Patency of arterial catheters with heparinized solutions versus non-heparinized solutions: a review of the literature

Lapum J L

CRD summary
The author concluded that the strength of individual study results is limited by the lack of rigour in the study design. Further research is needed to determine the effectiveness of heparinised versus non-heparinised solutions in arterial catheters. Given the poor quality of the available studies and inadequate reporting of the review process, the author's cautious conclusions are appropriate.

Authors' objectives
To compare the effectiveness of heparinised versus non-heparinised solutions in maintaining the patency of arterial catheters.

Searching
MEDLINE (1983 to 2001), CINAHL (1982 to 2001), Cancerlit (1975 to 2001), EMBASE (1980 to 2001), HealthSTAR (1975 to 2001) and the Cochrane Library; the search terms were reported.

Study selection
Studies comparing heparinised and non-heparinised infusions of arterial catheters were eligible for inclusion. The majority of studies used saline as the non-heparinised infusion; one used lactated Ringer's solution. The included studies used a variety of catheter lengths, gauges and insertion sites. Inclusion criteria for the participants were not specified clearly, although the population appears to have been restricted to adults with arterial catheters. The participants in the included studies were men and women aged from 18 to 99 years. Some participants received concomitant medication that would affect their coagulation status. Studies of the patency of arterial catheters were eligible for inclusion. A variety of non-standardised tools appear to have been used to measure patency, but these were not described in detail. In one study the end point was catheter failure rate. Inclusion criteria for the study design were not defined. The included studies were carried out in critical care units and intensive care units.

The author did not state how the studies were selected for the review, or how many reviewers performed the study selection.

Assessment of study quality
The author does not appear to have applied a formal validity assessment. However, aspects of study quality and validity were discussed in detail for each study.

Data extraction
In one study that included participants with both arterial and pulmonary artery catheters, only the findings for arterial catheters were extracted.

The author did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
The results were combined in a narrative.

Results of the review
Five studies were included in the review: one randomised controlled trial (RCT; n=5,037), two double-blind quasi-experimental studies (number of participants not reported) and two quasi-experimental studies (n=276).
A formal validity assessment was not carried out. However, the author identified methodological limitations in all of the studies including: use of outcome measures that were not established as valid or reliable; lack of randomisation or blinding; insufficient power or lack of power analysis; inadequate description of study details or outcome criteria; and failure to control for confounding variables such as differences between nursing staff.

Four of the five studies, including the RCT, concluded that heparinised solutions increased the patency of arterial catheters in comparison with non-heparinised solutions. Statistical significance (p-values) was only reported for two of these studies (one was significant, \( p<0.05 \); the other was not significant, \( p=0.06 \)). One quasi-experimental study concluded that non-heparinised arterial catheters could be maintained in short-term catheter placement (no statistical data or p-values were provided).

**Authors' conclusions**
The strength of the results is limited by the lack of rigour in the research design. Further research is needed to determine the effectiveness of heparinised versus non-heparinised solutions in arterial catheters.

**CRD commentary**
The inclusion criteria were broadly defined for the intervention, participants and outcomes, but not specified for the study design. Several relevant databases were searched but, since appropriate steps do not appear to have been taken to identify unpublished data, publication bias cannot be ruled out. There was insufficient information about the study selection, validity assessment and data extraction processes to rule out the possibility of reviewer error and bias. A formal validity assessment was not carried out, although the author did highlight methodological weaknesses in all of the included studies. The choice of a narrative synthesis was appropriate given the heterogeneity of the included studies, but there was insufficient details about the included studies to establish the generalisability of the study findings. The review is limited by the poor quality of the available studies and insufficient reporting of the study process. However, the author's cautious conclusions appear appropriate.

**Implications of the review for practice and research**
**Practice:** The author did not state any implications for practice.

**Research:** The author stated that further descriptive research should examine the role of variables such as solution, catheter variables, age, gender, placement of catheter, handedness of participant, medication and clotting disorders in the patency of catheters. Further randomised trials with adequate power analysis and standardised outcome measures are needed.

**Funding**
Heart and Stroke Foundation (Nursing Fellowship); partnership between CIHR Institute of Circulatory and Respiratory Health and the Heart and Stroke Foundation (Strategic Training Program for Cardiovascular Nurse Scientists); University of Toronto Fellowship.

**Bibliographic details**
Lapum J L. Patency of arterial catheters with heparinized solutions versus non-heparinized solutions: a review of the literature. Canadian Journal of Cardiovascular Nursing 2006; 16(2): 64-70

**PubMedID**
17153134

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Anticoagulants /administration & dosage; Arteries; Catheterization, Peripheral /adverse effects /nursing; Catheters, Indwelling /adverse effects; Clinical Nursing Research; Equipment Failure; Evidence-Based Medicine; Heparin /administration & dosage; Humans; Nursing Evaluation Research; Research Design; Solutions; Therapeutic Irrigation
/methods/nursing; Treatment Outcome; Vascular Patency

**Accession Number**
12007009094

**Date bibliographic record published**
09/08/2008

**Date abstract record published**
01/12/2008

**Record Status**
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.