001), catheter design and implantation technique, connection methodology and the presence of nasal reservoirs of *S.aureus* (Golper 1996; Schaefer 2003). Immunosuppressed, African-American and native American PD patients are particularly at risk (Fine 1994; Holley 1993; Piraino 2002).

Different antimicrobial interventions are used to prevent peritonitis. These include oral antibiotics, topical antibiotics (Thodis 2000), topical disinfectants and prophylactic treatment of *S. aureus* nasal carriage with intranasal antibiotic sprays, ointment or powders (Piraino 2002). All of these strategies, particularly cleansing and disinfection of the exit-site, are widely accepted, but practice patterns are variable and trials results are conflicting (Burkart 1997; Luzar 1990; Peacock 2002; Piraino 1997). Many societies do not have relevant guidelines on the topic (additional Table 1).

None of these interventions are free of risks or without cost. Antibiotic prophylaxis carries the risk of gastrointestinal toxicity and may be a cause of antibiotic resistance (Annigeri 2001; Bernardini 1996); it may also be ineffective when patients already have resis-

tance to some antibiotics.

The aim of this systematic review was to evaluate the effects of the commonly used antimicrobial interventions for the prevention of peritonitis in PD patients. A separate analysis has been undertaken focusing on catheter-related aspects (type, placement and insertion technique) for the prevention of peritonitis (Strippoli 2004).

O B J E C T I V E S

To evaluate the benefits and harms of antimicrobial strategies to prevent peritonitis in PD.

M E T H O D S

Criteria for considering studies for this review

Types of studies

All randomised controlled trials (RCTs) and quasi-RCTs on the effect of antimicrobial agents on the prevention of peritonitis in PD patients were included.

Types of participants

Adult and paediatric patients undergoing PD treatment.

Types of interventions

Trials looking at the use of any antimicrobial agent were included, whether the interventions were tested between themselves (head-to-head) or against placebo/no treatment.
Specifically, the following antimicrobial interventions were analysed:
- Oral antibiotics
- Nasal antibiotic prophylaxis (mupirocin, rifampicin, other)
- Antistaphylococcal vaccines
- Topical disinfectants of the exit-site (povidone-iodine, chlorhexidine, triclosan, soap and water)
- Preoperative intravenous antibiotic prophylaxis
- Germicidal systems for connection devices
- Antifungal agents

Types of outcome measures

- Peritonitis-number of patients with peritonitis and peritonitis rate (peritonitis defined as dialysate count of > 100 cells/mm³ with > 50% being polymorphonuclear leukocytes; peritonitis rate defined as number of episodes of peritonitis over total patient months on PD)

- Peritonitis relapse (reoccurrence of peritonitis due to the same organism within 2-4 weeks)
- Death due to peritonitis
- All-cause mortality
- Exit-site and tunnel infection-number of patients with exit-site and tunnel infections and exit-site and tunnel infection rate
- Catheter removal/catheter replacement
- Technique failure (transfer from PD to haemodialysis/ transplant due to peritonitis)
- Toxicity of antibiotic treatments (nasal irritation, sneezing, local pruritus, headache, diarrhoea, nausea, vomiting, jaundice)
- Time to first peritonitis episode

Search methods for identification of studies

Relevant trials were obtained from the following sources (see Table 2- Electronic search strategies)
1. Cochrane Renal Group specialised register of RCTs
2. Cochrane Central Register of Controlled Trials (CENTRAL - most recent issue) for any "New" records not yet incorporated in the specialised register
3. MEDLINE and Pre MEDLINE (1966 to May 2003) were searched using the above terms, combined with the optimally sensitive strategy for the identification of RCTs (Dickersin 1994) (see Cochrane Renal Group Module).
4. EMBASE (1980 to May 2003) was searched using terms similar to those used for MEDLINE and combined with a search strategy for the identification of RCTs (Lefebvre 1996).
5. Reference lists of nephrology textbooks, review articles and relevant trials.
6. Letters seeking information about unpublished or incomplete trials to investigators known to be involved in previous trials.
7. There was no language restriction.

Data collection and analysis

The review was undertaken by five reviewers (GFMS, AT, DJ, FPS, JC). The search strategies described were used to obtain titles and abstracts of studies that might be relevant to the review. The titles and abstracts were screened independently (GFMS, AT), who discarded studies that were not applicable based on the inclusion criteria for this review; however studies and reviews that might include relevant data or information on trials were retained initially and their full-text version was analysed. Two reviewers (GFMS, AT) independently assessed retrieved abstracts and, were necessary, the full text of these studies to determine study eligibility. Data extraction was carried out independently by the same reviewers using standard data extraction forms. It was planned that studies reported in non-English language journals (if any) would be translated before assessment. Where more than one publication of one

trial existed, only the publication with the most complete data was included. Any further information or clarification required from the authors was requested by written or electronic correspondence and relevant data obtained in this manner were included in the review. Disagreements were resolved in consultation (GFMS, DJ, JC).

Study quality

The quality of included studies was assessed independently (GFMS, AT) without blinding to authorship or journal using the checklist developed by the Cochrane Renal Group. Discrepancies were resolved by discussion (GFMS, JC, DJ). The quality items assessed were allocation concealment, blinding of investigators, participants and outcome assessors, intention-to-treat analysis, and the completeness to follow-up.

Quality checklist

Allocation concealment

- Adequate (A): Randomisation method described that would not allow investigator/participant to know or influence intervention group before eligible participant entered in the study
- Unclear (B): Randomisation stated but no information on method used is available
- Inadequate (C): Method of randomisation used such as alternate medical record numbers or unsealed envelopes; any information in the study that indicated that investigators or participants could influence intervention group

Blinding

- Blinding of investigators: Yes/no/not stated
- Blinding of participants: Yes/no/not stated
- Blinding of outcome assessor: Yes/no/not stated
- Blinding of data analysis: Yes/no/not stated

The above are considered not blinded if the treatment group can be identified in > 20% of participants because of the side effects of treatment.

Intention-to-treat analysis

- Yes: Specifically stated by authors that intention-to-treat analysis was undertaken and this was confirmed on study assessment.
- Yes: not specifically stated but confirmed on study assessment
- No: Not reported and lack of intention-to-treat analysis confirmed on study assessment (Patients who were randomised were not included in the analysis because they did not receive the study intervention, they withdrew from the study or were not included because of protocol violation).
- No: Stated, but not confirmed upon study assessment
- Not stated

Completeness to follow-up

Percent of participants excluded or lost to follow-up.

Statistical assessment

Data from individual trials were analysed using the risk ratio measure (RR) and its 95% confidence intervals (CIs). When appropriate, summary estimators of treatment effects were calculated using a random effects model with RR and its 95% CIs. For each analysis, the fixed effects model was also evaluated to ensure robustness of the model chosen and susceptibility to outliers.

Where data on the number of subjects with events (e.g. number of subjects with one or more episodes of peritonitis) were available, the RR was calculated as the ratio of the incidence of the event (one or more episodes) in the experimental treatment group over the incidence in the control group. Where data on the number of episodes were available the RR was calculated as the ratio of the rate of the outcome (e.g. the peritonitis rate) in the experimental treatment group (given by number of episodes of the outcome over total patient months on PD) over the rate in the control group.

Subgroup analysis was planned to explore potential sources of variability in observed treatment effect where possible (paediatric versus adult population, diabetic versus non-diabetic, time on PD before beginning of antimicrobial treatment). It was also planned that if sufficient RCTs were identified, an attempt would be made to assess for publication bias using a funnel plot (Egger 1997). Heterogeneity of treatment effects between studies was formally tested using the Q (heterogeneity χ^2) and the I² statistics.

RESULTS

Description of studies

The combined search of MEDLINE, EMBASE, and the specialist registry of the Cochrane Renal Group identified 382 articles. Of these, 338 were excluded. The major reasons for exclusion were that the identified studies were not randomised or were randomised trials evaluating other interventions (e.g. catheter-related interventions to prevent peritonitis) (Figure 1). Full-text assessment of 44 potentially eligible papers identified 19 eligible trials (1949 patients) reported in 23 publications (Bennet-Jones 1988; Bernardini 1996; Blowey 1994; Churchill 1988; Gadallah 2000;

Lye 1992; Low 1980; Luzar 1990; Mupirocin SG 1996; Nolph 1985; Perez 1992; Poole-Warren 1991; Sesso 1994; Swartz 1991; Wai-Kei Lo 1996; Waite 1997; Wikdahl 1997; Wilson 1997; Zimmerman 1991) . Five trial authors responded to queries about study methods and/or requests for additional unpublished information (Bernardini 1996; Churchill 1988; Davey 1999; Waite 1997; Wilson 1997).

Figure 1.   Flow-chart indicating the number of citations retrieved by individual searches and the final number of included trials; reasons for exclusions are provided.
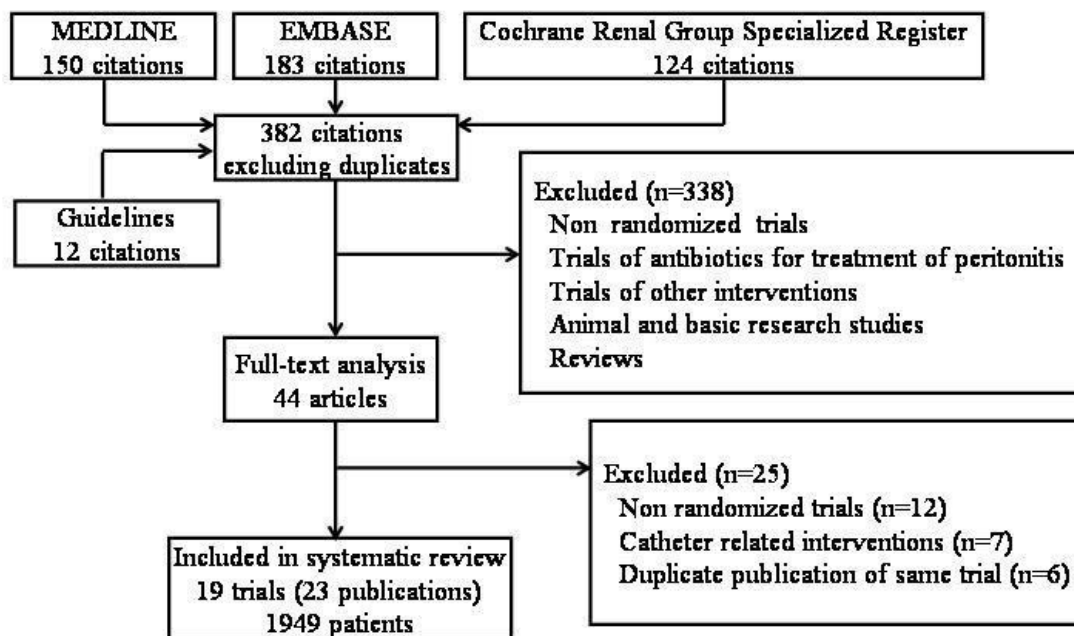
Fig. 1

Eight groups of studies were identified. In six trials (315 patients), patients were randomised to oral prophylactic antibiotics compared to placebo or no treatment (Blowey 1994; Churchill 1988; Low 1980; Sesso 1994; Swartz 1991; Zimmerman 1991). Two trials (289 patients) compared the use of nasal prophylactic antibiotics with placebo (Mupirocin SG 1996; Sesso 1994). Three trials (393 patients) evaluated the effect of povidone iodine versus "standard care" (no treatment or soap and water) (Luzar 1990; Waite 1997; Wilson 1997), one trial (167 patients) compared an ultravi-

olet germicidal chamber for the bag outlet port versus no treatment (Nolph 1985), and one (124 patients) compared the antistaphylococcal vaccine Staphypan Berna against placebo (Poole-Warren 1991). Four trials (336 patients) compared the use of perioperative intravenous antibiotic prophylaxis against no treatment (Bennet-Jones 1988; Gadallah 2000; Lye 1992; Wikdahl 1997). There was also one trial (397 patients) which evaluated the effect of oral nystatin for the prevention of superimposed fungal

peritonitis in patients receiving antibiotic treatment for bacterial peritonitis (Wai-Kei Lo 1996). Finally, there were three trials (164 patients) in which antibiotic interventions were compared head to head (Bernardini 1996; Lye 1992; Perez 1992).

Risk of bias in included studies

Assessment of the quality of the trials was difficult because many details such as the use of intention-to-treat analysis and the number of patients lost to follow-up were difficult to ascertain or were not provided. In general, trial quality was variable. Allocation concealment was adequate in only one trial, clearly inadequate (randomisation according to patient even/odd identity numbers and alternation) in two trials and unclear in all others. Outcome assessors were not stated as blinded in any of the trials. Blinding of participants was used in 6/19 (32%) trials and blinding of investigators in 5/19 (26%) trials. Analysis was based on intention to treat in 5/19 (26%) trials. The proportion of patients lost to follow-up ranged from 0 to 14%.

Effects of interventions

Oral antibiotic prophylaxis

The use of oral antibiotic prophylaxis (either cotrimoxazole, cephalexin, ofloxacin or rifampin) compared with placebo/no treatment did not significantly reduce the risk of peritonitis, (Analysis 1.3 (4 trials, 235 patients): RR 0.76, 95% CI 0.38 to 1.53). There was significant heterogeneity across these trials (heterogeneity $\chi^2 = 9.10$, P = 0.03, $I^2 = 67.0\%$), which can be explained by the trial of Churchill 1988 which was the largest trial with the highest event rate. Oral antibiotic prophylaxis did not reduce the peritonitis rate (Analysis 1.4 (2 trials, 670 patient-months): RR 0.74, 95% CI 0.39 to 1.37), but significantly reduced the risk of exit-site and tunnel infection (Analysis 1.5 (2 trials, 31 patients): RR 0.29, 95% CI 0.09 to 0.97). There was no significant effect on catheter removal or replacement (Analysis 1.7 (4 trials, 235 patients): RR 0.73, 95% CI 0.39 to 1.38) and all-cause mortality (Analysis 1.1 (4 trials, 195 patients): RR 0.84, 95% CI 0.39 to 1.79), with no significant heterogeneity across trials for any of these analyses.

Nasal antibiotic prophylaxis

The use of nasal antibiotic prophylaxis compared with placebo/no treatment did not reduce significantly the risk of peritonitis (Analysis 2.2 (2 trials, 282 patients): RR 0.94, 95% CI 0.67 to 1.33). Nasal antibiotic prophylaxis also did not significantly affect the peritonitis rate (Analysis 2.3 (1 trial, 2626 patient-months): RR 0.84, 95% CI 0.44 to 1.60) or the risk of exit-site and tunnel infection Analysis 2.4 (2 trials, 282 patients): RR 0.97, 95% CI 0.64 to 1.49). However, nasal mupirocin compared with placebo significantly reduced the exit-site and tunnel infection rate (Analysis 2.5 (1 trial, 2716 patient-months): RR 0.58, 95% CI 0.40 to 0.85)

and *S. aureus* nasal carriage (10 to 18% in mupirocin treated patients versus 48 to 61% in placebo treated patients, P < 0.001). Nasal antibiotic prophylaxis had no effect on catheter removal or replacement (Analysis 2.6 (2 trials, 282 patients): RR 0.89, 95% CI 0.44 to 1.79). There was no significant heterogeneity across trials for any of these analyses.

Peri-operative antibiotic prophylaxis

The use of peri-operative intravenous antibiotic prophylaxis compared with no treatment significantly reduced the risk of early peritonitis (less than one month from catheter insertion) (Analysis 3.1 (4 trials, 335 patients): RR 0.35 95% CI 0.15 to 0.80) but not the risk of exit-site and tunnel infection (Analysis 3.2 (2 trials, 114 patients), RR 0.32, 95% CI 0.02 to 4.81). When outcomes at more than one month after catheter insertion were considered, there was no significant difference in the risk of peritonitis or exit-site/tunnel infection.

Topical disinfectants

Topical disinfection of the exit-site with povidone iodine ointment or dry power spray compared with no treatment or soap and water did not significantly reduce the risk of peritonitis (Analysis 5.3 (3 trials, 382 patients): RR 0.72, 95% CI 0.46 to 1.11), exit-site/ tunnel infection (Analysis 5.2 (3 trials, 381 patients): RR 0.71, 95% CI 0.49 to 1.03), catheter removal or replacement (Analysis 5.4 (2 trials, 266 patients): RR 0.73, 95% CI 0.34 to 1.55), or all-cause mortality (Analysis 5.1 (2 trials, 266 patients): RR 1.24, 95% CI 0.54 to 2.84), with no significant heterogeneity across trials of any of these analyses.

Other interventions - placebo/no treatment controlled studies

There was no significant reduction of the peritonitis rate with other interventions including the use of a germicidal chamber for connection devices (Analysis 6.1 (1 trial, 167 patients, 1354 patient-months): RR 1.04, 95% CI 0.71 to 1.53) and the Staphypan Berna antistaphylococcal vaccine (Analysis 7.1 (1 trial, 124 patients, 1099 patient-months): RR 0.89, 95% CI 0.58 to 1.37). Staphypan Berna was also shown to have no significant effect on the exit-site and tunnel infection rate (Analysis 7.2 (1 trial, 1099 patient-months): RR 1.02, 95% CI 0.70 to 1.48).
One trial of oral nystatin to prevent the risk of superimposed fungal peritonitis in patients who already presented and were receiving treatment for bacterial peritonitis showed a significant reduction of the rate of superimposed fungal peritonitis (Analysis 1.14 (1 trial, 397 patients, 1168 patient-months): RR 0.10, 95% CI 0.03 to 0.31) with nystatin.

Other interventions (head to head trials)

There were insufficient data reported to evaluate the comparative effects of different antimicrobial agents in "head to head" trials of these agents. The only available data are reported in Table 3 - *Results of head-to-head trials of antimicrobial agents to prevent peritonitis*.

Other outcomes

Summary data for all other patient-relevant outcomes (mortality due to peritonitis, technique failure, drug-related toxicity, pruritus, nausea, diarrhoea, allergy, nasal irritation, rhinitis, headache, vomiting, technique failure) were also summarised (Table 4 - *Other outcomes analysed*) but seldom reported. This analysis showed no significant difference with any agent in relation to any of the outcomes.

DISCUSSION

This systematic review of antimicrobial prophylaxis in PD patients demonstrates a number of key findings.

- Topical administration of mupirocin to the anterior nares of PD patients colonised with *S. aureus* significantly reduces overall rates of exit-site and tunnel infections, but does not decrease rates of peritonitis or catheter loss.

- Preoperative intravenous antibiotic prophylaxis significantly reduces the risk of early peritonitis in the first few weeks (< 1 month) following Tenckhoff catheter insertion but not exit-site and tunnel infections.

- Oral nystatin prophylaxis with each antibiotic prescription reduces the rate of Candida peritonitis in PD patients.

- There are insufficient data reported to evaluate the comparative effects of different antimicrobial agents in "head-to-head" trials.

- None of the interventions studied had any significant effect on catheter loss.

- Considering the importance of PD catheter-associated infections as major causes of technique failure, morbidity and mortality, RCTs of antimicrobial prophylaxis in PD patients are rare.

To our knowledge, the present study represents the first systematic review assessing the relative benefits and harms of different antimicrobial regimens in PD patients. PD catheter-associated infection (peritonitis, exit-site and tunnel) is the commonest reason for technique failure. Consequently, reported median PD technique survival rates are only of the order of 2 to 2.5 years and are

markedly lower than those of haemodialysis (Gentil 1991; Gokal 1987; Johnson 2003; Maiorca 1996; Serkes 1990). Moreover, although a number of studies have demonstrated a possible survival advantage for PD compared with haemodialysis during the first two years of dialysis, infection represents the second commonest cause of PD patient death (Johnson 2003). There are over 150,000 patients worldwide receiving PD, but the prospect of infectious complications is a major impediment to its broader uptake (Diaz-Buxo 1998; Piraino 1989). This problem is compounded further by the lack of controlled clinical trials and clinical practice guidelines aimed to prevent infection in PD patients.

