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Title **An Evaluation of the Clinical and Cost Effectiveness of Pulmonary Artery Catheters in Patient Management in Intensive Care: A Systematic Review and A Randomized Controlled Trial**

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Aim

To test the hypothesis that hospital mortality is significantly decreased in critically ill patients managed with a pulmonary artery catheter (PAC) in adult intensive care units (ICUs) compared with those who are not; and to identify any difference in the expected costs and outcomes of patients treated with and without a PAC.

Conclusions and results

The systematic review identified 11 RCTs. Of these, 3 were of general ICU patients managed with a PAC. The remaining 8 studies were of high-risk surgery patients of which 5 included preoperative optimization of hemodynamics using a PAC in the intervention and 3 did not. A meta-analysis of the 3 studies of general ICU patients found no difference (pooled OR 0.97, 95 % CI 0.74 to 1.26). Separate meta-analyses, which included only those studies of high-risk surgery patients, found no difference between the 2 treatment groups either where preoperative optimization was part of the intervention (5 studies: pooled odds ratio (OR) 0.98, 95% confidence interval (CI) 0.72 to 1.33), or where it was not (3 studies: pooled odds ratio (OR) 1.10 (0.13 to 9.06).

The RCT found no difference in hospital mortality for patients managed with a PAC (68.4%) compared to those managed without (65.7%). The adjusted hazard ratio (PAC vs No PAC) was 1.09 (95% CI 0.94 to 1.27). There was no difference in the ICU length of stay, hospital length of stay, or organ-days of support in ICU between the two groups.

The economic evaluation found that the expected cost per QALY gained from the withdrawal of PAC was GBP 2985. The expected cost per life gained from the withdrawal of PAC was GBP 22 038.

Recommendations

Evidence from this pragmatic RCT has shown that PACs, as currently used in UK critical care, do not confer benefit to patients. The economic evaluation indicates that withdrawal of the PAC from routine clinical practice in the NHS would be considered cost effective in the current decision-making climate.

Methods

A systematic review of the evidence from all randomized controlled trials (RCTs) where patients were randomized to be managed with a PAC (of any type) in one arm and without a PAC in another arm (control). Studies were eligible for inclusion if more than 50% of participants were adult and if the PAC was placed in an ICU or was placed during a surgical procedure leading to ICU admission. Studies were excluded if participants had been declared brain dead, with a PAC being placed solely for organ support prior to donation.

A multicenter, open, RCT with an economic evaluation (cost utility and cost effectiveness analysis). Patients deemed by the treating clinician to require management with a PAC were eligible for inclusion, unless: they were less than 16 years of age; were admitted to the critical care unit electively prior to surgery for preoperative optimization; had a PAC already in situ on admission to the ICU; had previously been entered into the trial; or were brain dead with a PAC being placed for organ support prior to donation.

Further research/reviews required

Efficacy studies are urgently needed to determine optimal management protocols and patient groups who could gain from PAC use.

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