CRD summary
The review concluded that surgical patients who received perioperative haemodynamic optimisation were at decreased risk of renal impairment. As there was no description of the control treatments used, the reliability of the authors’ conclusions is uncertain.

Authors’ objectives
To investigate the effects of perioperative haemodynamic optimisation on postoperative renal dysfunction.

Searching
MEDLINE, EMBASE and The Cochrane Library were searched without language restrictions from 1980 to January 2008; search terms were reported. Reference lists of retrieved articles and reviews were searched, as were conference proceedings (2003 to 2007) from five relevant organisations.

Study selection
Randomised controlled trials (RCTs) of the effect perioperative haemodynamic goal-directed therapy (definition provided in the review) on mortality or morbidity (primary outcome was worsening of renal function) and that reported incidence of renal injury as postoperative complication (with a definition) were eligible for inclusion. Studies had to be of adult (aged ≥18 years) surgical patients; studies of mixed populations were excluded. Studies with no description of perioperative haemodynamic goal-directed therapy, no difference between groups in the optimisation protocol with therapy titrated to the same goal in both groups or not titrated to predefined end points were excluded.

Patient populations varied; around half of the studies recruited patients considered to be at high risk. Modalities of optimisation and types of surgery varied (although most operations were elective). Just less than half of the studies started haemodynamic monitoring and management before surgery (the remainder started during or after surgery). Haemodynamic monitoring was mostly performed with a pulmonary catheter, oxygen delivery, cardiac output, mixed venous oxygen saturation and lactate as goal parameters. No details of treatments given to control groups were provided. Definitions of acute kidney injury varied.

The authors did not state how many reviewers selected studies for inclusion.

Assessment of study quality
Study quality was evaluated with the Jadad scale of randomisation, blinding and description of withdrawals and dropouts to give a score between zero and 5.

Two reviewers independently made the assessments. Disagreements were resolved through consensus.

Data extraction
Data were extracted in order to calculate odds ratios (OR) and 95% confidence intervals (CI). Study investigators were contacted for missing data when necessary.

Two reviewers independently extracted data. Disagreements were resolved by re-inspection of the relevant study.

Methods of synthesis
Studies were pooled using a random-effects model. Heterogeneity was assessed using the Q test and $I^2$ statistic. Sensitivity analyses explored the effect of study quality, definition of renal dysfunction, timing of optimisation...
treatment relative to surgery, use of inotropes with fluids, monitoring tools and high-risk patients.

**Results of the review**

Twenty RCTs (n=4,220) were included in the review. One study scored 4 on the Jadad scale, 12 scored 3, five scored 2 and two scored 1.

Postoperative acute renal injury was significantly reduced by perioperative haemodynamic optimisation compared to control (OR 0.64, 95% CI 0.50 to 0.83, $I^2=0\%$; 20 studies), as was mortality (OR 0.50, 95% CI 0.31 to 0.80, $I^2=54\%$; 19 studies).

Subgroup analyses for renal injury yielded odds ratios of similar magnitude for the 13 studies that scored 3 or more on the Jadad scale, the nine studies of high-risk patients and for the various definitions used for renal injury. In low-risk patients no difference in renal injury was found (although this analysis had low power as few events occurred). Further subgroup results were reported.

**Authors’ conclusions**

Surgical patients who received perioperative haemodynamic optimisation were at decreased risk of renal impairment.

**CRD commentary**

The review addressed a clear question and was supported by appropriate inclusion criteria. Attempts to identify all relevant studies in any language were undertaken by searches of electronic databases and checking references and conference proceedings. Suitable methods were employed to reduce the risks of reviewer error and bias for the processes of data extraction and assessing study quality; the authors did not report on whether such methods were used to select studies for inclusion. Study quality was assessed and the assessment used in interpreting the results of the review. Appropriate methods were used to pool data and assess heterogeneity.

Many aspects of the review were well-conducted. However, there appeared to be no description of control treatments used, which made it very difficult to interpret the results; therefore, the reliability of the authors' conclusions is uncertain.

**Implications of the review for practice and research**

**Practice:** The authors stated that efforts should be aimed to identify (high-risk) patients and surgery that would most benefit from perioperative optimisation.

**Research:** The authors stated that future studies should have renal function as the main outcome, should adopt accurate, precise and repeatable definitions and should be performed in well-defined surgical samples with specified risk factors for renal damage. RCTs were needed to clarify whether use of less invasive monitoring tools and protocolised perioperative fluid optimisation strategies played an effective role in protection of renal function after surgery.

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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.