The International Society of PD (ISPD) guidelines (ISPD 2003) currently recommend exit-site mupirocin application for all PD patients at increased risk of *S. aureus* infections, including *S. aureus* carriers, diabetics and immunocompromised patients. Similarly, the Caring for Australians with Renal Impairment (CARI) guidelines (CARI 2003) recommend either nasal or exit-site mupirocin prophylaxis to decrease the risk of *S. aureus* exit/site tunnel infections and peritonitis in PD patients (Bannister 2003; Gokal 1998; Keane 2000). However, the present study only found evidence that nasal application of mupirocin is effective in preventing exit-site/ tunnel infections in nasal carriers of *S. aureus*. Interestingly, the benefit of mupirocin was only observed for the outcome measure of rates of exit-site and tunnel infections, but not for the proportion of patients with exit-site and tunnel infections. It is plausible that mupirocin reduces the risk of exit-site and tunnel infections only in patients who are frequent relapsers. Another possible explanation is that the outcome of exit-site/tunnel infection rates (rather than patients with exit-site/tunnel infections) has greater power to detect a significant difference. This hypothesis is less likely because the point estimate for the patient-level outcome is close to unity. No significant effect of mupirocin on peritonitis rates was observed.

There have been no reported RCTs, which have assessed the effectiveness of mupirocin when applied to the catheter exit-site or when administered to PD patients other than those with nasal colonisation by *S. aureus*. Moreover, the longest trial available to date had a follow-up period of only 18 months, which is inadequate to assess the potentially important harmful side effect of mupirocin resistance (Davey 1999).

Our systematic review supports the ISPD and CARI guidelines recommendation that prophylactic antibiotic administration prior to PD catheter insertion reduces the risk of early peritonitis but we do not find that this intervention reduces the risk of exit-site/ tunnel infection (Bannister 2003; Gokal 1998; Keane 2000). Both guidelines suggest that first generation cephalosporins should be the preferred antimicrobial agent based on extrapolations from the results of pre-operative antibiotic trials in patients without chronic kidney disease. However, our study indicates that the evidence supporting the use of first generation cephalosporins in PD patients undergoing Tenckhoff catheter insertion is scant. In the

present study, we identified five RCTs of different preoperative antibiotic prophylaxis regimens, including parenteral gentamicin, vancomycin, cephazolin and cefuroxime, with only two evaluating a first generation cephalosporin. One small trial involving 27 PD patients found that cephazolin and gentamicin were ineffective compared with no treatment (Lye 1992), whilst the largest of the meta-analysed trials (221 patients) observed that cephazolin was inferior to vancomycin with respect to preventing postoperative catheter-associated infections (7% versus 1%, respectively P < 0.05) (Gadallah 2000). Nevertheless, the recommendation of a first generation cephalosporin in preference to vancomycin may be a reasonable compromise because of the risk of vancomycin-resistant enterococci and *S. aureus* (HICPAC 1995). Postoperative infection rates in the control arms of each of the evaluated trials were high, ranging from 12 to 46% (Bennet-Jones 1988; Gadallah 2000; Lye 1992; Wikdahl 1997), and the applicability of these data to PD units with lower infection rates following PD catheter insertion is unclear.

Our study also indicates that nystatin significantly reduced the risk of Candida peritonitis in PD patients. The applicability of the present finding is also limited, given the relatively high occurrence rate reported in the control arm of the one large trial identified (8.5% over 2 years) (Johnson 2003).

Our study did not find any high level evidence to support the ISPD recommendation of regular topical exit-site disinfection with antibacterial soap or a medical antiseptic to keep the exit-site clean and to diminish resident bacteria. There are no controlled trials evaluating the effects of antibacterial soap. A meta-analysis of three randomised controlled trials of topical povidone-iodine did not show any benefit compared with non-disinfectant soap and water. Moreover, although harms were generally inadequately reported, one study observed that skin rashes occurred in 6% of patients following povidone-iodine application (Wilson 1997).

The strength of this study is that it represents a comprehensive systematic review, rigid inclusion criteria for RCTs only, and a comprehensive MEDLINE, EMBASE and CENTRAL search. Data extraction, data analysis and method quality assessment were performed independently by two investigators, and consistency was checked with an additional two reviewers. Furthermore, infectious outcomes were separately examined in terms of rates/patient-month and the number of patients affected in order to maximise statistical power and to verify the robustness of statistical analyses.

Nevertheless, our analysis has several limitations. Although there were quite a few trials which had assessed the benefits of different antimicrobial interventions to prevent peritonitis in PD, the majority enrolled few patients over relatively short periods of follow-up, did not adequately assess harms and were based upon suboptimal methodological quality standards of reporting of RCTs. The vast majority of studies evaluated failed to specify whether

randomisation allocation was concealed, outcome assessors were blinded or data were analysed on an intention to treat basis. These issues, together with the small sample sizes of all but three trials (Davey 1999; Gadallah 2000; Low 1980) reduce the strength of the conclusions that have been drawn in this review. The possibility of a type II statistical error for some of the less frequently observed outcome measures (e.g. catheter loss) cannot be excluded; almost all analyses in this study were consistent with both clinically important benefit or harm from the intervention. The absence of statistical significance in the overall risk estimates means that we do not know whether the intervention is effective because of problems with the trials, or whether the intervention implies no difference in the outcome. Finally, some studies, such as those involving prophylactic oral antibiotics, dated back to the 1980s when peritonitis rates were much higher than those observed more recently. Thus, the generalisability of these studies to contemporary practice is questionable.

AUTHORS' CONCLUSIONS

Implications for practice

In conclusion, this systematic review demonstrates that

(a) eradication of nasal S. aureus carriage with topical mupirocin effectively decreases the risk of exit-site and tunnel infections (probably by reducing the relapse rates in the high risk groups), but not peritonitis or catheter loss;

(b) intravenous antibiotic administration prior to PD catheter insertion effectively prevents early postoperative peritonitis but not exit-site and tunnel infections;

(c) concomitant oral nystatin with antibiotic therapy may reduce the occurrence of Candida peritonitis; and,

(d) no other prophylactic strategies (including prophylactic oral antibiotics, topical disinfectants, staphylococcal vaccines or germicidal chambers for connection devices) have been shown to be effective.

Implications for research

This review also demonstrates that antimicrobial prophylaxis in PD has been very poorly studied to date, perhaps indicating that there are insufficient incentives to drive research in this area. There is a pressing need for more well-designed RCTs in this area, which adequately assess safety, as well as efficacy.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Bennet-Jones 1988

Methods	RCT Randomization: method not stated
Participants	27 patients Mean age: 52.7 ± 18.6 versus 53.1 ± 13.0 years Proportion of diabetic patients: 0%
Interventions	Gentamicin (i.v.) 1.5 mg/kg at time of catheter placement versus none
Outcomes	Peritonitis, exit-site/tunnel infection, catehter removal
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Bernardini 1996

Methods	RCT Randomization: method not stated
Participants	82 patients Mean age: NA Proportion of diabetic patients: 34%
Interventions	Mupirocin (2%) nasal ointment, daily applications, versus rifampin (oral) 300 mg x 2/day x 5 days, every 3 months
Outcomes	All-cause mortality, peritonitis, exit-site/tunnel infection, catheter removal/replacement
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Blowey 1994

Methods	RCT Randomization: method not stated
Participants	15 patients Mean age: 11.5 (8-21) years Proportion of diabetic patients: NA
Interventions	Rifampicin 20 mg/kg/day in 2 doses for 5 days + bacitracin (nasal) 2 times/day x 7 days versus none
Outcomes	Peritonitis, exit-site/tunnel infection
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Churchill 1988

Methods	RCT Randomization: method not stated
Participants	105 patients Mean age: NA Proportion of diabetic patients: NA
Interventions	Trimethoprim 160 mg/sulfamethoxazole 800 mg/day x 12 months versus none
Outcomes	All-cause mortality, peritonitis, exit-site/tunnel infection
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Gadallah 2000

Methods	RCT Randomization: method not stated Inadequate allocation concealment Trial with three arms

Gadallah 2000   *(Continued)*

Participants	221 patients Mean age: 47 (15-76) versus 48 (28-81) versus 44 (18-77) years Proportion of diabetic patients: 23%
Interventions	Vancomycin (i.v.) 1000 mg 12 h before catheter placement versus cefazolin (i.v.) 100 mg 3 h before catheter placement versus no treatment
Outcomes	Peritonitis, exit-site/tunnel infection
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Low 1980

Methods	RCT Randomization: method not stated
Participants	50 patients Mean age: NA Proportion of diabetic patients: NA
Interventions	Cefalexin 500 mg x 2/day versus none
Outcomes	Peritonitis
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Luzar 1990

Methods	RCT Randomization: method not stated
Participants	127 patients Mean age: NA Proportion of diabetic patients: 22%

Luzar 1990 (*Continued*)

Interventions	Povidone iodine (20 g/L) and nonocclusive dressing 2-3 times/week versus none
Outcomes	All-cause mortality, peritonitis, exit-site/tunnel infection
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Lye 1992

Methods	RCT Randomization: method not stated
Participants	50 patients Mean age: 56.0 ± 14.3 versus 52.3 ± 14.0 years Proportion of diabetic patients: 30%
Interventions	Cefazolin (i.v.) t00 mg and gentamicin (i.v.) 80 mg 1 hour before catheter placement versus none
Outcomes	All-cause mortality, peritonitis, exit-site/tunnel infection
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Mupirocin SG 1996

Methods	RCT Randomization: method not stated
Participants	267 patients Mean age: 60.3 years Proportion of diabetic patients: 20%
Interventions	Mupirocin (2%) nasal ointment b.i.d. x 5 days, every 1 month versus placebo
Outcomes	All-cause mortality, peritonitis, peritonitis rate, exit-site/tunnel infection, exit-site/tunnel infection rate, catheter removal or replacement

Mupirocin SG 1996   *(Continued)*

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Nolph 1985

Methods	RCT Randomization: method not stated
Participants	167 patients Mean age: 49 ± 14 years Proportion of diabetic patients: 20%
Interventions	Ultraviolet germicidal chamber for bag outlet port versus none
Outcomes	All-cause mortality, peritonitis, peritonitix rate
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Perez 1992

Methods	RCT Randomization: method not stated
Participants	32 patients Mean age: 51 ± 15 versus 48 ± 21 years Proportion of diabetic patients: 16%
Interventions	Mupirocin (2%) nasal ointment t.i.d. x 7 days versus neomycin sulphate (0.1%) nasal ointment t.i.d. x 7 days
Outcomes	All-cause mortality, peritonitis, peritonitis rate, exit-site/tunnel infection
Notes	

Risk of bias

Perez 1992   (*Continued*)

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Poole-Warren 1991

Methods	RCT Randomization: method not stated; patients randomly assigned by an independent third party
Participants	124 patients Mean age: 51 ± 11 versus 52 ± 14 years Proportion of diabetic patients: 17%
Interventions	Staphypan Berna versus placebo
Outcomes	Peritonitis, peritonitis rate, exit-site/tunnel infection and exit-site/tunnel infection rate
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Sesso 1994

Methods	RCT Randomization: method not stated
Participants	31 patients Mean age 43.1 ± 3.8 versus 36.6 ± 4.6 Proportion of diabetic patients: 23%
Interventions	Ofloxacin 200 mg/day x 5 days versus Sodium fusidate (2%) nasal ointment twice daily x 5 days versus placebo
Outcomes	All-cause mortality, peritonitis, peritonitis rate, exit-site/tunnel infection, exit-site/tunnel infection rate, catheter removal or replacement, nasal irritation
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

Sesso 1994 (*Continued*)

Allocation concealment?	Unclear risk	B - Unclear

Swartz 1991

Methods	RCT Randomization: method not stated
Participants	59 patients Mean age 49 ± 3.4 versus 51 ± 3.1 Proportion of diabetic patients: 34%
Interventions	Trimethoprim/sulfamethoxazole (low dose) or cephalexin (250 mg) or clindamycin (300 mg) versus none
Outcomes	All-cause mortality, peritonitis rate, exit-site/tunnel infection
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Wai-Kei Lo 1996

Methods	RCT Randomization: method not stated Inadequate allocation concealment.
Participants	397 patients Mean age: 48.4 ± 14.5 versus 48.5 ± 14.2 years Proportion of diabetic patients: 17%
Interventions	Nystatin 500,000 units x 4/day (whenever antibiotics were administered for bacterial peritonitis) versus none
Outcomes	Tral focusing on prophylaxis of Candida peritonitis in patients receiving treatment for bacterial peritonitis Peritonitis, peritonitis rate
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Waite 1997

Methods	RCT
	Randomization: method not stated
Participants	117 patients
	Mean age: 54.4 ± 15.1 versus 53.2 ± 14.5 years
	Proportion of diabetic patients: 33%
Interventions	Povidone iodine (10%) ointment 3.5 g at every dressing change versus none
Outcomes	All-cause mortality, peritonitis, exit-site/tunnel infection, catheter removal or replacement
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Wikdahl 1997

Methods	RCT
	Randomization: method not stated
Participants	38 patients
	Mean age: 56 (33-84) versus 61 (38-84) years
	Proportion of diabetic patients: 34%
Interventions	Cefuroxime (i.v.) 1.5 g at time of catehter placement + 250 mg i.p. in first dialysis bag versus none
Outcomes	Peritonitis, exit-site/tunnel infection
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Wilson 1997

Methods	RCT
	Randomization: method not stated
Participants	149 patients
	Mean age: 53 (18-82) versus 51 (21-76) years
	Proportion of diabetic patients: NA

Wilson 1997   (*Continued*)

Interventions	Povidone iodine (2.5%) dry powder spray at every dressing change versus none
Outcomes	All-cause mortality, peritonitis, exit-site/tunnel infection, Technique failure due to peritonitis, Local pruritus/rash
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Zimmerman 1991

Methods	RCT Randomization: method not stated
Participants	64 patients Mean age: 53 ± 3 versus 55 ± 4 years Proportion of diabetic patients: 41%
Interventions	Rifampin 300 mg x 2/day x 5 days, every 3 months versus none
Outcomes	Peritonitis, peritonitis rate, catheter removal or replacement, toxicity
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Characteristics of excluded studies   *[ordered by study ID]*

Study	Reason for exclusion
de Fijter 1989	Treatment study not prevention.
Plum 1997	Treatment study not prevention.

DATA AND ANALYSES

Comparison 1. Oral antibiotics versus none

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality (all cause)	4		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
1.1 Any versus placebo/no treatment	4	195	Risk Ratio (M-H, Random, 95% CI)	0.84 [0.39, 1.79]
2 Mortality due to peritonitis	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
2.1 Cotrimoxazole versus placebo/no treatment	1		Risk Ratio (M-H, Random, 95% CI)	4.39 [0.22, 89.20]
3 Peritonitis (number of patients with one or more episodes)	4	235	Risk Ratio (M-H, Random, 95% CI)	0.76 [0.38, 1.53]
4 Peritonitis rate (episodes/patient-months on PD)	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
4.1 Any versus placebo/no treatment (excluding nistatin)	2	670	Risk Ratio (M-H, Random, 95% CI)	0.74 [0.39, 1.37]
5 Exit-site/tunnel infection (number of patients with one or more episodes)	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
5.1 Any versus placebo/no treatment	2	31	Risk Ratio (M-H, Random, 95% CI)	0.29 [0.09, 0.97]
6 Exit-site/tunnel infection rate (episodes/total patient-months on PD)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
6.1 Any versus placebo/no treatment	1		Risk Ratio (M-H, Random, 95% CI)	0.44 [0.08, 2.31]
7 Catheter removal or replacement	4		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
7.1 Any versus placebo/no treatment	4	235	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.39, 1.38]
8 Pruritus (generalised)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
8.1 Rifampin (oral) versus none	1		Risk Ratio (M-H, Random, 95% CI)	3.00 [0.13, 71.00]
9 Diarrhoea	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
9.1 Rifampin (oral) versus none	1		Risk Ratio (M-H, Random, 95% CI)	0.09 [0.01, 1.58]
10 Nausea	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
10.1 Rifampin (oral) versus none	1		Risk Ratio (M-H, Random, 95% CI)	9.00 [0.50, 160.59]
11 Allergy	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
11.1 Rifampin (oral) versus none	1		Risk Ratio (M-H, Random, 95% CI)	5.0 [0.25, 100.20]
12 Nasal irritation	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
12.1 Ofloxacin (oral) versus placebo	1		Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
13 Fungal peritonitis (number of patients with one or more episodes)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
13.1 Nistatin versus none	1		Risk Ratio (M-H, Random, 95% CI)	0.54 [0.20, 1.44]
14 Fungal peritonitis rate (episodes/patient-months on PD)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
14.1 Nistatin (oral) versus none	1		Risk Ratio (M-H, Random, 95% CI)	0.10 [0.03, 0.31]

Comparison 2.   Nasal antibiotics versus none

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality (all cause)	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
1.1 Any versus placebo	2	282	Risk Ratio (M-H, Random, 95% CI)	0.87 [0.52, 1.47]
2 Peritonitis (number of patients with peritonitis)	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
2.1 Any versus placebo	2	282	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.67, 1.33]
3 Peritonitis rate (episodes/patient-month versus total patient-months)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
3.1 Mupirocin (nasal) versus placebo	1		Risk Ratio (M-H, Random, 95% CI)	0.84 [0.44, 1.60]
4 Exit site and tunnel infection (number of patients with exit site and tunnel infection)	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
4.1 any versus placebo	2	282	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.64, 1.49]
5 Exit site and tunnel infection rate (episodes/patient-month versus total patient-months)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
5.1 Mupirocin versus placebo	1		Risk Ratio (M-H, Random, 95% CI)	0.58 [0.40, 0.85]
6 Catheter removal or replacement	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
6.1 Any versus placebo	2	282	Risk Ratio (M-H, Random, 95% CI)	0.89 [0.44, 1.79]
7 Nasal irritation/rhinitis	2		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
7.1 Fusidate versus placebo	1		Risk Ratio (M-H, Random, 95% CI)	2.1 [0.10, 44.40]
7.2 Mupirocin versus placebo	1		Risk Ratio (M-H, Random, 95% CI)	0.74 [0.27, 2.09]
8 Headache	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
9 Diarrhoea	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
10 Nausea	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
11 Vomiting	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
12 Pruritus	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
13 Peritonitis	2	282	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.67, 1.33]
14 Peritonitis rate	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
15 Exit-site/tunnel infection	2	282	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.64, 1.49]
16 Exit-site/tunnel infection rate	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected

Comparison 3. Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Peritonitis (number of patients with peritonitis)	4	335	Risk Ratio (M-H, Random, 95% CI)	0.35 [0.15, 0.80]
2 Exit site and tunnel infection (number of patients with exit site and tunnel infection)	3	114	Risk Ratio (M-H, Random, 95% CI)	0.32 [0.02, 4.81]
3 Catheter removal	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
3.1 Gentamicin (IV) versus no treatment (preoperative)	1		Risk Ratio (M-H, Random, 95% CI)	0.36 [0.02, 8.06]
4 Death	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected

Comparison 4. Peri-operative IV prophylaxis head-to-head

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Peritonitis (number of patients with peritonitis)	0		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
1.1 Any versus placebo/no treatment (preoperative)	0		Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
2 Exit site and tunnel infection (number of patients with exit site and tunnel infection)	0		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
2.1 Any versus placebo/no treatment (preoperative)	0		Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
3 Catheter removal	0		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
3.1 Gentamicin (IV) versus no treatment (preoperative)	0		Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

Comparison 5. Topical disinfectants versus none

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality (all cause)	2	266	Risk Ratio (M-H, Random, 95% CI)	1.24 [0.54, 2.84]
2 Exit site and tunnel infection (number of patients with exit site and tunnel infection)	3	381	Risk Ratio (M-H, Random, 95% CI)	0.71 [0.49, 1.03]
3 Peritonitis (number of patients with peritonitis)	3	382	Risk Ratio (M-H, Random, 95% CI)	0.72 [0.46, 1.11]
4 Catheter removal or replacement	2	266	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.34, 1.55]
5 Technique failure	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected

Comparison 6.   Germicidal chamber versus none

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Peritonitis rate (episodes/patient-month versus total patient-months)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
2 Mortality (all cause)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected

Comparison 7.   Antistaphylococcal vaccine (Staphypan) versus placebo

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Peritonitis rate (episodes/patient-month versus total patient-months)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
2 Exit site and tunnel infection rate (episodes/patient-month versus total patient-months)	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected

