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Antiseptic solutions for skin preparation during central catheter insertion in neonates
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Abstract
Background: Central venous catheters (CVC) are associated with potentially dangerous complications such as thromboses, pericardial effusions, extravasation, and infections in neonates. Indwelling catheters are amongst the main risk factors for nosocomial infections. The use of skin antiseptics during the preparation for central catheter insertion may prevent catheter-related bloodstream infections (CRBSI) and central line-associated bloodstream infections (CLABSI). However, it is still not clear which antiseptic solution is the best to prevent infection with minimal side effects. Objectives: To systematically evaluate the safety and efficacy of different antiseptic solutions in preventing CRBSI and other related outcomes in neonates with CVC. Search methods: We searched CENTRAL, MEDLINE, Embase, and trial registries up to 22 April 2022. We checked reference lists of included trials and systematic reviews that related to the intervention or population examined in this Cochrane Review. Selection criteria: Randomised controlled trials (RCTs) or cluster-RCTs were eligible for inclusion in this review if they were performed in the neonatal intensive care unit (NICU), and were comparing any antiseptic solution (single or in combination) against any other type of antiseptic solution or no antiseptic solution or placebo in preparation for central catheter insertion. We excluded cross-over trials and quasi-RCTs. Data collection and analysis: We used the standard methods from Cochrane Neonatal. We used the GRADE approach to assess the certainty of the evidence. Main results: We included three trials that had two different comparisons: 2% chlorhexidine in 70% isopropyl alcohol (CHG-IPA) versus 10% povidone-iodine (PI) (two trials); and CHG-IPA versus 2% chlorhexidine in aqueous solution (CHG-A) (one trial). A total of 466 neonates from level III NICUs were evaluated. All included trials were at high risk of bias. The certainty of the evidence for the primary and some important secondary outcomes ranged from very low to moderate. There were no included trials that compared antiseptic skin solutions with no antiseptic solution or placebo. CHG-IPA versus 10% PI. Compared to PI, CHG-IPA may result in little to no difference in CRBSI (risk ratio (RR) 1.32, 95% confidence interval (CI) 0.53 to 3.25; risk difference (RD) 0.01, 95% CI −0.03 to 0.06; 352 infants, 2 trials, low-certainty evidence) and all-cause mortality (RR 0.88, 95% CI 0.46 to 1.68; RD −0.01, 95% CI −0.08 to 0.06; 304 infants, 1 trial, low-certainty evidence). The evidence is very uncertain about the effect of CHG-IPA on CLABSI (RR 1.00, 95% CI 0.07 to 15.08; RD 0.00, 95% CI −0.11 to 0.11; 48 infants, 1 trial; very low-certainty evidence) and chemical burns (RR 1.04, 95% CI 0.24 to 4.48; RD 0.00, 95% CI −0.03 to 0.03; 352 infants, 2 trials, very low-certainty evidence), compared to PI. Based on a single trial, infants receiving CHG-IPA appeared less likely to develop thyroid dysfunction compared to PI (RR 0.05, 95% CI 0.00 to 0.85; RD −0.06, 95% CI −0.10 to −0.02; number needed to treat for an additional harmful outcome (NNTH) 17, 95% CI 10 to 50; 304 infants). Neither of the two included trials assessed the outcome of premature central line removal or the proportion of infants or catheters with exit-site infection. CHG-IPA versus CHG-A. The evidence suggests CHG-IPA may result in little to no difference in the rate of proven CRBSI when applied on the skin of neonates prior to central line insertion (RR 0.80, 95% CI 0.34 to 1.87; RD −0.05, 95% CI −0.22 to 0.13; 106 infants, 1 trial, low-certainty evidence) and CLABSI (RR 1.14, 95% CI 0.34 to 3.84; RD 0.02, 95% CI −0.12 to 0.15; 106 infants, 1 trial, low-certainty evidence), compared to CHG-A. Compared to CHG-A, CHG-IPA probably results in little to no difference in premature catheter removal (RR 0.91, 95% CI 0.26 to 3.19; RD −0.01, 95% CI −0.15 to 0.13; 106 infants, 1 trial, moderate-certainty evidence) and chemical burns (RR 0.98, 95% CI 0.47 to 2.03; RD −0.01, 95% CI −0.20 to 0.18; 114 infants, 1 trial, moderate-certainty evidence). No trial assessed the outcome of all-cause mortality and the proportion of infants or catheters with exit-site infection. Authors' conclusions: Based on current evidence, compared to PI, CHG-IPA may result in little to no difference in CRBSI and mortality. The evidence is very uncertain about the effect of CHG-IPA on CLABSI and chemical burns. One trial showed a statistically significant increase in thyroid dysfunction with the use of PI compared to CHG-IPA. The evidence suggests CHG-IPA may result in little to no difference in the rate of proven CRBSI and CLABSI when applied on the skin of neonates prior to central line insertion. Compared to CHG-A, CHG-IPA probably results in little to no difference in chemical burns and premature catheter removal. Further trials that compare different antiseptic solutions are required, especially in low- and middle-income countries, before stronger conclusions can be made.

Index Keywords
2 propanol, antiinfective agent, chlorhexidine, povidone iodine, thyroid hormone, chlorhexidine, topical antiinfective agent; all cause mortality, aqueous solution, catheter infection, clinical effectiveness, device removal, evidence based medicine, high risk population, hospital discharge, human, infection prevention, length of stay, low risk population, meta analysis, neonatal intensive care unit, numbers needed to treat, outcome assessment, pediatric patient, Review, risk assessment, risk benefit analysis, skin, systematic review, central venous catheter, chemical burn, infant, newborn, sepsis; Anti-Infective Agents, Local, Burns, Chemical, Central Venous Catheters, Chlorhexidine, Humans, Infant, Infant, Newborn, Sepsis

Chemicals/CAS
2 propanol, 67-63-0; chlorhexidine, 3697-42-5, 55-56-1; povidone iodine, 25655-41-8; Anti-Infective Agents, Local; Chlorhexidine

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