Doppler-guided intra-operative fluid management during major abdominal surgery: systematic review and meta-analysis

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CRD summary
The authors concluded that Doppler-guided fluid management may have improved outcomes in major abdominal surgery but that further research is required. The authors' cautious conclusions appear to be supported by the evidence presented, but lack of reporting of review methods makes it difficult to assess their reliability.

Authors’ objectives
To compare Doppler-guided intra-operative fluid management with routine care in patients undergoing major abdominal surgery.

Searching
MEDLINE and EMBASE were searched from inception to 2006. Search terms were reported. Reference lists of identified studies were also screened. Conference proceedings from seven specified relevant associations were handsearched.

Study selection
Randomised controlled trials (RCTs) that compared Doppler-guided intra-operative fluid management with routine care, in patients undergoing elective major abdominal surgery, were eligible for inclusion. The primary review outcome was postoperative complications. Secondary review outcomes included perioperative death, postoperative renal failure, length of hospital stay, time of return of bowel function and quantity of intra-operative colloid and crystalloid administration.

The included trials evaluated oesophageal Doppler-guided fluid management based on descending thoracic corrected flow time plus stroke volume, or stroke volume plus central venous pressure. Most trials involved patients undergoing colorectal surgery (including laparoscopic surgery); one trial included patients undergoing major gynaecological and urological surgery.

The authors did not state how papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Study validity was assessed using the Jadad criteria.

The authors did not state how the validity assessment was performed.

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

Methods of synthesis
Pooled odds ratios (OR) and pooled weighted mean differences (WMD) were calculated with 95% confidence intervals (CI). The DerSimonian and Laird random-effects model was used for odd ratios. Heterogeneity was assessed using the Cochran Q statistic. The potential for publication bias was assessed using Egger’s test.

Results of the review
Four RCTs were included (n=393 patients). One RCT scored 4 out of 5 points on the Jadad scale, one scored 3 points and two scored 2 points.

Doppler-guided intra-operative fluid management was associated with a statistically significant reduction in the risk of
perioperative complications compared to routine care (OR 0.32, 95% CI: 0.19 to 0.52; four trials). No significant heterogeneity (p=0.64) or publication bias (p=0.71) was found.

Doppler-guided intra-operative fluid management was associated with a statistically significant reduction in length of hospital stay compared to routine care (WMD 1.68 days, 95% CI: 2.39 to 0.98; four trials). No significant heterogeneity was found.

There was no statistically significant difference between interventions for death (two trials), renal failure (two trials) or the quantity of intra-operative crystalloid administered (three trials). No significant heterogeneity was found for any of these analyses.

Significant heterogeneity was found for analyses of time to return to normal diet (four trials; p=0.0017) and quantity of intra-operative colloid administered (three trials; p<0.0001).

**Authors' conclusions**

Doppler-guided fluid management may have improved outcomes in patients undergoing major abdominal surgery, but further research is required.

**CRD commentary**

The review question was clearly stated and inclusion criteria were appropriately defined. Several relevant sources were searched including conference proceedings. Although no evidence of publication bias was found, tests for publication bias may not be reliable due to the small number of trials. However, it was not clear if attempts were made to minimise language bias. Study validity was assessed but only aggregated scores were reported; this made it difficult to independently comment on the reliability of the evidence presented. Methods used to select studies, assess validity and extract data were not described, so it is not known whether efforts were made to reduce reviewer errors and bias. Little information was provided about participants, making it difficult to assess the generalisability of findings. Appropriate methods were used for the meta-analyses and heterogeneity was assessed. Some analyses involved a small number of events and there were differences between trials for some outcomes. The authors' cautious conclusions appear to be supported by the evidence presented, but lack of reporting of review methods makes it difficult to assess their reliability.

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

**Practice:** The authors stated that further research is required before Doppler-guided management can be recommended for routine use.

**Research:** The authors stated that differences between trials in the review appear to justify the need for a large trial to evaluate Doppler-guided fluid management. Trials that directly compare Doppler-guided management with fluid restriction and economic analyses of Doppler-guided management are also required. However, the recommendation for economic analysis was not supported by the review since the review did not search for economic studies, so the need for such studies was not apparent.

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