Comparison 8.   Antibiotic prophylaxis head-to-head agents

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mortality (all cause)	2	100	Risk Ratio (M-H, Random, 95% CI)	1.49 [0.14, 16.15]
1.1 Fusidate versus ofloxacin	1	18	Risk Ratio (M-H, Random, 95% CI)	0.33 [0.02, 7.24]
1.2 Mupirocin versus rifampin	1	82	Risk Ratio (M-H, Random, 95% CI)	4.0 [0.47, 34.28]
2 Exit site and tunnel infection (number of patients with exit site and tunnel infection)	3	305	Risk Ratio (M-H, Random, 95% CI)	0.96 [0.45, 2.03]
2.1 Fusidate versus ofloxacin	1	18	Risk Ratio (M-H, Random, 95% CI)	2.5 [0.65, 9.69]
2.2 Vancomicin versus cefazolin (preoperative)	1	205	Risk Ratio (M-H, Random, 95% CI)	0.50 [0.13, 1.93]
2.3 Mupirocin versus rifampin	1	82	Risk Ratio (M-H, Random, 95% CI)	0.85 [0.43, 1.66]
3 Peritonitis (number of patients with peritonitis)	2	287	Risk Ratio (M-H, Random, 95% CI)	0.44 [0.03, 5.73]
3.1 Vancomicin versus cefazolin (preoperative)	1	205	Risk Ratio (M-H, Random, 95% CI)	0.11 [0.01, 0.85]
3.2 Mupirocin versus rifampin	1	82	Risk Ratio (M-H, Random, 95% CI)	1.25 [0.67, 2.33]

4 Peritonitis rate (episodes/patient-month versus total patient-months)	2	1235	Risk Ratio (M-H, Random, 95% CI)	0.87 [0.51, 1.48]
4.1 Fusidate versus ofloxacin	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Mupirocin versus neomicin sulphate	1	209	Risk Ratio (M-H, Random, 95% CI)	0.71 [0.20, 2.58]
4.3 Mupirocin versus rifampin	1	1026	Risk Ratio (M-H, Random, 95% CI)	0.91 [0.51, 1.62]
5 Exit site and tunnel infection (rate)	2	1173	Risk Ratio (M-H, Random, 95% CI)	1.18 [0.30, 4.72]
5.1 Fusidate versus ofloxacin	1	147	Risk Ratio (M-H, Random, 95% CI)	2.96 [0.62, 14.19]
5.2 Mupirocin versus rifampin	1	1026	Risk Ratio (M-H, Random, 95% CI)	0.69 [0.38, 1.24]
6 Nausea	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
6.1 Mupirocin versus rifampin	1		Risk Ratio (M-H, Random, 95% CI)	0.11 [0.01, 2.00]
7 Catheter removal or replacement	2	100	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.45, 2.46]
7.1 Fusidate versus ofloxacin	1	18	Risk Ratio (M-H, Random, 95% CI)	1.33 [0.41, 4.33]
7.2 Mupirocin versus rifampin	1	82	Risk Ratio (M-H, Random, 95% CI)	0.8 [0.23, 2.77]
8 Nasal irritation	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
8.1 Fusidate versus ofloxacin	1		Risk Ratio (M-H, Random, 95% CI)	3.00 [0.14, 65.16]

Analysis 1.1. Comparison 1 Oral antibiotics versus none, Outcome 1 Mortality (all cause).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 1 Mortality (all cause)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Any versus placebo/no treatment					
Blowey 1994	0/7	2/8		6.9 %	0.23 [0.01, 4.02]
Churchill 1988	5/56	3/49		30.2 %	1.46 [0.37, 5.79]
Sesso 1994	1/9	1/7		8.6 %	0.78 [0.06, 10.37]
Swartz 1991	5/29	7/30		54.3 %	0.74 [0.26, 2.07]
Subtotal (95% CI)	**101**	**94**		**100.0 %**	**0.84 [0.39, 1.79]**
Total events: 11 (Treatment), 13 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 1.48, df = 3 (P = 0.69); I² =0.0%					
Test for overall effect: Z = 0.45 (P = 0.65)					

0.01 0.1 1 10 100

Favours treatment   Favours control
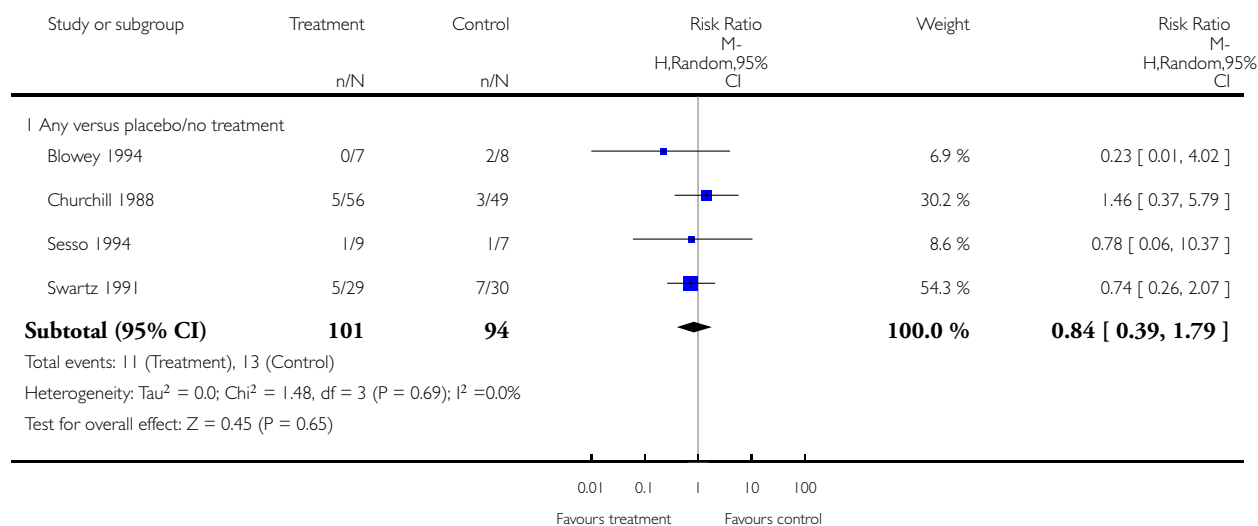
Analysis 1.2. Comparison 1 Oral antibiotics versus none, Outcome 2 Mortality due to peritonitis.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 2 Mortality due to peritonitis

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Cotrimoxazole versus placebo/no treatment				
Churchill 1988	2/56	0/49		4.39 [0.22, 89.20]

0.01 0.1 1 10 100

Favours treatment   Favours control

Analysis 1.3. Comparison 1 Oral antibiotics versus none, Outcome 3 Peritonitis (number of patients with one or more episodes).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 3 Peritonitis (number of patients with one or more episodes)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Churchill 1988	33/56	22/49		36.6 %	1.31 [0.90, 1.92]
Low 1980	2/25	6/25		14.2 %	0.33 [0.07, 1.50]
Sesso 1994	4/9	3/7		19.9 %	1.04 [0.34, 3.19]
Zimmerman 1991	8/32	17/32		29.4 %	0.47 [0.24, 0.93]
Total (95% CI)	**122**	**113**		**100.0 %**	**0.76 [0.38, 1.53]**

Total events: 47 (Treatment), 48 (Control)

Heterogeneity: Tau^2 = 0.31; Chi^2 = 9.10, df = 3 (P = 0.03); I^2 =67%

Test for overall effect: Z = 0.76 (P = 0.45)

0.05 0.2 1 5 20

Favours treatment   Favours control

Analysis 1.4. Comparison 1 Oral antibiotics versus none, Outcome 4 Peritonitis rate (episodes/patient-months on PD).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 4 Peritonitis rate (episodes/patient-months on PD)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Any versus placebo/no treatment (excluding nistatin)					
Sesso 1994	5/72	6/96		29.7 %	1.11 [0.35, 3.50]
Zimmerman 1991	10/231	19/271		70.3 %	0.62 [0.29, 1.30]
Subtotal (95% CI)	**303**	**367**		**100.0 %**	**0.74 [0.39, 1.37]**
Total events: 15 (Treatment), 25 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 0.71, df = 1 (P = 0.40); I² =0.0%					
Test for overall effect: Z = 0.96 (P = 0.33)					

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        0.2   0.5    1    2    5
      Favours treatment   Favours control
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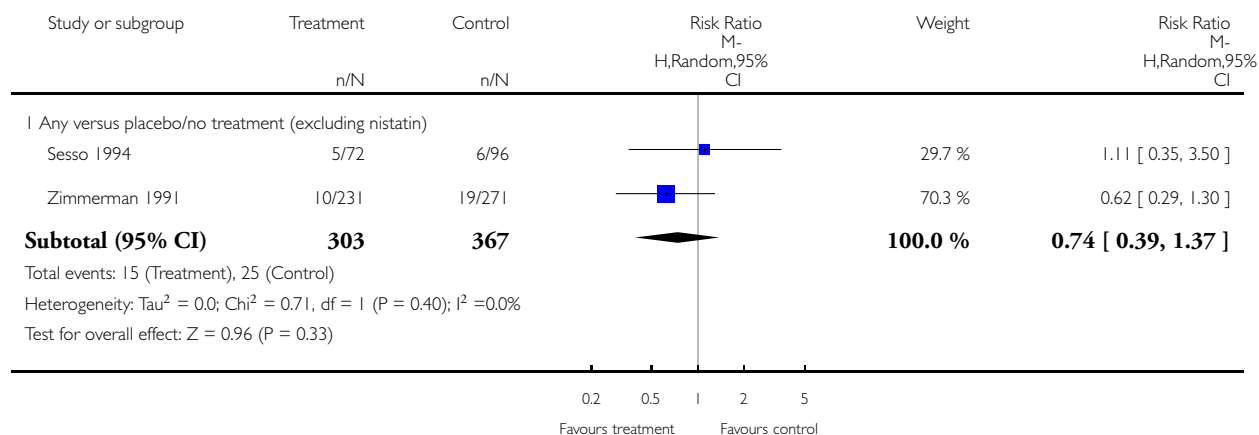
Analysis 1.5. Comparison 1 Oral antibiotics versus none, Outcome 5 Exit-site/tunnel infection (number of patients with one or more episodes).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 5 Exit-site/tunnel infection (number of patients with one or more episodes)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Any versus placebo/no treatment					
Blowey 1994	0/7	2/8		17.1 %	0.23 [0.01, 4.02]
Sesso 1994	2/9	5/7		82.9 %	0.31 [0.08, 1.15]
Subtotal (95% CI)	**16**	**15**		**100.0 %**	**0.29 [0.09, 0.97]**
Total events: 2 (Treatment), 7 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 0.04, df = 1 (P = 0.84); I² =0.0%					
Test for overall effect: Z = 2.01 (P = 0.044)					

0.01 0.1 1 10 100

Favours treatment   Favours control
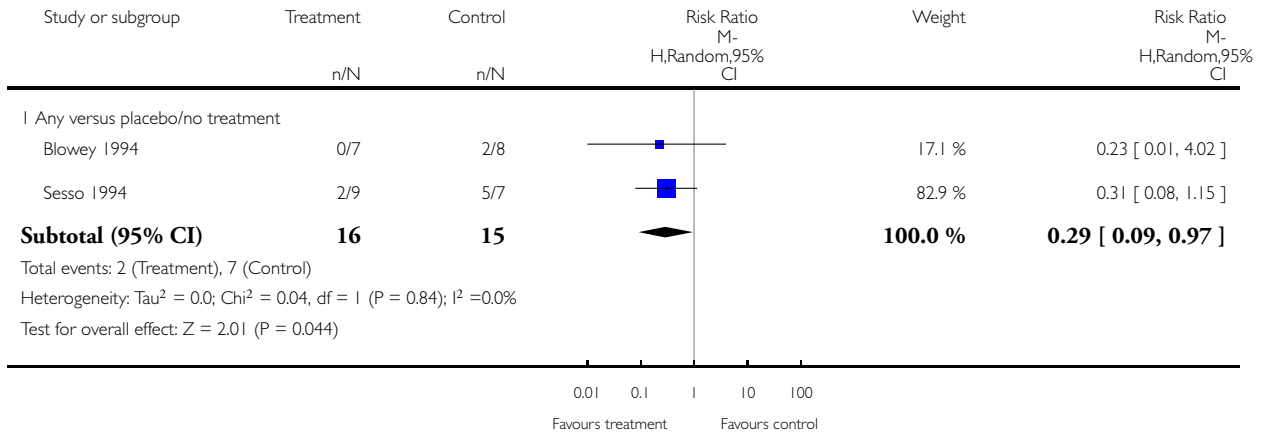
Analysis 1.6. Comparison 1 Oral antibiotics versus none, Outcome 6 Exit-site/tunnel infection rate (episodes/total patient-months on PD).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 6 Exit-site/tunnel infection rate (episodes/total patient-months on PD)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Any versus placebo/no treatment				
Sesso 1994	2/73	4/64		0.44 [0.08, 2.31]

0.05 0.2 1 5 20

Favours treatment   Favours control
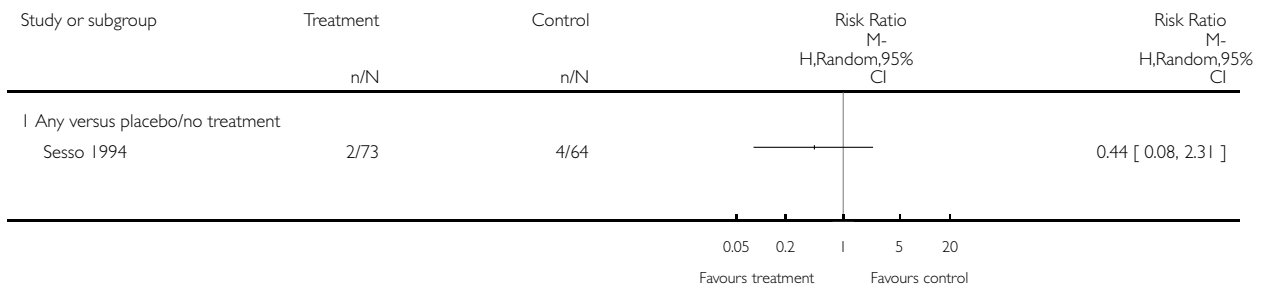
Analysis 1.7. Comparison 1 Oral antibiotics versus none, Outcome 7 Catheter removal or replacement.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 7 Catheter removal or replacement

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Any versus placebo/no treatment					
Churchill 1988	7/56	9/49		49.2 %	0.68 [0.27, 1.69]
Low 1980	3/25	1/25		8.5 %	3.00 [0.33, 26.92]
Sesso 1994	3/9	3/7		25.7 %	0.78 [0.22, 2.74]
Zimmerman 1991	2/32	5/32		16.6 %	0.40 [0.08, 1.91]
Subtotal (95% CI)	**122**	**113**		**100.0 %**	**0.73 [0.39, 1.38]**
Total events: 15 (Treatment), 18 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 2.20, df = 3 (P = 0.53); I² =0.0%					
Test for overall effect: Z = 0.96 (P = 0.34)					

$$0.02 \quad 0.1 \quad 1 \quad 10 \quad 50$$

Favours treatment   Favours control
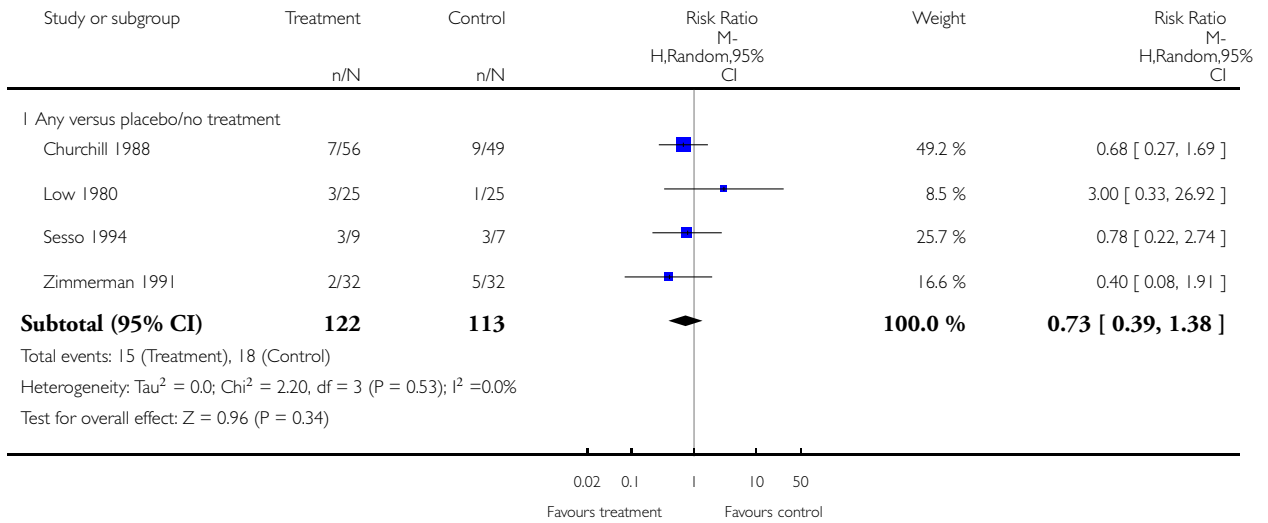
Analysis 1.8. Comparison 1 Oral antibiotics versus none, Outcome 8 Pruritus (generalised).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 8 Pruritus (generalised)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Rifampin (oral) versus none				
Zimmerman 1991	1/32	0/32		3.00 [0.13, 71.00]

$$0.01 \quad 0.1 \quad 1 \quad 10 \quad 100$$

Favours treatment   Favours control

Analysis 1.9. Comparison 1 Oral antibiotics versus none, Outcome 9 Diarrhoea.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 9 Diarrhoea

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Rifampin (oral) versus none				
Zimmerman 1991	0/32	5/32		0.09 [0.01, 1.58]

0.005   0.1   1   10   200

Favours treatment   Favours control

Analysis 1.10. Comparison 1 Oral antibiotics versus none, Outcome 10 Nausea.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 10 Nausea

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Rifampin (oral) versus none				
Zimmerman 1991	4/32	0/32		9.00 [0.50, 160.59]

0.005   0.1   1   10   200

Favours treatment   Favours control

Analysis 1.11. Comparison 1 Oral antibiotics versus none, Outcome 11 Allergy.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 11 Allergy

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
1 Rifampin (oral) versus none				
Zimmerman 1991	2/32	0/32		5.00 [0.25, 100.20]

0.005   0.1   1   10   200

Favours treatment   Favours control

Analysis 1.12. Comparison 1 Oral antibiotics versus none, Outcome 12 Nasal irritation.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 12 Nasal irritation

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
1 Ofloxacin (oral) versus placebo				
Sesso 1994	0/9	0/7		Not estimable

0.01   0.1   1   10   100

Favours treatment   Favours control

Analysis 1.13. Comparison 1 Oral antibiotics versus none, Outcome 13 Fungal peritonitis (number of patients with one or more episodes).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 13 Fungal peritonitis (number of patients with one or more episodes)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Nistatin versus none				
Wai-Kei Lo 1996	6/199	11/198		0.54 [0.20, 1.44]

```
        0.2   0.5    1    2    5
      Favours treatment   Favours control
```

Analysis 1.14. Comparison 1 Oral antibiotics versus none, Outcome 14 Fungal peritonitis rate (episodes/patient-months on PD).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 1 Oral antibiotics versus none

Outcome: 14 Fungal peritonitis rate (episodes/patient-months on PD)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Nistatin (oral) versus none				
Wai-Kei Lo 1996	4/894	12/274		0.10 [0.03, 0.31]

