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## Enhanced recovery in colorectal resections: a systematic review and meta-analysis

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### CRD summary

The review evaluated the safety and effectiveness of enhanced recovery programmes after colorectal resection and found that they reduced length-of-stay (total primary length of stay and total length of stay) and possibly reduced 30-day morbidity and increased 30-day readmission. The extent to which the authors' conclusions are reliable was unclear due to the limited evidence provided.

### Authors' objectives

To evaluate the safety and effectiveness of enhanced recovery programmes after colorectal resection.

### Searching

MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL) and Cochrane Colorectal Cancer Group Database were searched from 1966 to February 2007 for all types of publications in English. The bibliography of each retrieved article was handsearched and electronic links were explored. Search terms were reported.

### Study selection

Randomised controlled trials (RCTs) and clinical controlled studies (CCTs) that evaluated enhanced recovery programmes in colorectal surgery were eligible for inclusion. Studies needed to provide length of hospital stay data either as a total length of stay, primary length of stay or postoperative length of stay and have a minimum follow-up of 30 postoperative days. A list of 17 elements during the preoperative, perioperative and postoperative phases that characterised enhanced recovery was developed; eligible studies had to include at least five elements, with at least one element from each phase. Details of all the enhanced recovery elements were provided. Most of the enhanced recovery elements on the included list were used in the included studies. Studies were eligible for inclusion only if the participants who underwent colorectal resection had "a circumferential segmental excision of any part, or parts, of the colon and or rectum involving either a primary anastomosis and, or stoma formation".

Studies that included paediatric patients were excluded. The operations carried out in most included patients were either hemicolectomy or sigmoidectomy. Information on the age and sex of the patients was not reported. The primary eligible outcome was total primary length of stay defined as the total number of days during the index admission when surgery was performed for colorectal resection. Eligible secondary outcomes were total length of stay (primary length of stay plus additional length of stay acquired as a result of any 30-day readmissions), readmission, morbidity and mortality rates.

Two independent researchers were involved in study selection; disagreements were resolved with a third reviewer, and only when all three reviewers agreed was the study included in the review.

### Assessment of study quality

Methodological quality was assessed by two reviewers independently. Criteria included how the control group was formed, sources of potential bias and blinding. Criteria for RCTs included: randomisation method; presence of power calculation; method of data collection; adequacy of recruitment and statistics; post-randomisation exclusions; ITT analysis; and external validity. Criteria for CCTs included details of confounders and adverse events, and use of statistics. Detailed summaries of the validity assessment results for each study were reported.

### Data extraction

Outcome data were extracted using a standardised data extraction form. The outcome data included length of stay, readmission, morbidity and mortality rates. All length-of-stay data were converted to days. Two independent reviewers extracted data. Authors were contacted for missing data.

### Methods of synthesis

Summary estimates of treatment effects were pooled using a fixed-effect model, using weighted means (WM) for length of stay data (primary length of stay and total length of stay) and relative risk (RR) for morbidity, mortality and 30-day readmission rates. All treatment effects were presented with 95% confidence intervals (CI). Data from the RCTs and CCTs were pooled separately. Between-study heterogeneity was determined using  $I^2$  tests. Where heterogeneity was low, a fixed-effect model was used for meta-analysis. Publication bias was not assessed due to the small number of included studies.

### Results of the review

Four relevant studies were identified: two RCTs (n=64, range 25 to 39) and two CCTs (n=312, range 52 to 260). Both RCTs had power calculations, adequate recruitment and statistics, and good external validity, but no blinding, no intention-to-treat analysis. Both RCTs had 11% post randomisation exclusions. Only one RCT reported allocation concealment. There was potential bias in allocation to groups in both CCTs. Both CCTs had no blinding and there were some baseline differences between the trial groups. Both CCTs gave details of confounders, adverse effects and statistics used.

Meta-analysis of the RCTs gave a significant reduction in both primary length of stay and total length of stay for the enhanced recovery intervention compared to controls (WM -3.64 days, 95% CI -4.98 to -2.29,  $I^2=0\%$  and WM -3.75 days, 95% CI -5.11 to -2.40,  $I^2=0\%$ ). Meta-analysis was not carried out for the CCTs, which only reported postoperative length of stay data.

Meta-analysis of the RCTs for morbidity gave no significant difference between the two groups. The pooled analysis of the CCTs showed a significant reduction in morbidity with enhanced recovery (RR 0.44, 95% CI 0.32 to 0.61,  $I^2=0\%$ ). There was no significant difference in mortality found with the pooled analyses of either RCTs or CCTs for enhanced recovery compared to controls.

Only one RCT reported any 30-day readmissions and there was no significant difference between the control and intervention groups. The pooled analysis of the CCTs for 30-day readmissions found a significantly higher number of readmissions with enhanced recovery compared with controls (RR 1.73, 95% CI 1.00 to 3.01,  $I^2=0\%$ ).

### Authors' conclusions

Enhanced recovery programmes after colorectal resections reduce length-of-stay and may reduce 30-day morbidity and increase 30-day readmission without increasing mortality.

### CRD commentary

The review addressed a well-defined question in terms of participants, interventions, study design and relevant outcomes. Relevant databases were searched in any language and unpublished studies were considered, but only articles published in English were included and so some relevant publications may have been missed. Publication bias was not assessed due to the small number of relevant studies found. Study quality was assessed with suitable criteria for the two types of study included and detailed results were reported. Both RCTs had a relatively high number of post randomisation exclusions. It appeared that efforts were made to reduce error and bias throughout the review process. Relevant study details were reported, but there were no details of the age or sex of the included patients. Statistical heterogeneity was assessed and no evidence for it found. The statistical method used for meta-analysis of the RCTs seemed appropriate. The extent to which the authors' conclusions are reliable was unclear due to the limited evidence provided.

The tabulation of Table 3 was changed in an Erratum in 2010 (see Other Publications of Related Interest). The original data in Table 3 appeared to contradict the results for 30-day readmission rates.

### Implications of the review for practice and research

**Practice:** The authors did not state any implications for practice.

**Research:** The authors identified a need for larger good-quality multi-centred RCTs that evaluated enhanced recovery programmes in colorectal surgery with a more pragmatic approach to identify the true risks and benefits of enhanced

recovery.

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### **Bibliographic details**

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### **Other publications of related interest**

Erratum: Walter et al. Systematic review, *Colorectal Disease* 2009, Walter et al. *Colorectal Disease* 2010; 12: 728.

### **Indexing Status**

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