The efficacy of daily bathing with chlorhexidine for reducing healthcare-associated bloodstream infections: a meta-analysis

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CRD summary
This review found that existing evidence from mostly non-randomised studies supported daily bathing with chlorhexidine for decreasing healthcare-associated and central-line bloodstream infections in the medical intensive care unit. This was a well-conducted review but the authors' conclusions are limited by the poor quality of the available evidence.

Authors' objectives
To determine the effects of daily bathing with chlorhexidine on healthcare-associated and central line-associated bloodstream infections, mortality and costs.

Searching
Cochrane Central Register of Controlled Trials (CENTRAL), PubMed, CINAHL Plus, Web of Science, OpenSIGLE and the NTIS databases and Google Scholar were searched to May 2011. There were no language restrictions. Relevant conference proceedings, clinical trials registers and reference lists of included papers were searched.

Study selection
Individual or cluster randomised controlled trials and quasi-experimental studies (published and unpublished) that evaluated daily bathing with chlorhexidine compared with soap and water or standard care in men, women or children were eligible for inclusion. Outcomes had to include prevention of bloodstream infections in intensive care unit and other settings. Studies of perioperative chlorhexidine bathing for prevention of surgical site infections were excluded.

Most studies were conducted between 2005 and 2010 in USA; one study was in France and one was in Israel. Most studies were set in intensive care units. These included medical, surgical, mixed and trauma units. Most had other infection control programmes already in place. One study was performed at a long-term acute care hospital that included a high proportion of patients who needed mechanical ventilation and central vascular catheters. All studies except one assessed daily chlorhexidine bathing; one study assessed twice daily bathing. Most studies used 2% chlorhexidine-impregnated cloths; some used 4% chlorhexidine solution. Where reported, mean patient age ranged from 39 to 67 years.

Studies were selected by three reviewers independently. Disagreements were resolved by discussion.

Assessment of study quality
Risk of bias was assessed using criteria adapted from the Cochrane Collaboration for randomisation at the group or individual level, randomisation method, type of comparison (between or within groups), which parts of the study were prospective, how comparability between groups was assessed and study design.

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Results for bloodstream infections were extracted and used to calculate odds ratios (OR) with 95% confidence intervals. Results were extracted also for adverse events, costs and mortality. Study authors were contacted for further information where necessary.

Data were extracted by three reviewers independently.

Methods of synthesis
Pooled results for bloodstream infections were obtained from a Mantel-Haenszel random-effects meta-analysis. Heterogeneity was assessed with the $I^2$ statistic. Sensitivity analyses were used to explore the impact of individual
studies. Subgroup analyses were used to compare the mode of chlorhexidine administration (liquid or impregnated cloth wipe). Publication bias was assessed using Egger's test and a funnel plot.

**Results of the review**

Twelve studies (137,392 participants) were included: one randomised controlled trial, 10 controlled interrupted times series and one cluster non-randomised controlled trial. Most studies were quasi-experimental and made little or no assessment of confounding factors. Only one study reported allocation concealment. Four studies assessed comparability between treatment groups.

Chlorhexidine reduced the chance of developing a bloodstream infection compared with control (OR 0.44, 95% CI 0.33 to 0.59; 12 studies; I²=58%). Results were similar for the subgroup analysis of bathing (five studies) compared with wipes (seven studies) and heterogeneity remained at a moderate level so was not explained by the type of chlorhexidine administration. Sensitivity analysis did not reveal any studies with influential results.

Six studies reported on adverse events but five did not report details for the control group. Event rates ranged from one to six participants who received chlorhexidine and were mostly rashes, dryness and skin allergies. Two studies reported crude mortality and overall death rates were 15.9% for chlorhexidine and 19.8% for control with no significant difference between groups.

**Cost information**

Four studies reported costs (full details in the paper) but none performed a formal cost-effectiveness analysis.

**Authors' conclusions**

The existing evidence from mostly non-randomised studies supported daily bathing with chlorhexidine for decreasing healthcare-associated and central-line bloodstream infections in the medical intensive care unit.

**CRD commentary**

This review stated clear inclusion criteria for intervention, study design, participants and outcomes. The search covered several relevant databases, included efforts to locate unpublished studies and was not restricted by language. The authors found some evidence to suggest publication bias. Study selection and data extraction were performed by three independent reviewers to reduce errors and bias; it was not reported whether this also applied to the quality assessment. Use of a random effects meta-analysis seemed appropriate given the differences between studies and possible reasons were explored in subgroup and sensitivity analyses.

This was a well-conducted review. The authors' conclusions are limited by the poor quality of the available evidence.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that more research was needed into whether chlorhexidine bathing had a role in other intensive and non-intensive care environments. The comparative effectiveness of bathing compared to chlorhexidine-impregnated dressings and antiseptic-impregnated catheters needed to be assessed. Future studies needed to report on patient characteristics so that comparability of treatment and control groups could be assessed.

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**Bibliographic details**


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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.