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      0.02   0.1    1    10   50
      Favours treatment   Favours control
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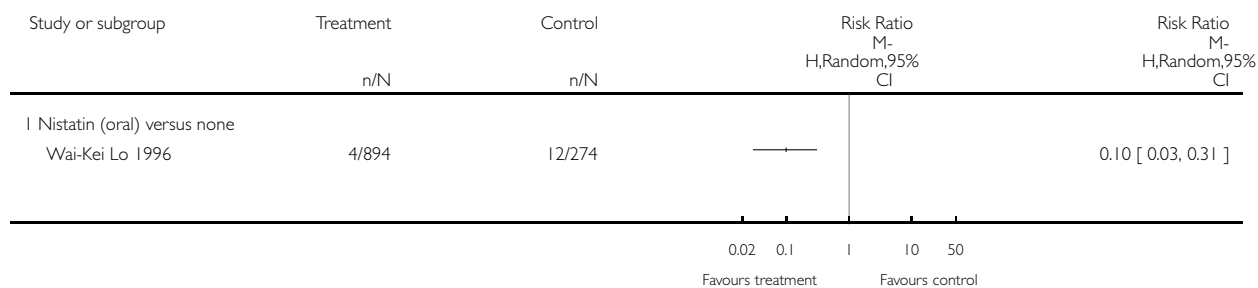
Analysis 2.1.   Comparison 2 Nasal antibiotics versus none, Outcome 1 Mortality (all cause).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 1 Mortality (all cause)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Any versus placebo					
Mupirocin SG 1996	22/134	25/133		100.0 %	0.87 [0.52, 1.47]
Sesso 1994	0/9	0/6			Not estimable
Subtotal (95% CI)	**143**	**139**		**100.0 %**	**0.87 [0.52, 1.47]**
Total events: 22 (Treatment), 25 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.51 (P = 0.61)					

0.5   0.7   1   1.5   2

Favours treatment   Favours control
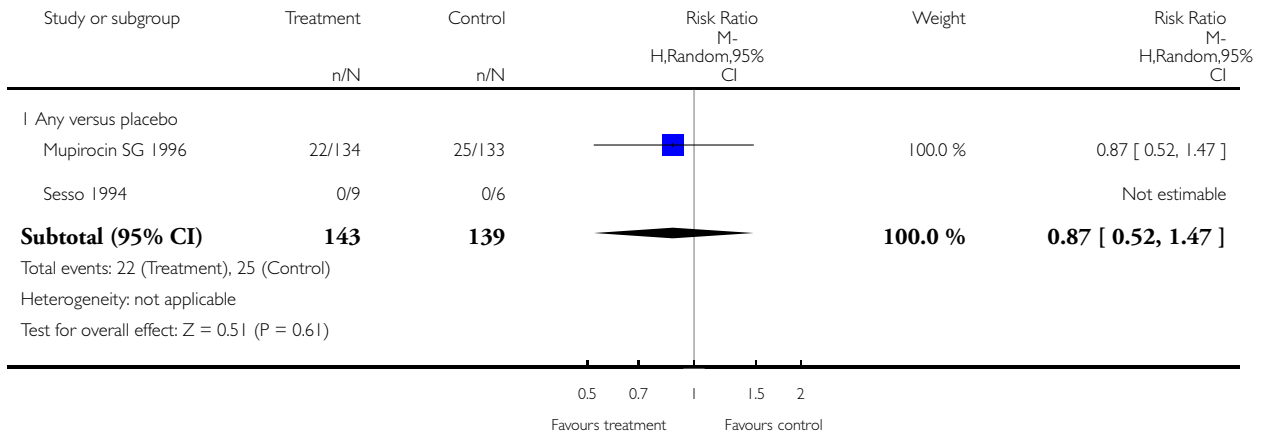
Analysis 2.2.   Comparison 2 Nasal antibiotics versus none, Outcome 2 Peritonitis (number of patients with peritonitis).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 2 Peritonitis (number of patients with peritonitis)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Any versus placebo					
Mupirocin SG 1996	43/134	44/133		97.5 %	0.97 [0.69, 1.37]
Sesso 1994	1/9	2/6		2.5 %	0.33 [0.04, 2.91]
Subtotal (95% CI)	**143**	**139**		**100.0 %**	**0.94 [0.67, 1.33]**
Total events: 44 (Treatment), 46 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 0.91, df = 1 (P = 0.34); I² =0.0%					
Test for overall effect: Z = 0.33 (P = 0.74)					

0.02   0.1   1   10   50

Favours treatment   Favours control
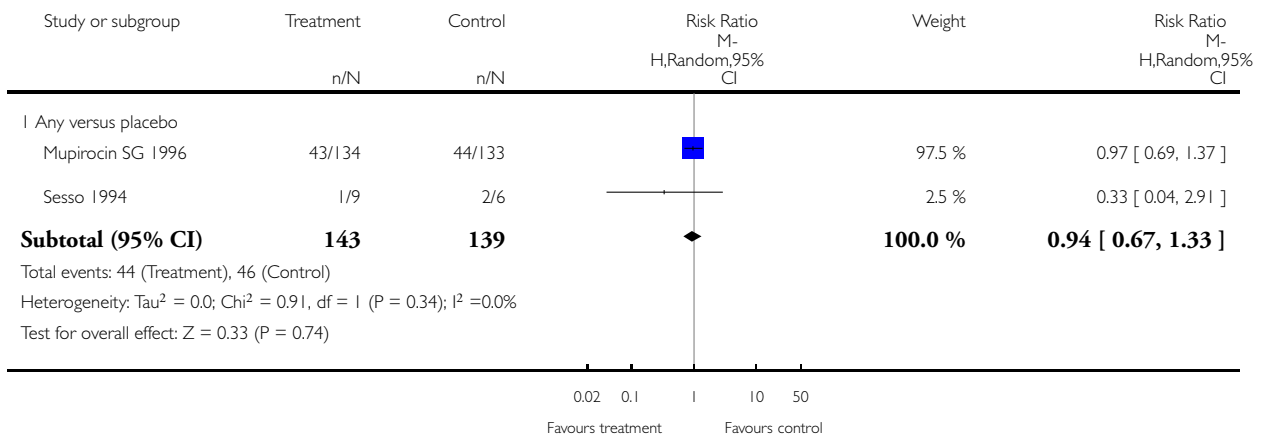
Analysis 2.3. Comparison 2 Nasal antibiotics versus none, Outcome 3 Peritonitis rate (episodes/patient-month versus total patient-months).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 3 Peritonitis rate (episodes/patient-month versus total patient-months)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
1 Mupirocin (nasal) versus placebo				
Mupirocin SG 1996	18/1390	19/1236		0.84 [0.44, 1.60]

0.2   0.5   1   2   5

Favours treatment   Favours control
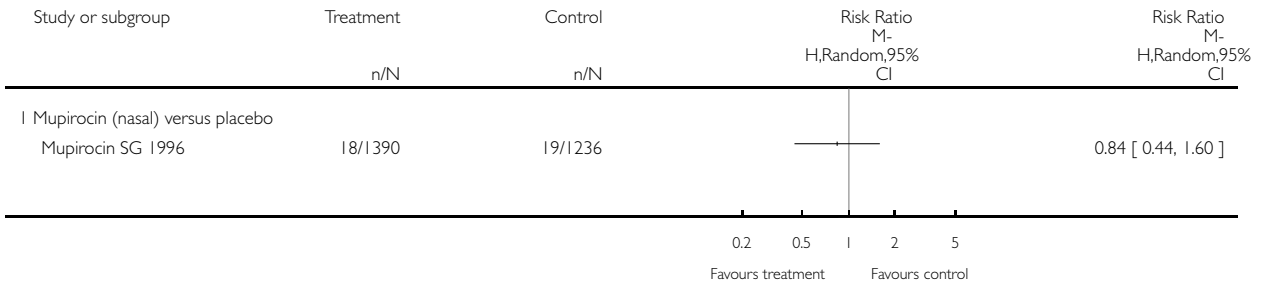
Analysis 2.4. Comparison 2 Nasal antibiotics versus none, Outcome 4 Exit site and tunnel infection (number of patients with exit site and tunnel infection).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 4 Exit site and tunnel infection (number of patients with exit site and tunnel infection)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
I any versus placebo					
Mupirocin SG 1996	26/134	25/133		73.1 %	1.03 [0.63, 1.69]
Sesso 1994	5/9	4/6		26.9 %	0.83 [0.37, 1.88]
Subtotal (95% CI)	**143**	**139**		**100.0 %**	**0.97 [0.64, 1.49]**
Total events: 31 (Treatment), 29 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 0.21, df = I (P = 0.65); I² =0.0%					
Test for overall effect: Z = 0.12 (P = 0.90)					

```
        0.2   0.5   I    2    5
     Favours treatment   Favours control
```

Analysis 2.5. Comparison 2 Nasal antibiotics versus none, Outcome 5 Exit site and tunnel infection rate (episodes/patient-month versus total patient-months).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 5 Exit site and tunnel infection rate (episodes/patient-month versus total patient-months)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
I Mupirocin versus placebo				
Mupirocin SG 1996	42/1390	64/1236		0.58 [0.40, 0.85]

```
        0.2   0.5   I    2    5
     Favours treatment   Favours control
```

Analysis 2.6.   Comparison 2 Nasal antibiotics versus none, Outcome 6 Catheter removal or replacement.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 6 Catheter removal or replacement

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Any versus placebo					
Mupirocin SG 1996	8/134	9/133		58.0 %	0.88 [0.35, 2.22]
Sesso 1994	4/9	3/6		42.0 %	0.89 [0.30, 2.63]
Subtotal (95% CI)	**143**	**139**		**100.0 %**	**0.89 [0.44, 1.79]**
Total events: 12 (Treatment), 12 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 0.00, df = 1 (P = 0.99); I² =0.0%					
Test for overall effect: Z = 0.34 (P = 0.73)					

```
              0.2    0.5    1    2    5
          Favours treatment    Favours control
```
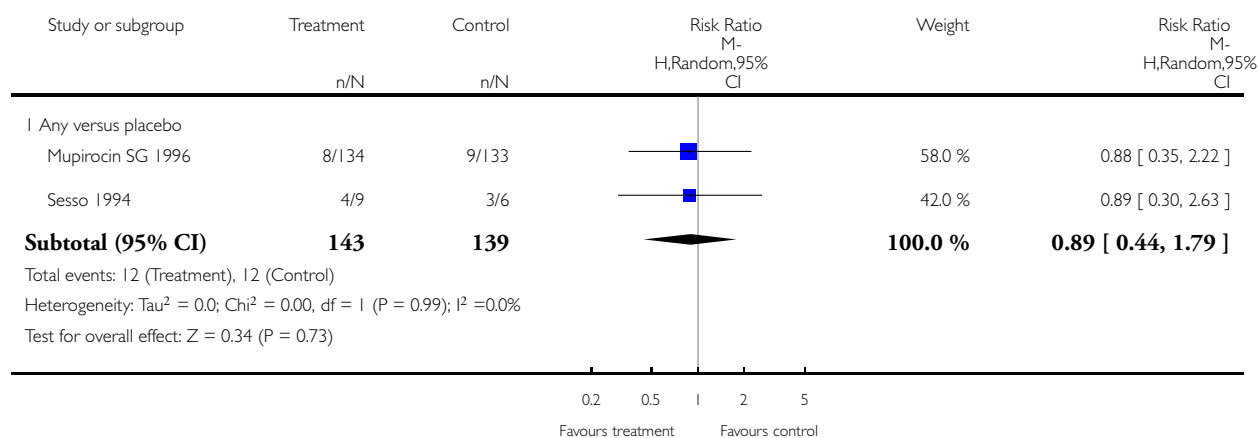
Analysis 2.7.   Comparison 2 Nasal antibiotics versus none, Outcome 7 Nasal irritation/rhinitis.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 7 Nasal irritation/rhinitis

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
1 Fusidate versus placebo				
Sesso 1994	1/9	0/6		2.10 [0.10, 44.40]
2 Mupirocin versus placebo				
Mupirocin SG 1996	6/134	8/133		0.74 [0.27, 2.09]

```
            0.02   0.1    1    10   50
        Favours treatment    Favours control
```
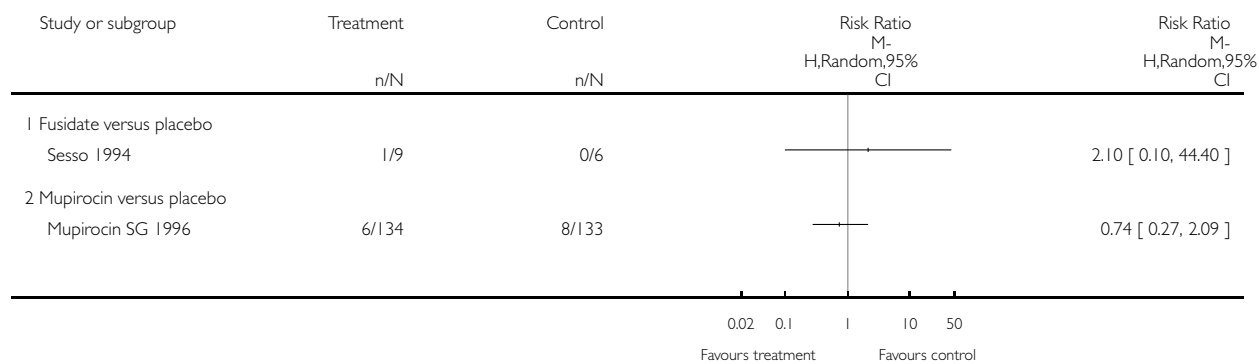
Analysis 2.8. Comparison 2 Nasal antibiotics versus none, Outcome 8 Headache.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 8 Headache

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
Mupirocin SG 1996	2/134	2/133		0.99 [0.14, 6.94]

```
        0.1  0.2   0.5   1    2    5   10
       Favours treatment      Favours control
```
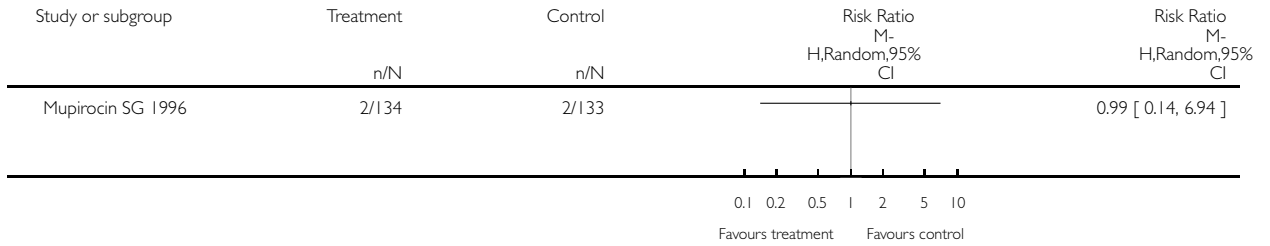
Analysis 2.9. Comparison 2 Nasal antibiotics versus none, Outcome 9 Diarrhoea.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 9 Diarrhoea

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
Mupirocin SG 1996	5/134	3/133		1.65 [0.40, 6.78]

```
        0.1  0.2   0.5   1    2    5   10
       Favours treatment      Favours control
```

Analysis 2.10.   Comparison 2 Nasal antibiotics versus none, Outcome 10 Nausea.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 10 Nausea

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
Mupirocin SG 1996	2/134	2/133		0.99 [0.14, 6.94]

0.1   0.2   0.5   1   2   5   10

Favours treatment   Favours control

Analysis 2.11.   Comparison 2 Nasal antibiotics versus none, Outcome 11 Vomiting.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

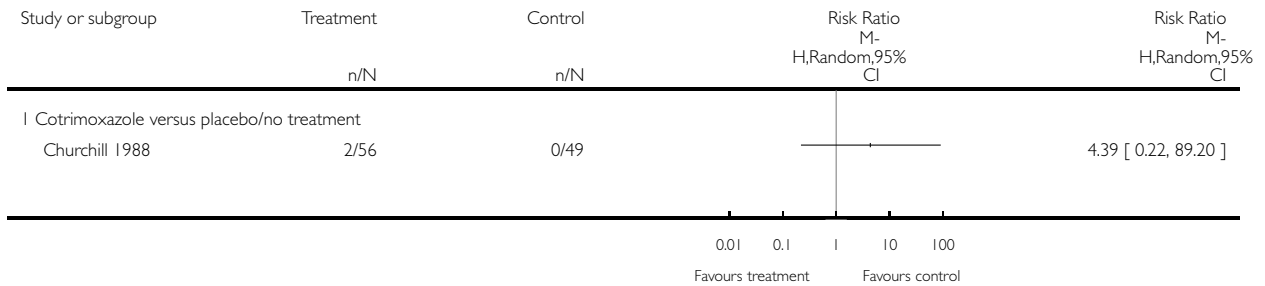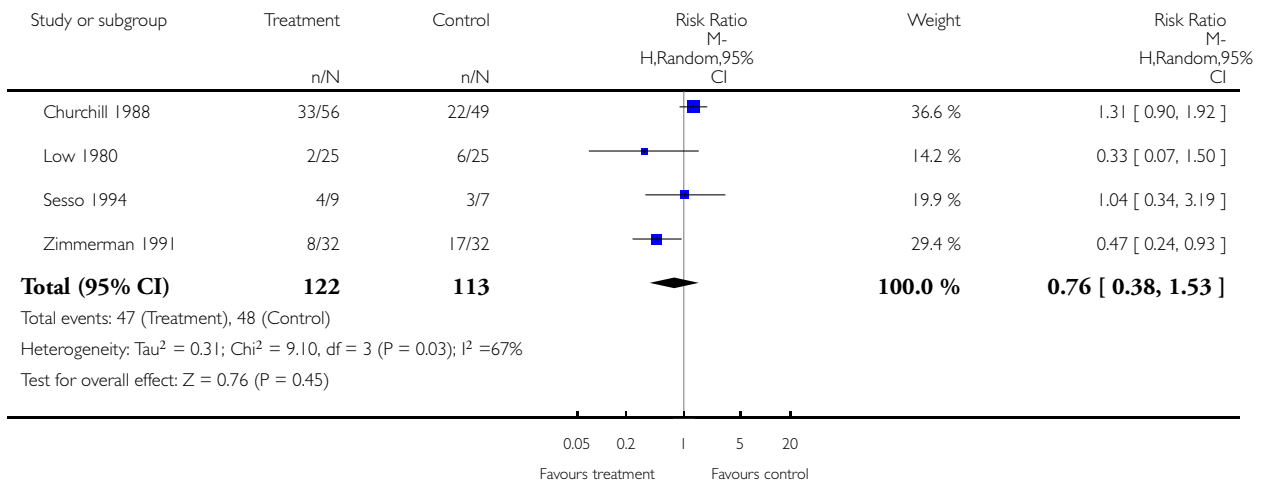Comparison: 2 Nasal antibiotics versus none

Outcome: 11 Vomiting

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
Mupirocin SG 1996	6/134	2/133		2.98 [0.61, 14.49]

0.05   0.2   1   5   20

Favours treatment   Favours control

Analysis 2.12. Comparison 2 Nasal antibiotics versus none, Outcome 12 Pruritus.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 12 Pruritus

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
Mupirocin SG 1996	3/134	2/133		1.49 [0.25, 8.77]

0.1 0.2 0.5 1 2 5 10

Favours treatment   Favours control

Analysis 2.13. Comparison 2 Nasal antibiotics versus none, Outcome 13 Peritonitis.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 13 Peritonitis

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
Mupirocin SG 1996	43/134	44/133		97.5 %	0.97 [0.69, 1.37]
Sesso 1994	1/9	2/6		2.5 %	0.33 [0.04, 2.91]
Total (95% CI)	**143**	**139**		**100.0 %**	**0.94 [0.67, 1.33]**

Total events: 44 (Treatment), 46 (Control)

Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.91, df = 1 (P = 0.34); I^2 =0.0%

Test for overall effect: Z = 0.33 (P = 0.74)

0.02 0.1 1 10 50

Favours treatment   Favours control

Analysis 2.14. Comparison 2 Nasal antibiotics versus none, Outcome 14 Peritonitis rate.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 2 Nasal antibiotics versus none

Outcome: 14 Peritonitis rate

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
Mupirocin SG 1996	18/1390	19/1236		0.84 [0.44, 1.60]

```
                                        0.2    0.5    1    2    5
                                      Favours treatment   Favours control
```

