Routine perioperative pulmonary artery catheterization has no effect on rate of complications in vascular surgery: a meta-analysis

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Authors' objectives
To undertake a meta-analysis of peri-operative use of pulmonary catheterisation in vascular surgery.

Searching
MEDLINE was searched from 1970 onwards using keywords ('pulmonary artery catheter', 'Swan-Ganz', 'perioperative', 'preoperative', 'operating room', 'oxygen consumption' and 'vascular surgery') and Boolean phrases. The bibliographies of recent articles were examined and the extensive files of one of the senior authors, who has had a career-long interest in pulmonary artery catheterisation and critical care, were reviewed for relevant references.

Study selection
Prospective, randomised controlled trials (RCTs). Only RCTs that described specific therapeutic goals were included in the meta-analysis of mortality and complications. Only papers published in English were included.

Specific interventions included in the review
Peri-operative insertion of pulmonary artery catheters. The timing of insertion for studies that were included in the meta-analysis was 3 to 4 hours pre-operative, the morning of surgery, greater than 12 hours pre-operatively, and greater than 14 hours pre-operatively. The type of interventions used as control included a central venous line only, a peripheral intravenous line, and a pulmonary artery catheter only.

Participants included in the review
Only studies that were confined to vascular surgery patients were considered for inclusion. The included studies evaluated the following surgical patient populations: aortic or lower limb revascularisation; aortic surgery; and aortic or limb salvage surgery.

Outcomes assessed in the review
No inclusion criteria were specified with respect to the outcome. The outcomes assessed in the included papers were mortality, reported complications (adverse events that could reasonably have been expected to have been prevented by or resulted from pulmonary artery catheterisation), and the quantity of intravenous fluid given.

How were decisions on the relevance of primary studies made?
Two authors selected the papers for inclusion.

Assessment of study quality
The studies were assessed for quality using a modification of the method of Heyland et al. (see Other Publications of Related Interest). The papers were given a partial credit, or a score of one, if the randomisation was less than a true random number-based technique but was at least an attempt to randomise in a somewhat acceptable fashion. The highest possible score that could be obtained was not stated. Some of the other criteria included in the quality assessment were a description of the cointerventions, blinding, clearly listed exclusion criteria, and accounting for exclusions. Two authors reviewed the papers.

Data extraction
Two authors reviewed the papers. The types of data extracted included reference details, study population, interventions protocol, control, the number of participants, and outcomes.
**Methods of synthesis**

How were the studies combined?
The Mantel-Haenszel test was used for the meta-analysis of mortality and complications, whereas t-tests were used for the analysis of interval data. The studies were pooled in a narrative summary for the outcome measure of intravenous fluid administration.

How were differences between studies investigated?
Statistical heterogeneity was investigated using the Breslow and Day test.

**Results of the review**

Six studies were included in the review, of which only four (with 385 patients) were included in the meta-analysis of mortality and complications.

The quality score of RCTs included in the meta-analysis of mortality and complications ranged from 6 to 11.

**Mortality (4 studies).**

There was no statistically-significant difference between patients who underwent pre-operative pulmonary catheterisation and controls (odds ratio 1.198, p=0.60; Breslow and Day heterogeneity p=0.81).

**Complications (4 studies).**

There was no statistically-significant difference between patients who underwent pre-operative pulmonary catheterisation and controls in terms of post-operative complications (Breslow and Day heterogeneity p=0.18).

The categorisation of intra-operative complications was quite variable, and the exact number of complications that occurred was not listed clearly in each paper. This data were therefore not included in the meta-analysis. The incidence of hypotension, arrhythmia and ST changes were listed (separately for the intervention and control group) for each study.

**Intravenous fluid admission (5 studies).**

In three of the studies, patients with pulmonary artery catheters received statistically significantly more fluid than those in the control group.

**Cost information**

One of the included trials reported cost data. There was no significant difference in the mean hospital charges between patients undergoing pre-operative pulmonary artery catheterisation and those having only venous lines inserted.

**Authors’ conclusions**

The meta-analysis indicated that, in moderate-risk vascular surgery patients, routine pre-operative pulmonary artery catheterisation is not associated with improved outcomes.

**CRD commentary**

The review was based on a clearly stated objective with predefined inclusion and exclusion criteria. The literature search included only one electronic database and no attempt was made to locate unpublished data. In addition, only English language studies were included; therefore, some important information may have been missed. It was stated that two authors selected and reviewed the papers, but it was not stated if there were any discrepancies, and if so, how they were resolved. It was unclear if this also meant that two authors extracted the data separately.

Relevant details of the studies included in the meta-analysis were presented in summary tables, but very little data were provided on the two additional studies that were included in the qualitative review of intravenous fluid administration.
The results were pooled appropriately. A forest plot was presented for the meta-analysis of both mortality and complications; however, the pooled odds ratio for complications was not presented numerically. Similarly, the 95% confidence intervals of the pooled odds ratios for both outcomes were also only presented graphically (i.e. no numerical data were given).

The authors’ conclusions follow from the results presented.

Implications of the review for practice and research
Practice: The authors state that on the basis of the lack of proven efficacy of peri-operative pulmonary artery catheterisation, and the potential increased costs associated with it, the procedure can no longer be justified in moderate-risk patients.

Research: The authors did not state any implications for further research.

Bibliographic details

PubMedID
11450787

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

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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.