

# Review: chlorhexidine gluconate is more effective than povidone-iodine for preventing vascular catheter related bloodstream infection

Chaiyakunapruk N, Veenstra DL, Lipsky BA, et al. *Chlorhexidine compared with povidone-iodine solution for vascular catheter-site care: a meta-analysis*. *Ann Intern Med* 2002;136:792–801.

**QUESTION:** Is chlorhexidine gluconate as effective as povidone-iodine for preventing vascular catheter related bloodstream infection (CRBI)?

## Data sources

Clinical trials in any language were identified by searching Medline (1966–2001), CINAHL (1982–2001), Doctoral Dissertation Abstracts (1861–2001), International Pharmaceutical Abstracts (1970–2001), EMBASE/Excerpta Medica, Lexis-Nexus, Web of Sciences, and the *Cochrane Library*; hand searching *Index Medicus* (1960–65) and scientific meeting programmes and proceedings; reviewing bibliographies of retrieved articles; and contacting the manufacturer of chlorhexidine gluconate, authors of relevant studies, and experts in the field.

## Study selection

Studies were included if they were randomised trials that compared any type of chlorhexidine gluconate solution with a povidone-iodine solution for vascular catheter site care, and outcomes included incidence of CRBI or catheter colonisation, with sufficient data to calculate risk ratios.

## Data extraction

Data were independently extracted by 2 reviewers on sample size, patient population, type of catheter, type of antiseptic, anatomic site of insertion, use of catheter exchange with guide wire, concurrent interventions, and main outcomes (CRBI and catheter colonisation). Methodological quality of individual studies was assessed based on randomisation procedure, blinding, and description of eligible participants.

## Main results

8 trials (mean age of patients 50–65 y) met the selection criteria. The trials used 4143 catheters (1493 central venous, 1361 peripheral venous, 704 peripheral arterial, 395 pulmonary arterial, 75 peripherally inserted central venous, 62 introducer sheaths, and 53 haemodialysis). 5 trials used an alcoholic solution of chlorhexidine gluconate and 3 used an aqueous solution. All trials used 10% povidone-iodine solution for the control group.

Patients in the chlorhexidine gluconate group had lower rates of CRBI and catheter colonisation than patients in the povidone-iodine group (table). Subgroup analyses of only trials using chlorhexidine alcohol solutions, central vascular catheters, or non-central catheters showed similar results.

## Conclusion

Chlorhexidine gluconate for vascular catheter site care reduces catheter related bloodstream infections and catheter colonisation more than povidone-iodine.

## COMMENTARY

This well executed systematic review by Chaiyakunapruk *et al* addresses a common clinical issue, and the heterogeneity of the study populations suggests broad clinical applicability.

One methodological issue is noteworthy. The mean duration of catheterisation differed between the 2 treatment arms in 2 studies. In one, the difference favoured the chlorhexidine group by 1 day (ie, the shorter duration of catheterisation in this group could have resulted in a lower CRBI rate than the povidone-iodine group), and in the other, the difference favoured the povidone-iodine group by half a day. Furthermore, 2 other studies did not report the mean duration of catheterisation. Because a longer duration of catheterisation increases the risk of catheter related infection, this important information should be made available. Its absence means that it is not possible to determine whether confounding could account for differences in study outcomes. However, when the reviewers excluded the study with the greatest between-treatment difference in duration of catheterisation from the analysis, the overall result did not change, lending further weight to the results.

Based on this review, facilities using chlorhexidine instead of povidone-iodine should expect fewer CRBIs. It is unclear whether the introduction of chlorhexidine can reduce infection rates by 50% or if this is a realistic goal. Only one of the included studies was blinded, so careful practice could account for some of the difference. But the lower value of the confidence interval suggests, at worst, a 12% reduction in CRBIs could be expected if chlorhexidine were introduced as an antimicrobial in catheter site care. The extra attributable costs of a nosocomial bloodstream infection are US \$40 000 per survivor, and the attributable mortality is 35%.<sup>1</sup> Although chlorhexidine gluconate (\$0.92) is more expensive than povidone-iodine (\$0.41), the difference seems far less than the costs of treating bloodstream infections.

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1 Pittet D, Tarara D, Wenzel RP. Nosocomial bloodstream infection in critically ill patients. Excess length of stay, extra costs, and attributable mortality. *JAMA* 1994;271:1598–1601.

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Chlorhexidine gluconate (Chlor) v povidone-iodine (PI) for vascular catheter site care\*

Outcomes	Weighted event rates		RRR (95% CI)	NNT (CI)
	Chlor	PI		
Catheter related blood stream infection (7 trials, n=3899)	1.0%	2.1%	51% (12 to 72)	93 (66 to 393)
Patients with positive cultures (8 trials, n=4001)	6.4%	13.5%	51% (29 to 69)	15 (11 to 26)

\*Abbreviations defined in glossary. Chlorhexidine event rates calculated from control event rate and absolute risk reduction reported in article; RRR (CI) and NNT (CI) calculated from control event rate and relative risk (CI) reported in article.