Analysis 2.15. Comparison 2 Nasal antibiotics versus none, Outcome 15 Exit-site/tunnel infection.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients
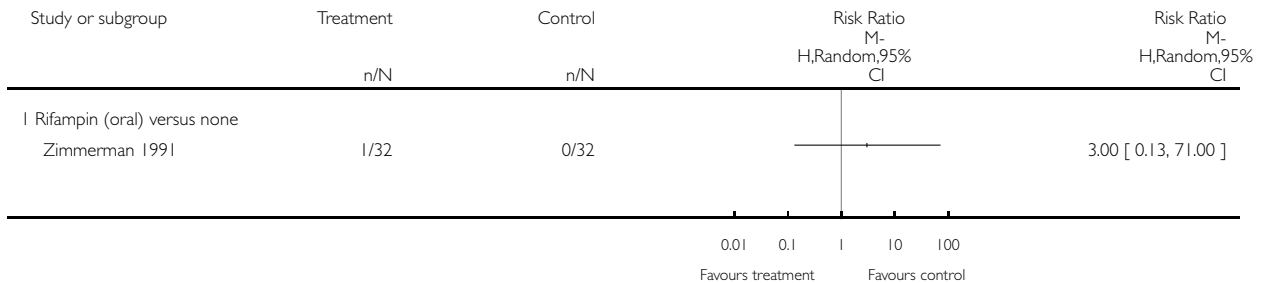
Comparison: 2 Nasal antibiotics versus none

Outcome: 15 Exit-site/tunnel infection

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Mupirocin SG 1996	26/134	25/133		73.1 %	1.03 [0.63, 1.69]
Sesso 1994	5/9	4/6		26.9 %	0.83 [0.37, 1.88]
Total (95% CI)	**143**	**139**		**100.0 %**	**0.97 [0.64, 1.49]**

Total events: 31 (Treatment), 29 (Control)

Heterogeneity: Tau² = 0.0; Chi² = 0.21, df = 1 (P = 0.65); I² =0.0%

Test for overall effect: Z = 0.12 (P = 0.90)

```
                                        0.2    0.5    1    2    5
                                      Favours treatment   Favours control
```

Analysis 2.16. Comparison 2 Nasal antibiotics versus none, Outcome 16 Exit-site/tunnel infection rate.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

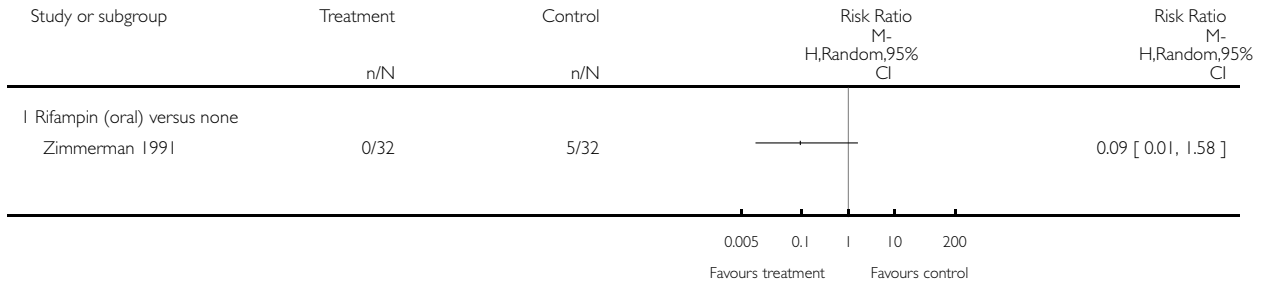Comparison: 2 Nasal antibiotics versus none

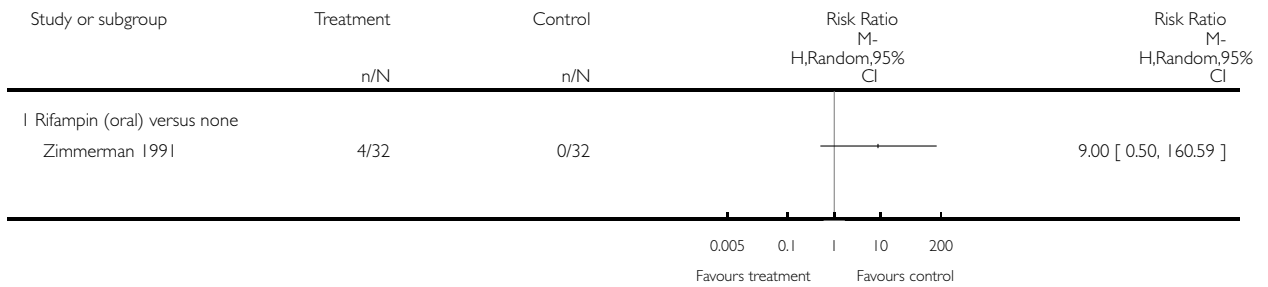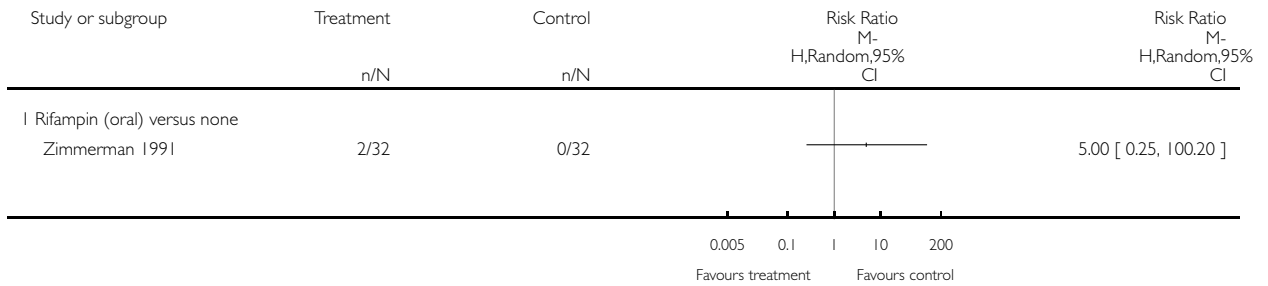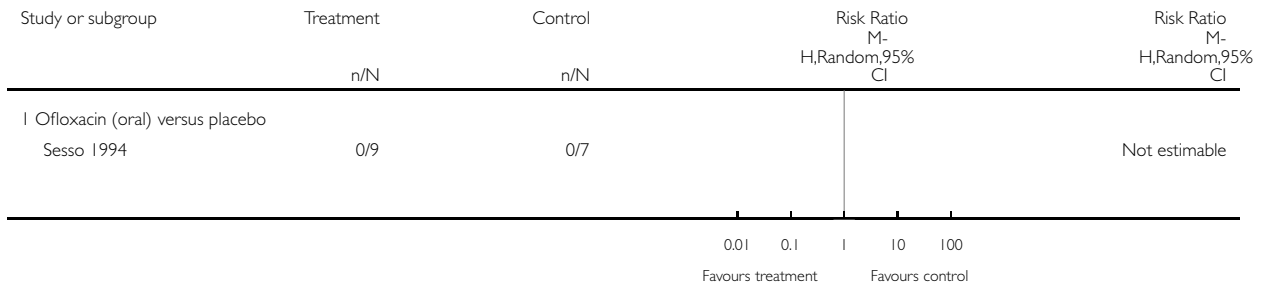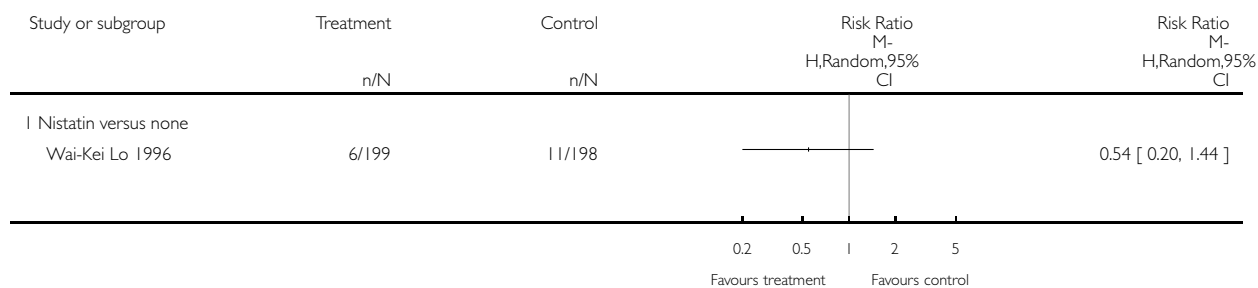Outcome: 16 Exit-site/tunnel infection rate

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
Mupirocin SG 1996	42/1390	64/1236		0.58 [0.40, 0.85]

0.2   0.5   1   2   5

Favours treatment   Favours control
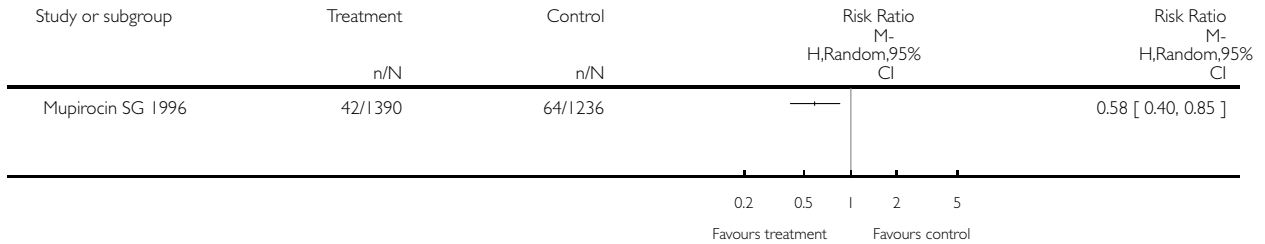
Analysis 3.1. Comparison 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials), Outcome 1 Peritonitis (number of patients with peritonitis).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials)

Outcome: 1 Peritonitis (number of patients with peritonitis)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Bennet-Jones 1988	1/13	6/13		16.7 %	0.17 [0.02, 1.20]
Gadallah 2000	7/148	10/73		62.9 %	0.35 [0.14, 0.87]
Lye 1992	2/25	1/25		12.1 %	2.00 [0.19, 20.67]
Wikdahl 1997	0/18	4/20		8.2 %	0.12 [0.01, 2.13]
Total (95% CI)	**204**	**131**		**100.0 %**	**0.35 [0.15, 0.80]**

Total events: 10 (Treatment), 21 (Control)

Heterogeneity: Tau^2 = 0.06; Chi^2 = 3.22, df = 3 (P = 0.36); I^2 =7%

Test for overall effect: Z = 2.49 (P = 0.013)

0.005   0.1   1   10   200

Favours treatment   Favours control
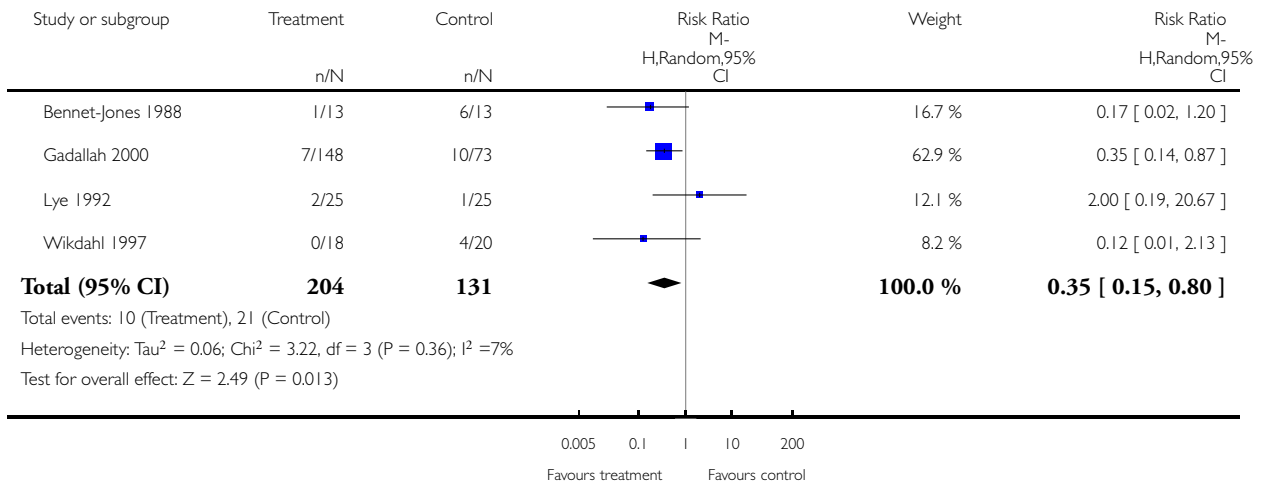
Analysis 3.2. Comparison 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials), Outcome 2 Exit site and tunnel infection (number of patients with exit site and tunnel infection).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials)

Outcome: 2 Exit site and tunnel infection (number of patients with exit site and tunnel infection)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
Bennet-Jones 1988	0/13	7/13		39.1 %	0.07 [0.00, 1.06]
Lye 1992	6/25	7/25		60.9 %	0.86 [0.34, 2.19]
Wikdahl 1997	0/18	0/20			Not estimable
Total (95% CI)	**56**	**58**		**100.0 %**	**0.32 [0.02, 4.81]**

Total events: 6 (Treatment), 14 (Control)
Heterogeneity: Tau^2 = 2.95; Chi^2 = 3.66, df = 1 (P = 0.06); I^2 =73%
Test for overall effect: Z = 0.83 (P = 0.41)

0.002   0.1   1   10   500
Favours treatment   Favours control
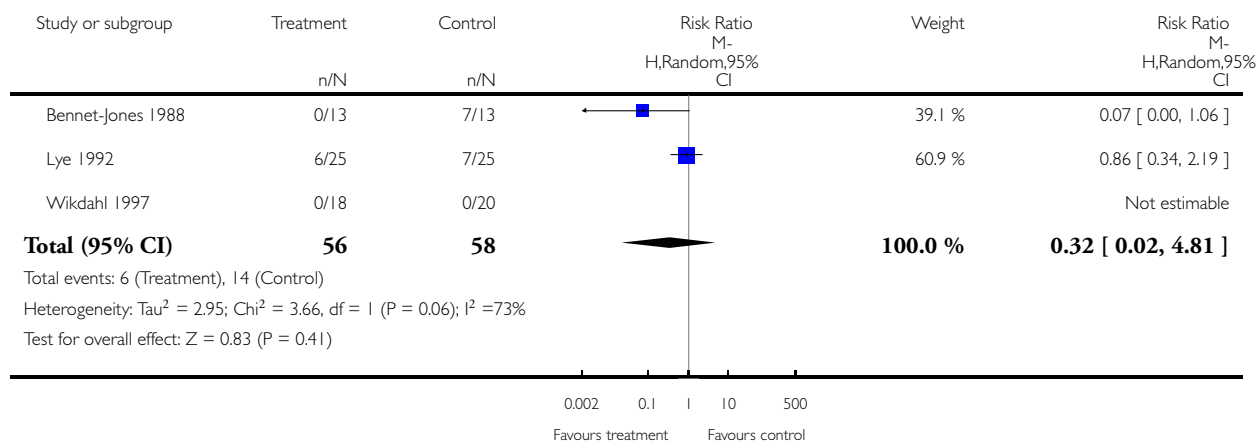
Analysis 3.3. Comparison 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials), Outcome 3 Catheter removal.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials)

Outcome: 3 Catheter removal

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
1 Gentamicin (IV) versus no treatment (preoperative)				
Bennet-Jones 1988	0/13	1/14		0.36 [0.02, 8.06]

0.01   0.1   1   10   100
Favours treatment   Favours control
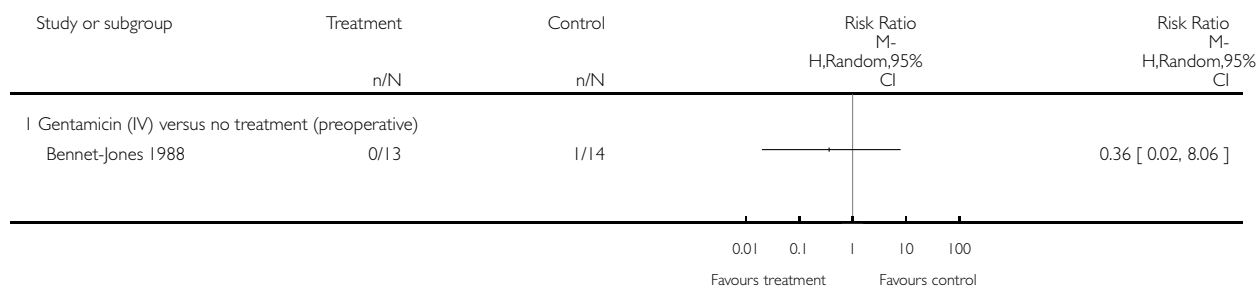
Analysis 3.4. Comparison 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials), Outcome 4 Death.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 3 Peri-operative IV prophylaxis versus none (placebo/no treatment controlled trials)

Outcome: 4 Death

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M- H,Random,95% CI	Risk Ratio M- H,Random,95% CI
Lye 1992	1/25	1/25		1.00 [0.07, 15.12]

0.05   0.2   1   5   20

Favours treatment   Favours control
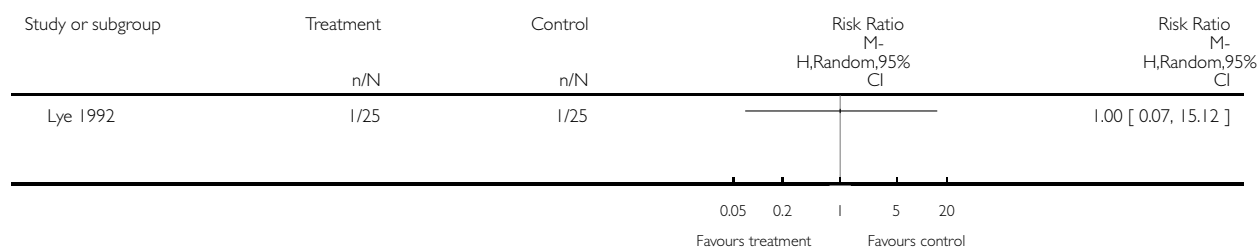
Analysis 5.1. Comparison 5 Topical disinfectants versus none, Outcome 1 Mortality (all cause).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 5 Topical disinfectants versus none

Outcome: 1 Mortality (all cause)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M- H,Random,95% CI	Weight	Risk Ratio M- H,Random,95% CI
Waite 1997	5/61	4/56		43.2 %	1.15 [0.32, 4.06]
Wilson 1997	7/77	5/72		56.8 %	1.31 [0.44, 3.94]
Total (95% CI)	**138**	**128**		**100.0 %**	**1.24 [0.54, 2.84]**

Total events: 12 (Treatment), 9 (Control)

Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.02, df = 1 (P = 0.88); I^2 =0.0%

Test for overall effect: Z = 0.50 (P = 0.62)

