A systematic review for effective management of central venous catheters and catheter sites in acute care paediatric patients

Lee O K, Johnston L

CRD summary
This systematic review found a paucity of evidence relating to the management of central venous catheters (CVCs) in paediatric care. The authors concluded that there was inconclusive evidence for the use of prophylactic vancomycin in paediatric patients with CVCs. The authors' limited conclusions reflect the lack of evidence.

Authors' objectives
To evaluate effective management of central venous catheters (CVCs) and catheter sites in the prevention or reduction of catheter-related complications in hospitalised paediatric patients.

Searching
The Cochrane Library, MEDLINE, CINAHL, HealthSTAR and Cancerlit were searched from inception up to December 2000 for English language papers; the search terms were reported. The reference lists of all retrieved articles and packaging leaflets of relevant medical supplies were checked. Experts in the field, including the manufacturers of relevant medical supplies, were contacted. Handsearches of key relevant journals and conference proceedings were also performed.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion. Where evidence from RCTs was not available, controlled clinical trials were included after being assessed for quality.

Specific interventions included in the review
Interventions to be reviewed were: aseptic techniques or barrier precautions taken at the time of catheter insertion; infusate or flushing solution used; skin preparation, antiseptic or antimicrobial ointment; type of dressing; frequency of dressing changes; frequency of administration set changes; and whether an in-line filter was used. The trials included in the review investigated the effect of using an antibiotic (vancomycin), antiseptic (chlorhexidine) or Tegaderm dressing in addition to infusate (normal saline, heparin, parenteral nutrition), povidone-iodine skin preparation or silk tape.

Participants included in the review
Only trials of hospitalised paediatric patients (between birth and aged 18 years) were eligible for the review. Trials of mixed adult and paediatric populations were excluded unless the data for children could be extracted separately. The included trials were of premature neonates, neonates, or children whose ages ranged (where reported) from 7 months to 21 years.

Outcomes assessed in the review
Studies reporting outcomes related to a decrease in CVC-related complications were eligible for inclusion. The outcomes reported in the included studies were catheter-related infections (including specifically bacteraemia and infections at the catheter tip and exit site), incidence of catheter colonisation, and incidence of exit site irritation.

How were decisions on the relevance of primary studies made?
A single reviewer assessed the relevance of studies for inclusion using a standard form. A second author was consulted only when the first reviewer was uncertain.

Assessment of study quality
Study quality was assessed on the basis of study design, how the sample size was calculated, minimisation of selection bias, adequacy of adjustments for residual confounding, and adequacy of follow-up. All included studies were graded for strength of evidence according to the publication by the National Health and Medical Research Council, Australia 2000 (reference provided). The authors did not state how many reviewers performed the quality assessment.

Data extraction
Two independent reviewers extracted the data using a pre-designed data extraction form. Any disagreements were resolved through discussion and, where necessary, through consultation with third observer. Where relevant data were not reported in the paper, the primary authors were contacted.

Methods of synthesis
How were the studies combined?
The trials were combined in a narrative, with results grouped according to type of intervention: aseptic technique, barrier precaution, antiseptic or antimicrobial agents for skin preparations; infusates or flushing solutions; dressings (types or frequency of changes).

How were differences between studies investigated?
Differences between the trials were discussed in the text.

Results of the review
Six RCTs (n=1,260) were included in the review.

Aseptic technique, barrier precaution, antiseptic or antimicrobial agents for skin preparations: 2 RCTs (n=964) were identified. No information was available for aseptic technique or barrier precaution. One indicated that chlorhexidine-impregnated dressings reduced the incidence of catheter-tip colonisation, although such dressings may cause contact dermatitis in low birth weight infants. The other RCT showed a reduced incidence of catheter colonisation and catheter-related bacteraemia with chlorhexidine compared with povidone-iodine skin.

Infusates or flushing solutions: 3 RCTs (n=202) were identified. The included studies failed to demonstrate any benefit of adding an antibiotic to the flushing solution.

Dressings (types or frequency of changes): 1 RCT (n=32) was identified. No difference in efficacy was found between silk tape and Tegaderm, although Tegaderm did appear to protect skin integrity better.

Authors’ conclusions
There was a paucity of evidence relating to the management of CVCs in paediatric care. In addition, there was inconclusive evidence for the use of prophylactic vancomycin in paediatric patients with CVCs.

CRD commentary
The review addressed a focused clinical question with clearly defined inclusion criteria. The literature search was appropriate and thorough, except that only English language studies were considered; this might have resulted in some relevant trials being missed. The selection of studies for the review was performed mainly by a single reviewer, which might have introduced some reviewer bias. The quality of the included trials was assessed, and details of the included trials were reported. Given the diversity of the included trials, the use of a narrative synthesis was appropriate. The authors’ limited conclusions reflect the lack of evidence.

Implications of the review for practice and research
Practice: The authors stated that, owing to the paucity of evidence, they were unable to provide recommendations for practice.
Research: The authors stated that there is an urgent need for well-designed, appropriately powered RCTs in this therapeutic area.

Bibliographic details

Other publications of related interest
This additional published commentary may also be of interest. Carno M. Commentary on "A systematic review for effective management of central venous catheters and catheter sites in acute care paediatric patients" by Lee and Johnston. Worldviews Evid Based Nurs 2005;2:14-5.

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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.