A systematic review and meta-analysis on the use of preemptive hemodynamic intervention to improve postoperative outcomes in moderate and high-risk surgical patients

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CRD summary
The authors stated that a pre-emptive targeted approach to the management of haemodynamics in the perioperative period may reduce morbidity and mortality for high-risk surgical patients. The conclusions appear reliable although likely language bias suggests a need for some caution.

Authors' objectives
To assess the effect of a pre-emptive strategy of haemodynamic monitoring and manipulation on postoperative outcomes in moderate and high risk surgical patients.

Searching
MEDLINE, EMBASE and Cochrane Central Register of Controlled Clinical Trials were searched for papers published between 1985 and January 2010. Search terms were reported. Reference lists of identified articles were handsearched. Personal archives and communications were searched and experts and industry representatives were contacted. Only papers published in English were considered.

Study selection
Randomised controlled trials (RCTs) that evaluated use of a pre-emptive haemodynamic intervention (defined as the proactive use of haemodynamic monitoring and therapies in the perioperative period) to cardiovascular management in moderate to high risk groups of patients were eligible for inclusion. Trials where haemodynamic monitoring was used differently between the control and protocol groups before randomisation were excluded. Conference abstracts and non-peer reviewed articles were excluded. The primary outcome was hospital mortality. Studies had to report mortality on an intention-to-treat basis. The secondary outcome measure was the number of patients with complications after surgery.

Studies were published between 1988 and 2008. Details on study settings were not reported. Interventions assessed included fluids and fluids and inotropes. Goals of optimisation varied across studies (cardiac index, oxygen delivery, corrected flow time and stroke volume; further details were reported). Control group therapies varied and included standard care.

Two reviewers assessed studies for inclusion.

Assessment of study quality
Study quality was assessed using the Jadad tool by considering the adequacy of randomisation, application and blinding (range of scores 1 to 5).

Data extraction
Two reviewers extracted data to enable calculation of odds ratios (ORs) and their 95% confidence intervals (CIs).

Disagreements were resolved by a third reviewer.

Methods of synthesis
Pooled odds ratios and corresponding 95% CIs were calculated using fixed-effect meta-analysis. Heterogeneity was assessed with $I^2$. Subgroup analysis assessed the effect on overall results of types of monitoring used, therapy (fluids versus fluids and inotropes), therapeutic goals and resuscitation target (normal versus supranormal). Sensitivity analysis assessed the influence of study quality and change in care and event rates over time.

Results of the review
Twenty-nine studies (4,805 patients) were included. Fourteen studies had Jadad scores of at least 3.
Mortality: Use of pre-emptive haemodynamic intervention was associated with a 52% reduction in mortality (OR 0.48, 95% CI 0.33 to 0.78; I²=34%, 29 RCTs, 4,805 patients).

Use of pre-emptive haemodynamic intervention was associated with significant reductions in mortality in studies using a pulmonary artery catheter (OR 0.35, 95% CI 0.19 to 0.65; 15 RCTs, 3,511 patients), fluids and inotropes as opposed to intravenous fluids alone (OR 0.47, 95% CI 0.29 to 0.76; 19 RCTs, 4,105 patients), cardiac index or oxygen delivery as the end-point (OR 0.38, 95% CI 0.21 to 0.68; 17 RCTs, 3,350 patients) and supranormal resuscitation targets (OR 0.29, 95% CI 0.18 to 0.47; eight RCTs, number of patients not reported).

Morbidity: Use of pre-emptive haemodynamic intervention was associated with a 57% reduction in overall rates of surgical complications (OR 0.43, 95% CI 0.34 to 0.53; I²=2%, 23 RCTs, 2,392 patients).

Subgroup analysis did not significantly affect the overall result.

Sensitivity analysis revealed no effect of pre-emptive haemodynamic intervention on mortality in trials with a Jadad score of 3 or more; trials with a Jadad score below 3 were associated with significant reductions in mortality. Study quality had no influence on morbidity outcomes. Results for a time-dependent analysis were reported.

Authors’ conclusions
Findings suggested that a pre-emptive targeted approach to the management of haemodynamics in the perioperative period may reduce morbidity and mortality for high-risk surgical patients.

CRD commentary
The review question was clearly stated. Three major databases were searched and efforts were made to search grey literature sources. Publications in languages other than English were excluded, which raised the possibility of language bias. Data extraction was conducted in duplicate, which minimised potential for error and bias; it was unclear whether similar processes were used in study selection and quality assessment. Study quality was assessed using appropriate criteria and the results were used to inform the synthesis. The decision to combine study results in a meta-analysis appeared appropriate. The authors stated that few studies were of high quality and many had limited sample sizes. Reporting of postoperative complications was not consistent between studies this limited the applicability of the results.

The authors’ conclusions appear reliable although likely language bias suggests a need for some caution.

Implications of the review for practice and research
The authors did not state any implications for practice or research.

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