0.2   0.5   1   2   5
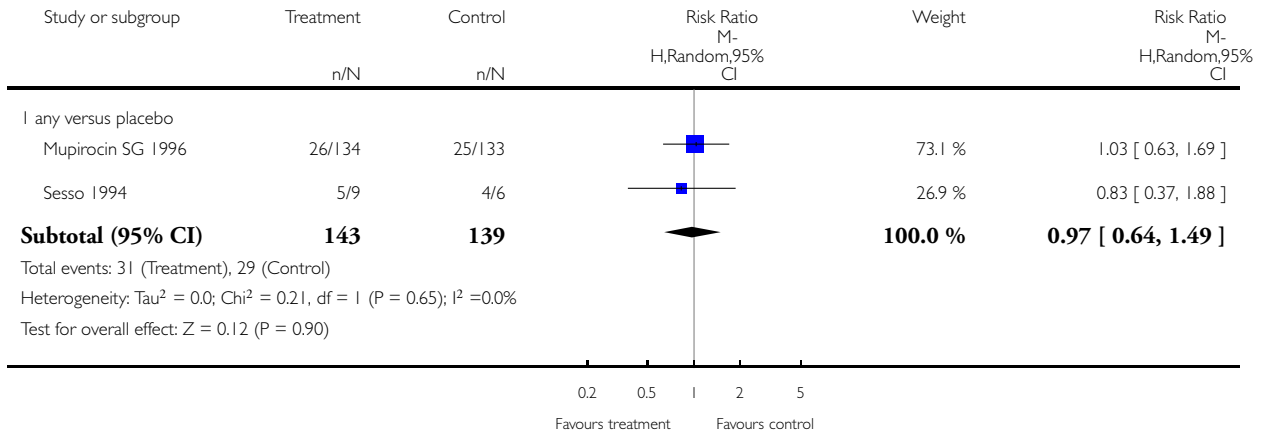
Favours treatment   Favours control
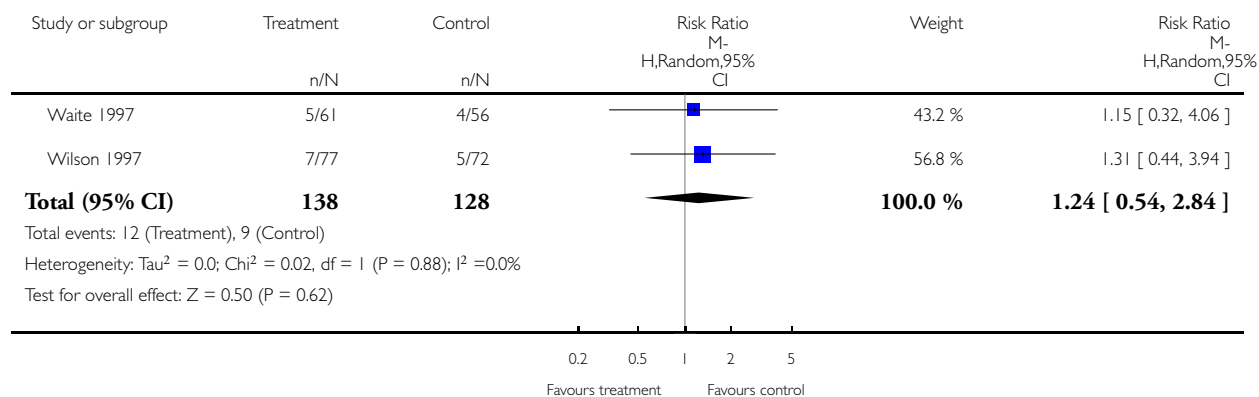
Analysis 5.2. Comparison 5 Topical disinfectants versus none, Outcome 2 Exit site and tunnel infection (number of patients with exit site and tunnel infection).
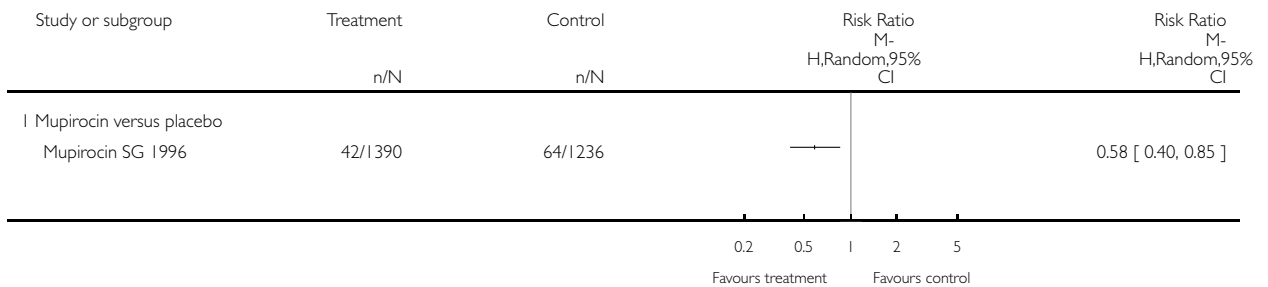
Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 5 Topical disinfectants versus none

Outcome: 2 Exit site and tunnel infection (number of patients with exit site and tunnel infection)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Luzar 1990	17/74	16/41		44.5 %	0.59 [0.33, 1.04]
Waite 1997	9/61	11/56		22.1 %	0.75 [0.34, 1.68]
Wilson 1997	14/77	15/72		33.4 %	0.87 [0.45, 1.68]
Total (95% CI)	**212**	**169**		**100.0 %**	**0.71 [0.49, 1.03]**

Total events: 40 (Treatment), 42 (Control)

Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.83, df = 2 (P = 0.66); I^2 =0.0%

Test for overall effect: Z = 1.79 (P = 0.074)

0.2   0.5   1   2   5

Favours treatment   Favours control
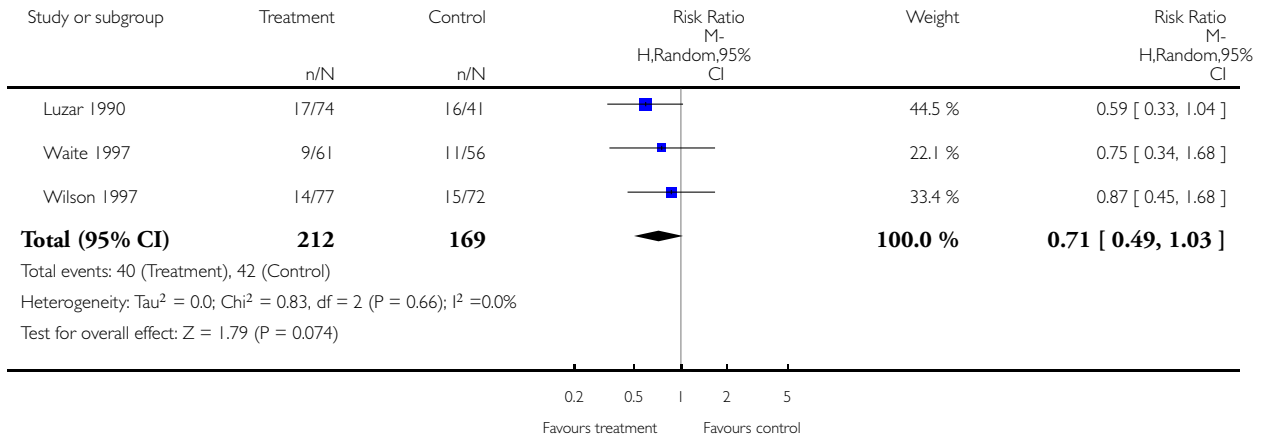
Analysis 5.3. Comparison 5 Topical disinfectants versus none, Outcome 3 Peritonitis (number of patients with peritonitis).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

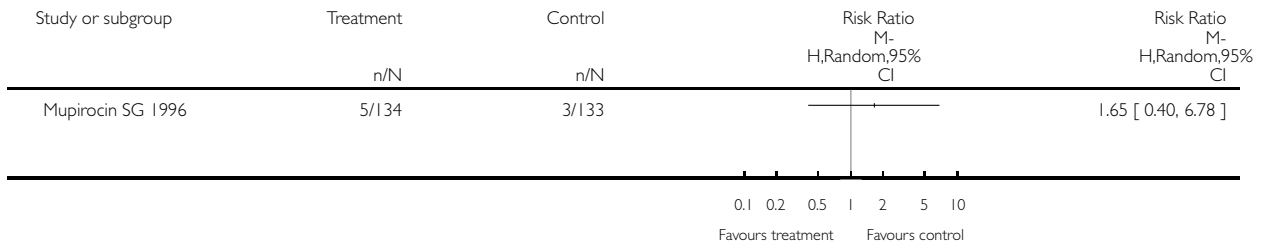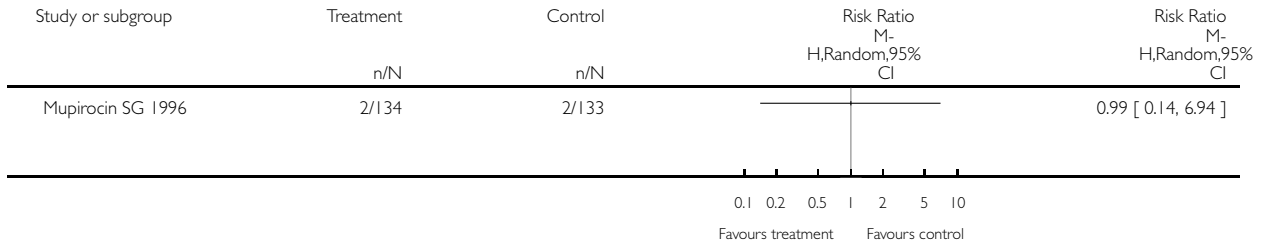Comparison: 5 Topical disinfectants versus none

Outcome: 3 Peritonitis (number of patients with peritonitis)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Luzar 1990	17/74	14/42		53.5 %	0.69 [0.38, 1.25]
Waite 1997	1/61	3/56		3.8 %	0.31 [0.03, 2.86]
Wilson 1997	13/77	15/72		42.6 %	0.81 [0.41, 1.58]
Total (95% CI)	**212**	**170**		**100.0 %**	**0.72 [0.46, 1.11]**

Total events: 31 (Treatment), 32 (Control)
Heterogeneity: Tau² = 0.0; Chi² = 0.71, df = 2 (P = 0.70); I² =0.0%
Test for overall effect: Z = 1.50 (P = 0.13)

0.02   0.1   1   10   50

Favours treatment   Favours control
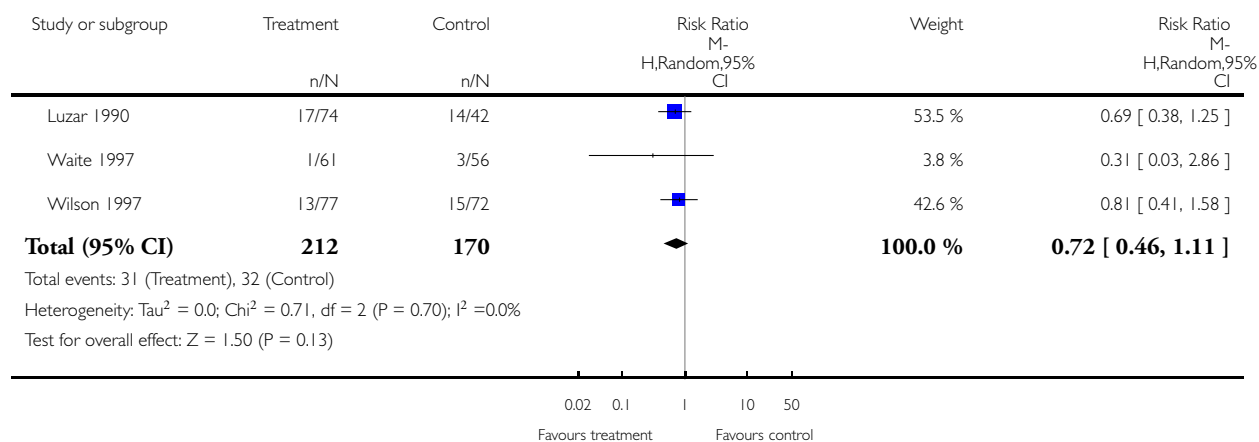
Analysis 5.4. Comparison 5 Topical disinfectants versus none, Outcome 4 Catheter removal or replacement.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

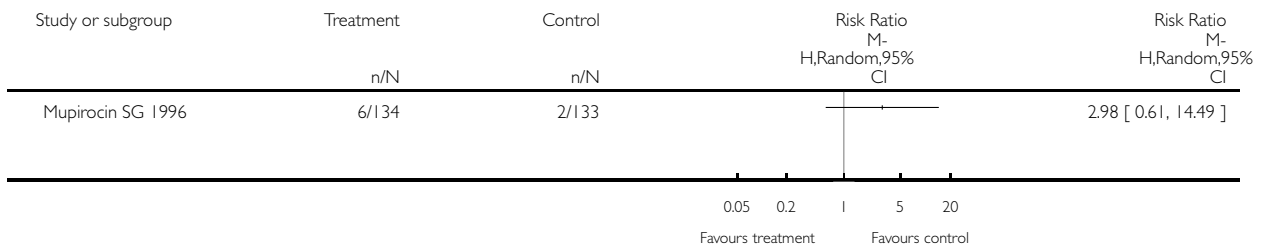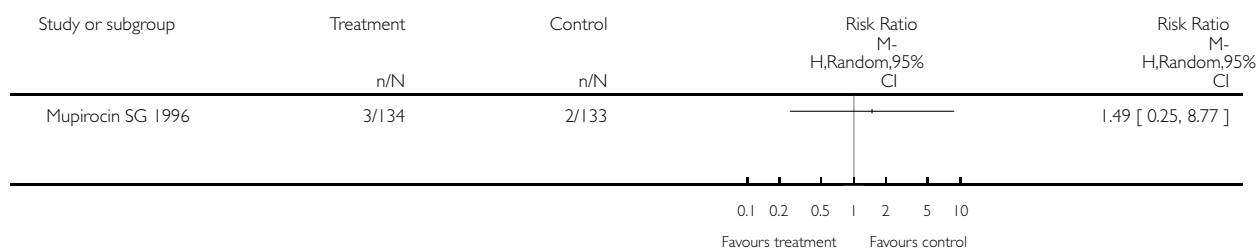Comparison: 5 Topical disinfectants versus none

Outcome: 4 Catheter removal or replacement

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Waite 1997	5/61	5/56		40.7 %	0.92 [0.28, 3.00]
Wilson 1997	6/77	9/72		59.3 %	0.62 [0.23, 1.66]
Total (95% CI)	**138**	**128**		**100.0 %**	**0.73 [0.34, 1.55]**

Total events: 11 (Treatment), 14 (Control)
Heterogeneity: Tau² = 0.0; Chi² = 0.24, df = 1 (P = 0.62); I² =0.0%
Test for overall effect: Z = 0.82 (P = 0.41)

0.2   0.5   1   2   5

Favours treatment   Favours control
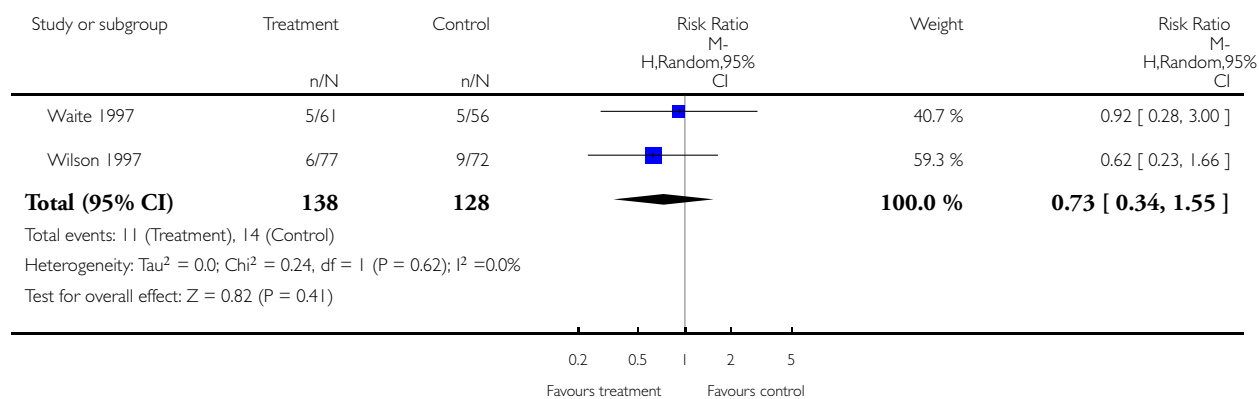
Analysis 5.5. Comparison 5 Topical disinfectants versus none, Outcome 5 Technique failure.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

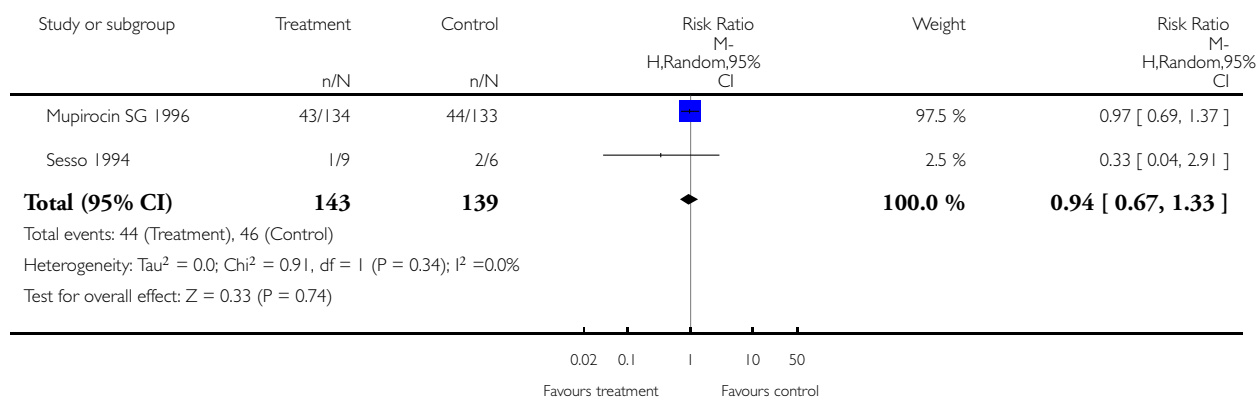Comparison: 5 Topical disinfectants versus none

Outcome: 5 Technique failure

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
Wilson 1997	0/77	2/72		0.19 [0.01, 3.83]

```
                        0.005   0.1    1    10   200
                       Favours treatment   Favours control
```
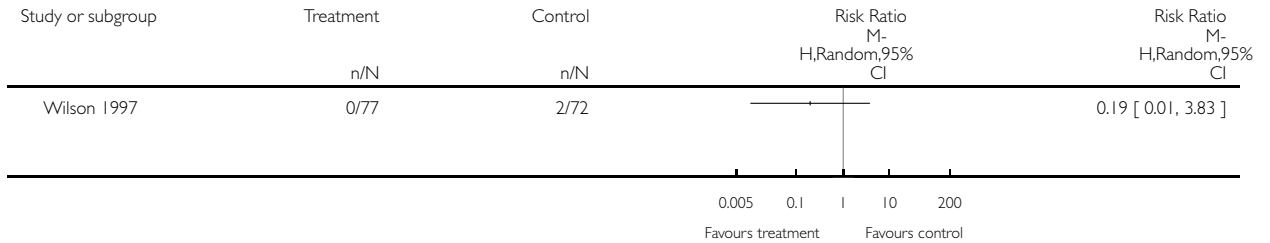
Analysis 5.6. Comparison 5 Topical disinfectants versus none, Outcome 6 Pruritus (local).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

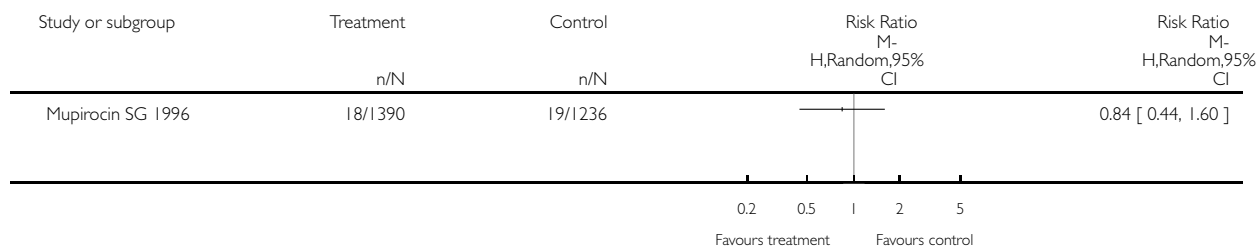Comparison: 5 Topical disinfectants versus none

Outcome: 6 Pruritus (local)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
Wilson 1997	5/77	0/72		10.29 [0.58, 182.92]

```
                        0.002   0.1    1    10   500
                       Favours treatment   Favours control
```
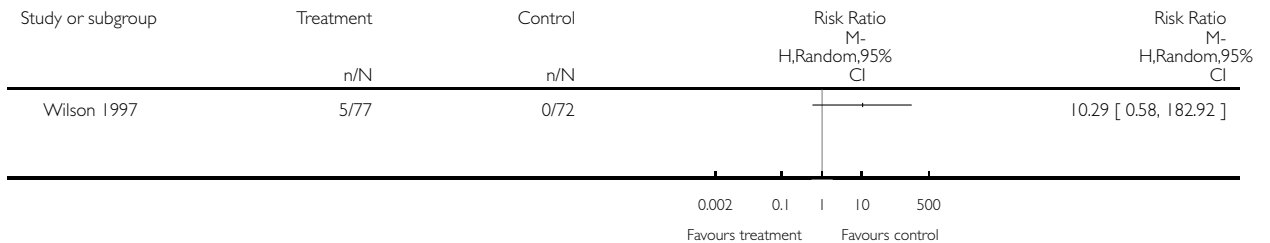
Analysis 6.1. Comparison 6 Germicidal chamber versus none, Outcome 1 Peritonitis rate (episodes/patient-month versus total patient-months).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 6 Germicidal chamber versus none
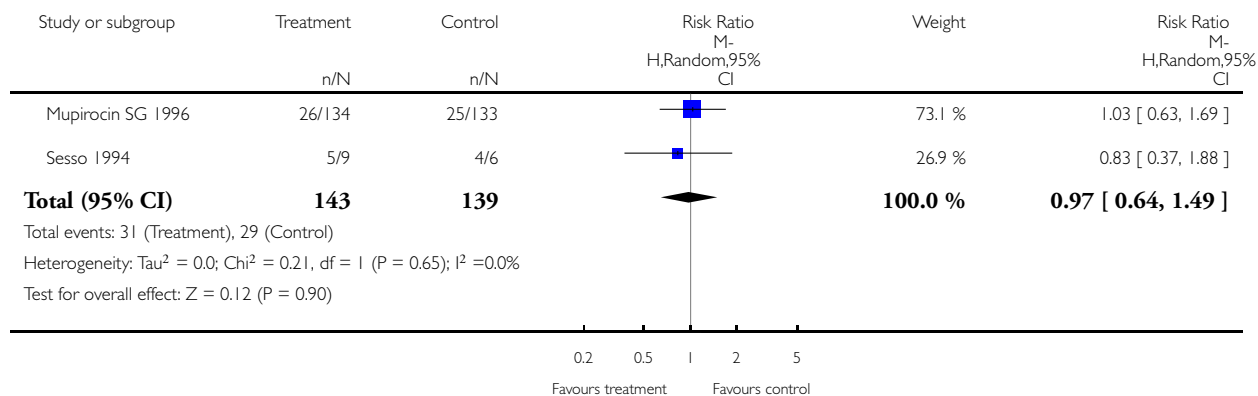
Outcome: 1 Peritonitis rate (episodes/patient-month versus total patient-months)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M- H,Random,95% CI	Risk Ratio M- H,Random,95% CI
Nolph 1985	44/601	53/753		1.04 [0.71, 1.53]

0.5   0.7   1   1.5   2

Favours treatment   Favours control
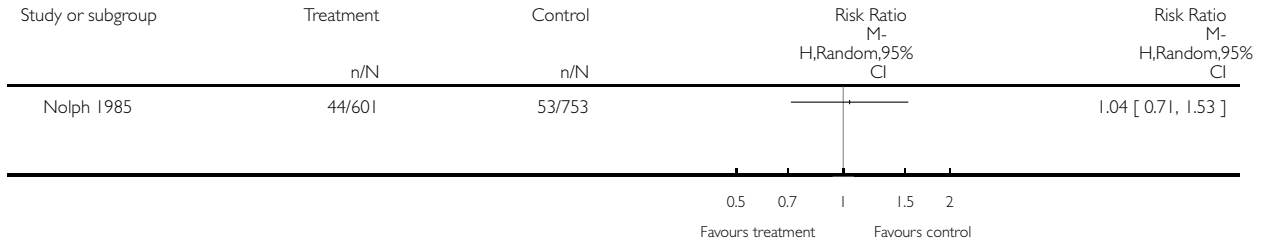
Analysis 6.2. Comparison 6 Germicidal chamber versus none, Outcome 2 Mortality (all cause).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 6 Germicidal chamber versus none

Outcome: 2 Mortality (all cause)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M- H,Random,95% CI	Risk Ratio M- H,Random,95% CI
Nolph 1985	4/74	11/93		0.46 [0.15, 1.38]

0.1   0.2   0.5   1   2   5   10

Favours treatment   Favours control
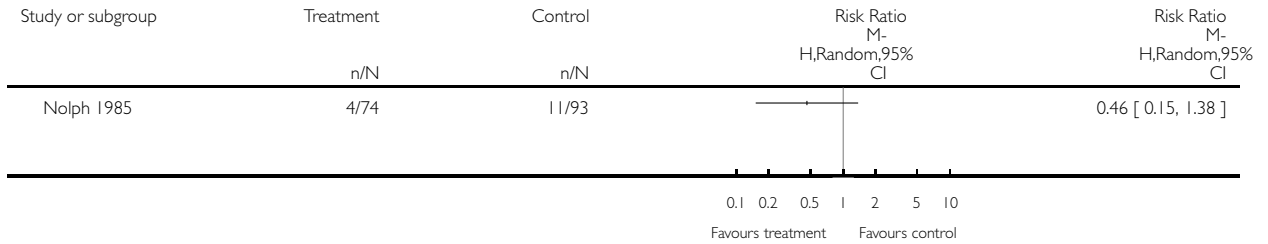
Analysis 7.1. Comparison 7 Antistaphylococcal vaccine (Staphypan) versus placebo, Outcome 1 Peritonitis rate (episodes/patient-month versus total patient-months).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 7 Antistaphylococcal vaccine (Staphypan) versus placebo

Outcome: 1 Peritonitis rate (episodes/patient-month versus total patient-months)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
Poole-Warren 1991	37/552	41/547		0.89 [0.58, 1.37]

0.5   0.7   1   1.5   2

Favours treatment   Favours control
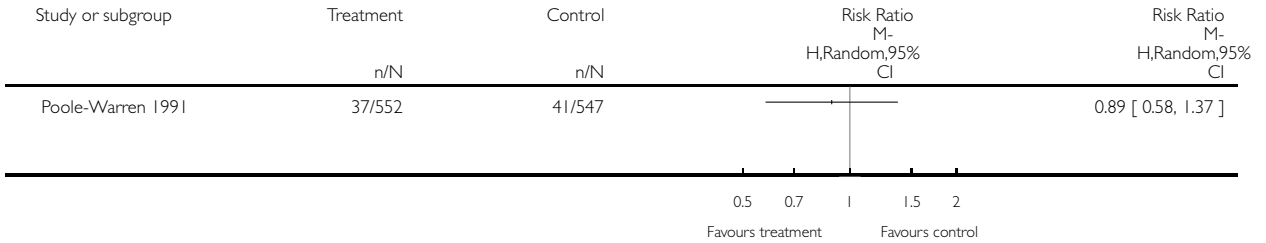
Analysis 7.2. Comparison 7 Antistaphylococcal vaccine (Staphypan) versus placebo, Outcome 2 Exit site and tunnel infection rate (episodes/patient-month versus total patient-months).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 7 Antistaphylococcal vaccine (Staphypan) versus placebo

Outcome: 2 Exit site and tunnel infection rate (episodes/patient-month versus total patient-months)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
Poole-Warren 1991	52/565	49/542		1.02 [0.70, 1.48]

0.5   0.7   1   1.5   2

Favours treatment   Favours control
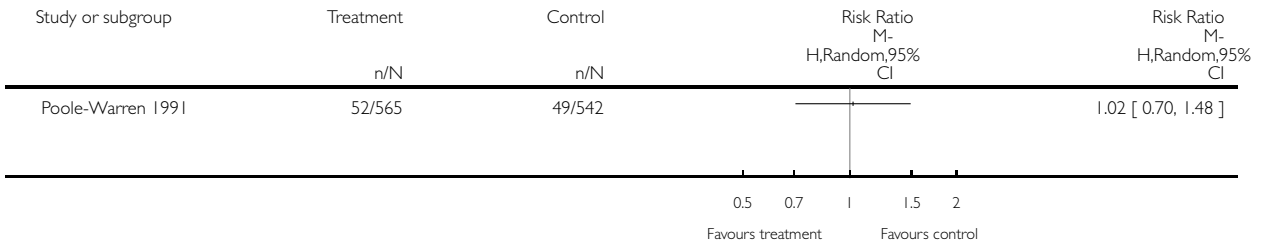
Analysis 8.1. Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 1 Mortality (all cause).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 8 Antibiotic prophylaxis head-to-head agents

Outcome: 1 Mortality (all cause)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Fusidate versus ofloxacin					
Sesso 1994	0/9	1/9		39.8 %	0.33 [0.02, 7.24]
Subtotal (95% CI)	**9**	**9**		**39.8 %**	**0.33 [0.02, 7.24]**
Total events: 0 (Treatment), 1 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.70 (P = 0.48)					
2 Mupirocin versus rifampin					
Bernardini 1996	4/41	1/41		60.2 %	4.00 [0.47, 34.28]
Subtotal (95% CI)	**41**	**41**		**60.2 %**	**4.00 [0.47, 34.28]**
Total events: 4 (Treatment), 1 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.26 (P = 0.21)					
Total (95% CI)	**50**	**50**		**100.0 %**	**1.49 [0.14, 16.15]**
Total events: 4 (Treatment), 2 (Control)					
Heterogeneity: Tau² = 1.25; Chi² = 1.68, df = 1 (P = 0.19); I² =41%					
Test for overall effect: Z = 0.33 (P = 0.74)					

```
        0.01   0.1    1    10    100
      Favours treatment    Favours control
```

Analysis 8.2. Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 2 Exit site and tunnel infection (number of patients with exit site and tunnel infection).

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Fusidate versus ofloxacin					
Sesso 1994	5/9	2/9		23.2 %	2.50 [0.65, 9.69]
Subtotal (95% CI)	**9**	**9**		**23.2 %**	**2.50 [0.65, 9.69]**
Total events: 5 (Treatment), 2 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.33 (P = 0.18)					
2 Vancomicin versus cefazolin (preoperative)					
Gadallah 2000	3/103	6/102		23.1 %	0.50 [0.13, 1.93]
Subtotal (95% CI)	**103**	**102**		**23.1 %**	**0.50 [0.13, 1.93]**
Total events: 3 (Treatment), 6 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.01 (P = 0.31)					
3 Mupirocin versus rifampin					
Bernardini 1996	11/41	13/41		53.8 %	0.85 [0.43, 1.66]
Subtotal (95% CI)	**41**	**41**		**53.8 %**	**0.85 [0.43, 1.66]**
Total events: 11 (Treatment), 13 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.48 (P = 0.63)					
Total (95% CI)	**153**	**152**		**100.0 %**	**0.96 [0.45, 2.03]**
Total events: 19 (Treatment), 21 (Control)					
Heterogeneity: Tau² = 0.15; Chi² = 2.96, df = 2 (P = 0.23); I² =32%					
Test for overall effect: Z = 0.10 (P = 0.92)					

0.1 0.2 0.5 1 2 5 10

Favours treatment   Favours control

Analysis 8.3.   Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 3 Peritonitis (number of patients with peritonitis).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 8 Antibiotic prophylaxis head-to-head agents

Outcome: 3 Peritonitis (number of patients with peritonitis)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Vancomicin versus cefazolin (preoperative)					
Gadallah 2000	1/103	9/102		42.9 %	0.11 [0.01, 0.85]
Subtotal (95% CI)	**103**	**102**		**42.9 %**	**0.11 [0.01, 0.85]**
Total events: 1 (Treatment), 9 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 2.11 (P = 0.035)					
2 Mupirocin versus rifampin					
Bernardini 1996	15/41	12/41		57.1 %	1.25 [0.67, 2.33]
Subtotal (95% CI)	**41**	**41**		**57.1 %**	**1.25 [0.67, 2.33]**
Total events: 15 (Treatment), 12 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.70 (P = 0.48)					
Total (95% CI)	**144**	**143**		**100.0 %**	**0.44 [0.03, 5.73]**
Total events: 16 (Treatment), 21 (Control)					
Heterogeneity: Tau² = 2.90; Chi² = 5.87, df = 1 (P = 0.02); I² =83%					
Test for overall effect: Z = 0.63 (P = 0.53)					

```
         0.01   0.1    1    10   100
       Favours treatment   Favours control
```

Analysis 8.4. Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 4 Peritonitis rate (episodes/patient-month versus total patient-months).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

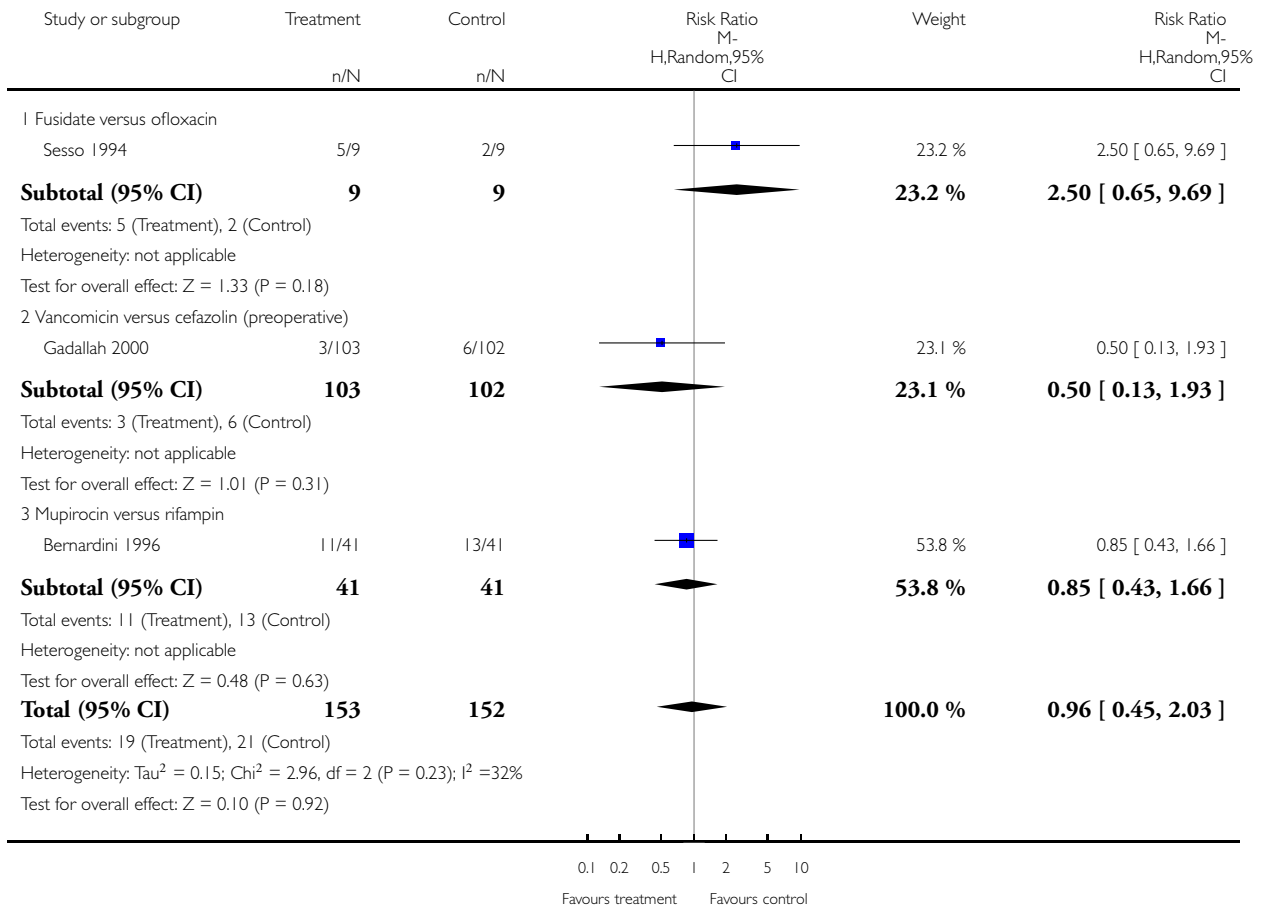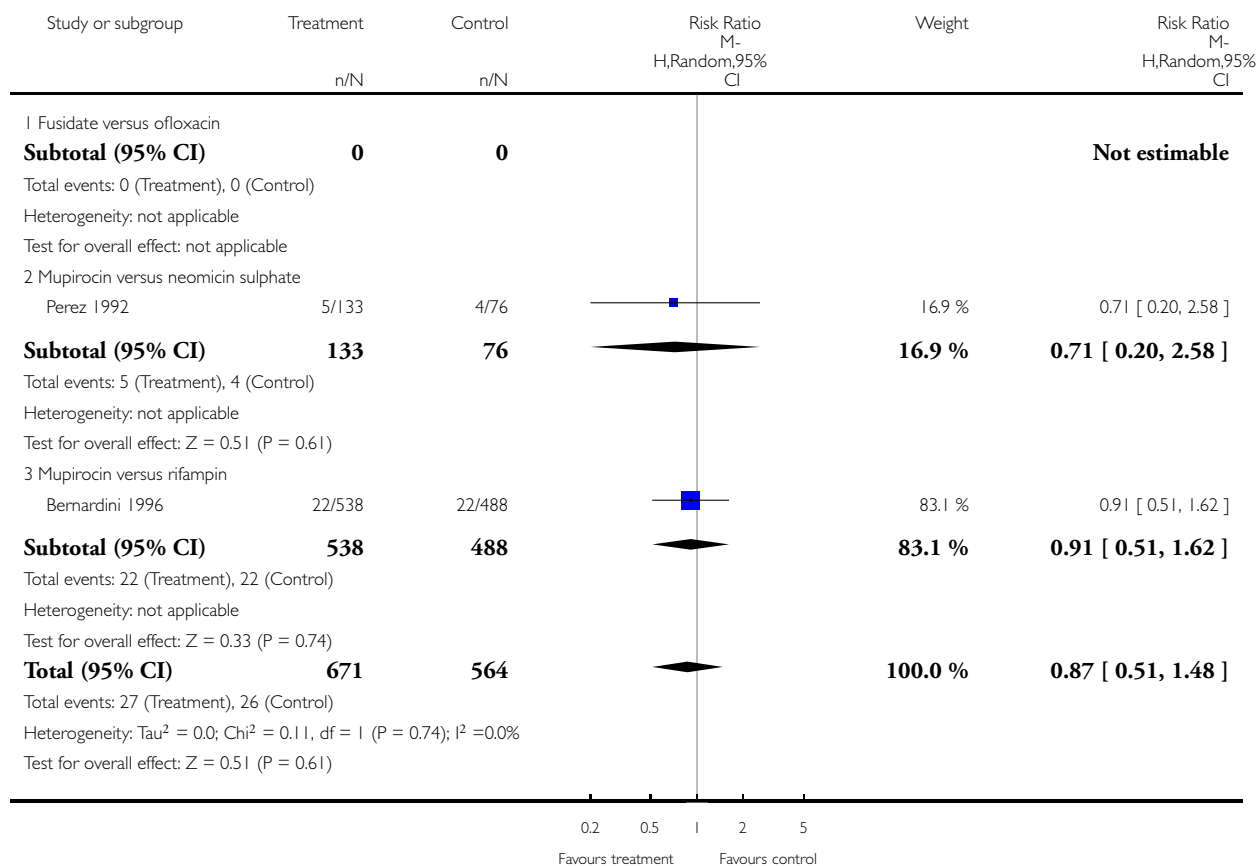Comparison: 8 Antibiotic prophylaxis head-to-head agents

Outcome: 4 Peritonitis rate (episodes/patient-month versus total patient-months)
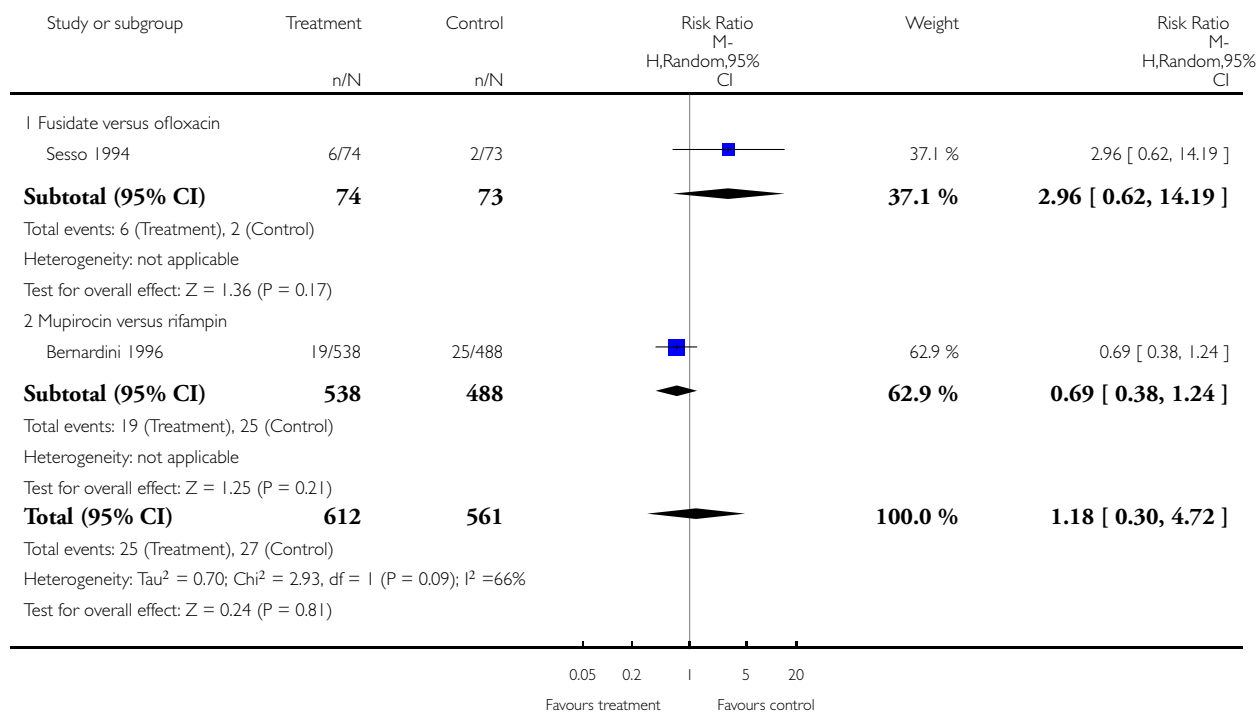
Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Fusidate versus ofloxacin					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (Treatment), 0 (Control)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
2 Mupirocin versus neomicin sulphate					
Perez 1992	5/133	4/76		16.9 %	0.71 [0.20, 2.58]
Subtotal (95% CI)	**133**	**76**		**16.9 %**	**0.71 [0.20, 2.58]**
Total events: 5 (Treatment), 4 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.51 (P = 0.61)					
3 Mupirocin versus rifampin					
Bernardini 1996	22/538	22/488		83.1 %	0.91 [0.51, 1.62]
Subtotal (95% CI)	**538**	**488**		**83.1 %**	**0.91 [0.51, 1.62]**
Total events: 22 (Treatment), 22 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.33 (P = 0.74)					
Total (95% CI)	**671**	**564**		**100.0 %**	**0.87 [0.51, 1.48]**
Total events: 27 (Treatment), 26 (Control)					
Heterogeneity: Tau² = 0.0; Chi² = 0.11, df = 1 (P = 0.74); I² =0.0%					
Test for overall effect: Z = 0.51 (P = 0.61)					

0.2   0.5   1   2   5

Favours treatment   Favours control

Analysis 8.5. Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 5 Exit site and tunnel infection (rate).

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 8 Antibiotic prophylaxis head-to-head agents
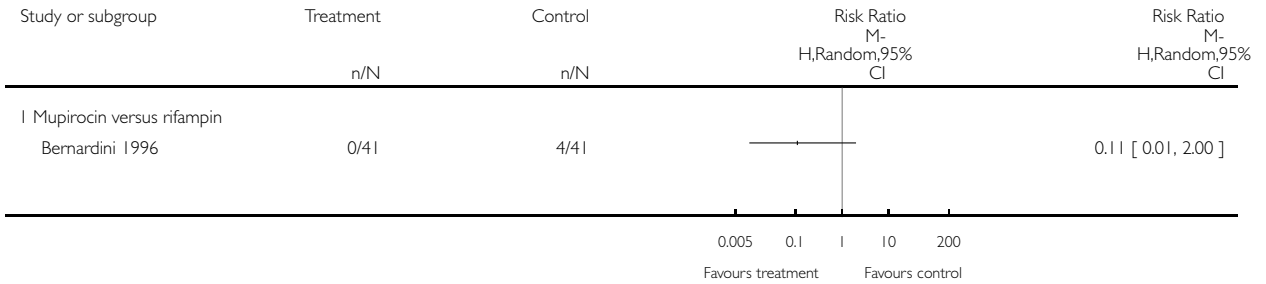
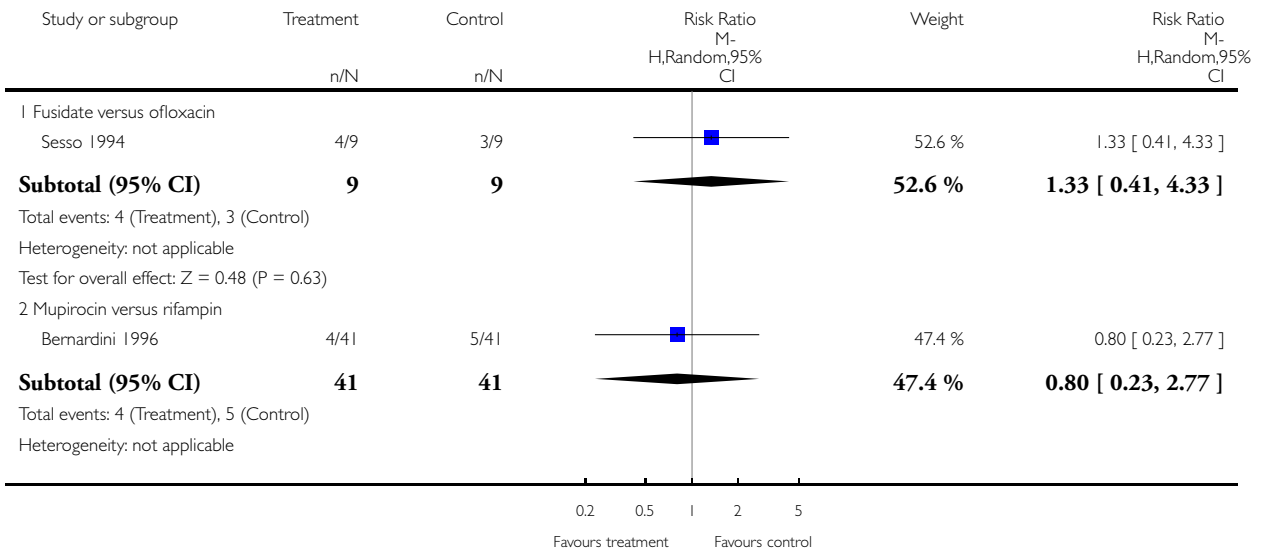Outcome: 5 Exit site and tunnel infection (rate)

Study or subgroup	Treatment n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Fusidate versus ofloxacin					
Sesso 1994	6/74	2/73		37.1 %	2.96 [0.62, 14.19]
Subtotal (95% CI)	**74**	**73**		**37.1 %**	**2.96 [0.62, 14.19]**
Total events: 6 (Treatment), 2 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.36 (P = 0.17)					
2 Mupirocin versus rifampin					
Bernardini 1996	19/538	25/488		62.9 %	0.69 [0.38, 1.24]
Subtotal (95% CI)	**538**	**488**		**62.9 %**	**0.69 [0.38, 1.24]**
Total events: 19 (Treatment), 25 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.25 (P = 0.21)					
Total (95% CI)	**612**	**561**		**100.0 %**	**1.18 [0.30, 4.72]**
Total events: 25 (Treatment), 27 (Control)					
Heterogeneity: Tau² = 0.70; Chi² = 2.93, df = 1 (P = 0.09); I² =66%					
Test for overall effect: Z = 0.24 (P = 0.81)					

```
        0.05   0.2    1    5    20
      Favours treatment    Favours control
```

Analysis 8.6.   Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 6 Nausea.
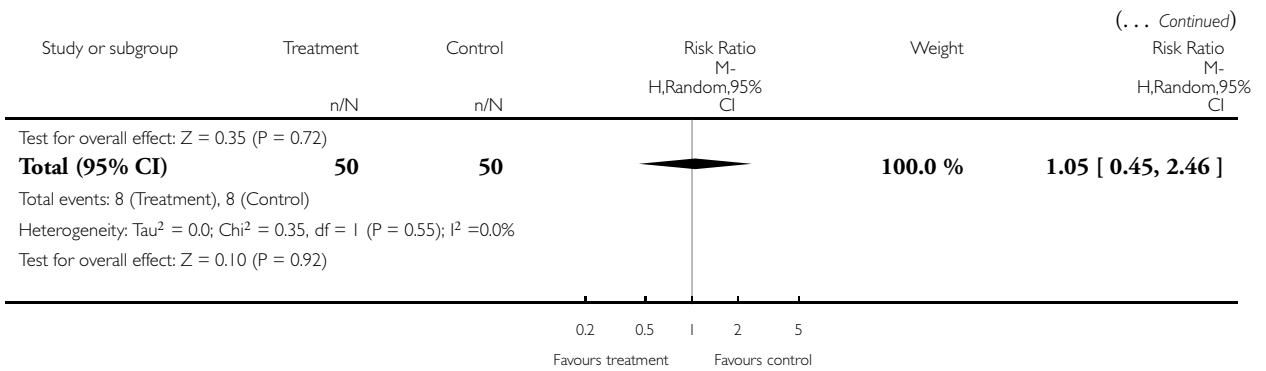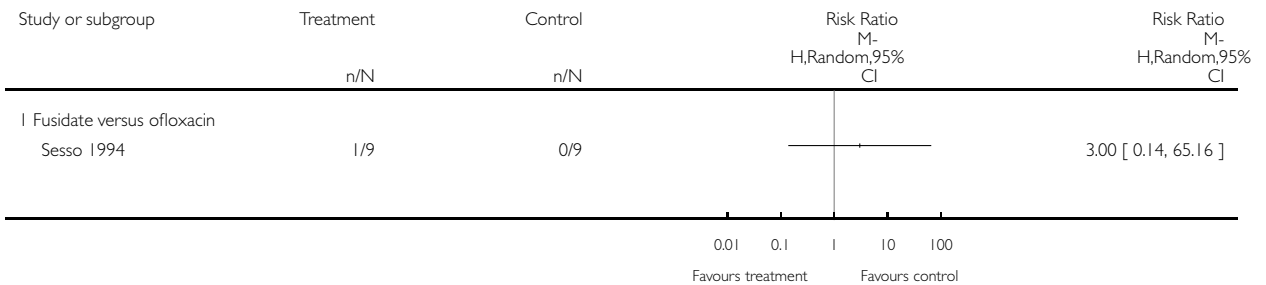
Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 8 Antibiotic prophylaxis head-to-head agents

Outcome: 6 Nausea

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
1 Mupirocin versus rifampin				
Bernardini 1996	0/41	4/41		0.11 [0.01, 2.00]

0.005   0.1   1   10   200

Favours treatment   Favours control

Analysis 8.7.   Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 7 Catheter removal or replacement.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 8 Antibiotic prophylaxis head-to-head agents

Outcome: 7 Catheter removal or replacement

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			
1 Fusidate versus ofloxacin					
Sesso 1994	4/9	3/9		52.6 %	1.33 [0.41, 4.33]
Subtotal (95% CI)	**9**	**9**		**52.6 %**	**1.33 [0.41, 4.33]**
Total events: 4 (Treatment), 3 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.48 (P = 0.63)					
2 Mupirocin versus rifampin					
Bernardini 1996	4/41	5/41		47.4 %	0.80 [0.23, 2.77]
Subtotal (95% CI)	**41**	**41**		**47.4 %**	**0.80 [0.23, 2.77]**
Total events: 4 (Treatment), 5 (Control)					
Heterogeneity: not applicable					

0.2   0.5   1   2   5

Favours treatment   Favours control

(*Continued* . . .)

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
	n/N	n/N			

Test for overall effect: Z = 0.35 (P = 0.72)

| **Total (95% CI)** | **50** | **50** | | **100.0 %** | **1.05 [0.45, 2.46]** |

Total events: 8 (Treatment), 8 (Control)

Heterogeneity: Tau² = 0.0; Chi² = 0.35, df = 1 (P = 0.55); I² =0.0%

Test for overall effect: Z = 0.10 (P = 0.92)

```
      0.2   0.5   1   2   5
```
Favours treatment   Favours control

Analysis 8.8.   Comparison 8 Antibiotic prophylaxis head-to-head agents, Outcome 8 Nasal irritation.

Review: Antimicrobial agents for preventing peritonitis in peritoneal dialysis patients

Comparison: 8 Antibiotic prophylaxis head-to-head agents

Outcome: 8 Nasal irritation

Study or subgroup	Treatment	Control	Risk Ratio M-H,Random,95% CI	Risk Ratio M-H,Random,95% CI
	n/N	n/N		
1 Fusidate versus ofloxacin				
Sesso 1994	1/9	0/9		3.00 [0.14, 65.16]

```
   0.01  0.1   1   10  100
```
Favours treatment   Favours control

Table 1. Guidelines on antimicrobial interventions to prevent peritonitis in PD

Guideline	Country	Year	Recommendation
K-DOQI	United States of America	NA	No guideline
British Renal Association	United Kingdom	NA	No guideline
Canadian Society of Nephrology	Canada	NA	No guideline
European Best Practice Guidelines	Europe	NA	No guideline
ISPD guidelines/recommendations ISPD 2003	NA	2000	• Prophylactic antibiotic therapy for S. aureus nasal carriage recommended to decrease the risk of S. aureus catheter exit site/tunnel infections • Topical disinfectants or antibacterial soaps and topical exit-site mupirocin ointment recommended to decrease the risk of exit site/tunnel infections • Preoperative prophylaxis with first generation cephalosporin recommended at time of catheter insertion; routine use of vancomycin should be avoided • Prophylactic antibiotic therapy for S. aureus nasal carriage recommended to decrease the risk of S. aureus catheter exit site/tunnel infections • Topical disinfectants or antibacterial soaps and topical exit-site mupirocin ointment recommended to decrease the risk of exit site/tunnel infections • Preoperative prophylaxis with first generation cephalosporin recommended at time of catheter insertion; routine use of vancomycin should be avoided • Prophylactic antibiotic therapy for S. aureus nasal carriage recommended to decrease the risk of S. aureus catheter exit site/tunnel infection • Topical disinfectants or antibacterial soaps and topical exit-site mupirocin ointment recommended to decrease the risk of exit site/tunnel infections • Pre-operative prophylaxis with first generation cephalosporin recommended at time of catheter insertion; routine use of vancomycin should be avoided
CARI guidelines CARI 2003	Australia	2003	• Prophylactic therapy with mupirocin ointment, especially for S. aureus carriage (intranasally or at exit site) recommended to decrease the risk of S. aureus catheter exit site/tunnel infections and peritonitis • Antibiotic prophylaxis with a first generation cephalosporin at the time of catheter insertion recommended to decrease the incidence of peritonitis- Prophylactic therapy

Table 1. Guidelines on antimicrobial interventions to prevent peritonitis in PD   *(Continued)*

		with mupirocin ointment, especially for S. aureus carriage (intranasally or at exit site) recommended to decrease the risk of S. aureus catheter exit site/tunnel infections and peritonitis • Antibiotic prophylaxis with a first generation cephalosporin at the time of catheter insertion recommended to decrease the incidence of peritonitis • Prophylactic therapy with mupirocin ointment, especially for S. aureus carriage (intranasally or at exit site) recommended to decrease the risk of S. aureus catheter exit site/tunnel infections and peritonitis • Antibiotic prophylaxis with a first generation cephalosporin at the time of catheter insertion recommended to decrease the incidence of peritonitis

Table 2. Electronic search strategies

Database searched	Search terms
CENTRAL	#1 peritoneal next dialysis #2 PERITONEAL DIALYSIS (MeSH explode)) #3 pd or capd or ccpd #4 #1 or #2 or #3 #5 PERITONITIS (MeSH) #6 periton* #7 #5 or #6 #8 #4 and #7
MEDLINE (1966 to most recent)	1 exp Peritoneal Dialysis/ 2 peritoneal dialysis.tw. 3 (PD or CAPD or CCPD).tw. 4 or/1-3 5 Catheters, Indwelling/ 6 catheter$.tw. 7 or/5-6 8 Peritonitis/ 9 peritonitis.tw. 10 (periton$ and infect$).tw. 11 or/8-10 12 and/4,7,11 13 pc.fs. 14 (plac$ or insert$).tw. 15 (break-in or immobil$).tw. 16 surg$.tw. 17 or/13-16 18 12 and 17 19 and/4,11,13 20 18 or 19

Table 3. Results of head-to-head trials of antimicrobial agents to prevent peritonitis

Outcome analyzed	Number of studies	Number of patients	RR (95% CI)
Sodium fusidate (2%) nasal ointment versus ofloxacin			
All-cause mortality	1	18	0.33 (0.02 to 7.24)
Exit-site/tunnel infection	1	18	2.50 (0.65 to 9.69)
Exit-site/tunnel infection rate	1	147 (patient months)	2.96 (0.62 to 14.19)
Catheter removal or re-placement	1	18	1.33 (0.41 to 4.33)
Nasal irritation	1	18	3.00 (0.14 to 65.16)
Nasal mupirocin versus neomicin sulphate			
Peritonitis rate	1	209 (patient months	0.71 (0.20 to 2.58)
Nasal mupirocin versus oral rifampin			
Nausea	1	82	0.11 (0.01 to 2.00)
Perioperative vancomicin versus cefazolin			
Peritonitis	1	205	0.11 (0.01 to 0.85)

Table 4. Other outcomes analyzed

Outcome analyzed	Number of studies	Number of patients	RR (95% CI)
Oral antibiotic prophylaxis			
Pruritus	1	64	3.00 (0.13 to 71.00)
Diarrhoea	1	64	0.09 (0.01 to 1.58)
Nausea	1	64	9.00 (0.50 to 160.59)
Allergy	1	64	5.00 (0.25 to 100.20)
Nasal antibiotic prophylaxis			
Nasal irritation	1	15	2.10 (0.10 to 44.40)

Table 4. Other outcomes analyzed *(Continued)*

Rhinitis	1	267	0.74 (0.27 to 2.09)
Headache	1	267	0.99 (0.14 to 6.94)
Diarrhoea	1	267	1.65 (0.40 to 6.78)
Nausea	1	267	0.99 (0.14 to 6.94)
Vomiting	1	267	2.98 (0.61 to 14.94)
Pruritus	1	267	1.49 (0.25 to 8.77)
Topical disinfectants			
Technique failure	1	149	0.19 (0.01 to 3.83)
Pruritus	1	149	10.29 (0.58 to 182.92)

WHAT'S NEW

Last assessed as up-to-date: 17 December 2007.

Date	Event	Description
18 March 2010	Amended	Contact details updated.

HISTORY

Protocol first published: Issue 1, 2004

Review first published: Issue 4, 2004

Date	Event	Description
13 May 2009	Amended	Contact details updated.
16 September 2008	Amended	Converted to new review format.
18 December 2007	Amended	New trials sought but none found

CONTRIBUTIONS OF AUTHORS

Designing the Review; GFMS, DJ, JCC

Coordinating the review; GFMS, DJ, JCC

Data Collection for the review; GFMS and AT, independently

Developing search strategy; same

Undertaking searches; same

Screening search results; same

Organising retrieval of papers; same

Screening retrieved papers against inclusion criteria; same

Appraising quality of papers; same

Abstracting data from papers (modified renal Group data extraction form); same

Searching for additional data in unpublished studies; same

Data management for the review

Entering data into RevMan; GFMS

Analysis of data; GFMS, JCC, DJO

Interpretation of data: GFMS, JCC , DJO

Providing a methodological perspective; GFMS, JCC

Providing a clinical perspective; GFMS, DJO, JCC

Providing a policy perspective; GFMS, DJO, JCC

Providing a consumer perspective; GFMS, DJO, JCC

Writing the review; GFMS, DJO, JCC

Providing general advice on the review; JCC, FPS

DECLARATIONS OF INTEREST

None known

INDEX TERMS
Medical Subject Headings (MeSH)

*Antibiotic Prophylaxis; Anti-Bacterial Agents [*therapeutic use]; Mupirocin [therapeutic use]; Peritoneal Dialysis [*adverse effects]; Peritonitis [*prevention & control]; Randomized Controlled Trials as Topic

MeSH check words

Humans