Optimizing strategies in gastrointestinal surgery

Vlug, M.S.

Citation for published version (APA):
Vlug, M. S. (2010). Optimizing strategies in gastrointestinal surgery

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
CHAPTER 6

Systematic review of laparoscopic versus open colonic surgery within an enhanced recovery programme

Malaika S. Vlug
Jan Wind
Edwin S. van der Zaag
Dirk T. Ubbink
Huib A. Cense
Willem A. Bemelman

Colorectal Dis. 2009 May;11(4):335-43
Abstract

Background
Fast track accelerates recovery, reduces morbidity and shortens hospital stay. It is unclear what the effects are of laparoscopic and open surgery within a fast track programme. Aim of this systematic review was to appreciate the existing evidence.

Methods
A systematic review was performed of all randomized (RCTs) and controlled clinical trials (CCTs) on laparoscopic and open surgery within a fast track setting. Primary endpoints were primary and overall hospital stay, readmission rate, morbidity and mortality. Study selection, quality assessment and data extraction were performed independently by two observers.

Results
Only 2 RCTs and 3 CCTs were eligible for final analysis, which reported on 400 patients. Data could not be pooled because of clinical heterogeneity. One RCT and one CCT stated a shorter primary hospital stay in the laparoscopic group of 3 and 2 days, respectively. In one RCT, the readmission rate was lower in the laparoscopic group; absolute risk reduction (ARR) 21.4% [95% confidence interval (CI): 6–42.3%] resulting in a number to treat (NNT) of 4.7 patients (95% CI: 2.4–176). Another study showed a 23 % difference in favour of the laparoscopic group with regard to morbidity (95% CI: 6.3–39.1%), i.e. a NNT of 4.4 patients (95% CI: 2.6–15.9). There were no significant differences in mortality rates.

Conclusion
Due to the present lack of data, no robust conclusions can be made. A large randomized controlled trial is required to compare laparoscopic with open surgery within a fast track setting.
**Introduction**

A recent development in elective large bowel surgery is the introduction of an enhanced recovery programme after surgery (ERAS)\(^1\,^2\), also referred to as fast track perioperative care. It combines a number of elements aiming at a faster recovery after surgery and a reduction in the surgical stress response.\(^3\,^4\,^12\) This multidisciplinary protocol was developed by Kehlet et al.\(^4\,^6\,^9\,^11\) for all patients undergoing a segmental colectomy enabling a faster recovery resulting in an earlier discharge as compared to traditional care. Furthermore, postoperative morbidity might be reduced in a fast track perioperative care setting.\(^5\,^7\,^9\,^13\,^14\) The essence of ERAS consists of extensive preoperative counselling, no bowel preparation, no sedative premedication, carbohydrate loaded liquids until two hours before operation, thoracic epidural anaesthesia, short acting anaesthetic, perioperative intravenous fluid restriction, small incisions, nonopioid pain management and no routine use of drains and nasogastric tubes. Postoperative care includes early oral feeding, enforced mobilization, early removal of bladder catheter and standard laxative.\(^1\,^12\,^15\)

Laparoscopic surgery was first described in 1991\(^16\) and is still increasingly popular. Advantages of laparoscopic surgery are a reduced hospital stay of about 4–8 days\(^17\,^22\), less morbidity and less postoperative pain.\(^17\,^21\,^26\) After open colorectal surgery postoperative hospital stay is about 6–11 days.\(^17\,^22\) It is unclear what difference there is in hospital stay and clinical end-points between laparoscopic and open surgery in a fast track programme. The aim of this systematic review was to appreciate the existing high-level evidence on these differences.

**Materials and Methods**

**Data search**

Medline database (from January 1950 to August 2007), EMBASE and the Cochrane Library (both from January 1980 to August 2007) were searched for randomized controlled trials (RCTs) or controlled clinical trials (CCTs) with a prospective intervention group comparing laparoscopic surgery with open surgery within an enhanced recovery programme, using the following MeSH (Medical Subject Headings) terms and free text words; fast track, enhanced recovery, ERAS, laparoscopy, laparoscopic, minimally invasive, surgery, laparotomy, open, colon, colonic, colorectal or rectal.
Electronic links to related articles and references of selected articles were hand-searched as well. Leading investigators in the field were contacted to enquire whether studies were ongoing or publications were recently submitted. A hand-search of relevant journals and conference proceedings was not performed. No language restriction was applied.

**Study selection, quality assessment and data extraction**

From the potentially eligible studies, two investigators (JW, MSV) independently selected suitable studies on the basis of their titles and abstracts. Studies were included if they investigated the following primary endpoints: age, gender, American Society of Anesthesiologists (ASA) classification, type of resection, primary (PHS) and/or overall hospital stay (OHS), readmission rate and/or morbidity and/or mortality, and whether at least four fast track (FT) elements were used in a FT protocol. If an eligible study did not specify at least one of these endpoints, it was excluded. The arbitrary number of four FT elements was chosen because fewer elements might represent ‘modern’ traditional care. Secondary endpoints were: quality of life, gastrointestinal function and pain medication.

In case of disagreement, full papers were obtained for final judgement. Discrepancies were resolved by discussion. Final inclusion was confirmed after consensus was reached. The remaining trials were critically appraised using the standard checklist from the Dutch Cochrane Collaboration. Subsequently, study data on the predefined endpoints were extracted, again independently by the two investigators.

**Data analysis**

Primary hospital stay (PHS) is expressed as a median value and inter-quartile range (IQR) or range for each surgical treatment group, calculated from the date of operation to the date of discharge. Overall hospital stay was defined as PHS including the hospitalization period of patients readmitted within 30 days of surgery. Readmission rate, morbidity and mortality are presented as a percentage of the included patients in each surgical treatment group. Morbidity was defined as the reported major and/or minor morbidity within 30 days after surgery. The authors of the papers included here were asked to send the median, interquartile range and range of their PHS and OHS for proper statistical analysis. For dichotomous outcomes (readmission, morbidity and mortality) the absolute risk reduction (ARR), number needed to treat (NNT) and 95% confidence intervals (CIs) were calculated. In the absence of clinical heterogeneity a meta-analysis was to be attempted.

**Results**

**Included studies**

The search identified 178 publications of which 171 were excluded, because those studies did not match the criteria for inclusion. From the 7 selected studies, 2 studies were excluded because all data was used in one of the other selected studies. Of the 3 studies publishing on the same data, the study of Junghans et al. was selected, because both studies reported on a smaller sample size. Five studies remained for final analysis, two RCTs and three CCTs. The selection process of the studies included is summarized in Figure 1.
Included studies were published between 2004 and 2008 and reported on a total of 400 patients, ranging from 55 to 147 patients per study. In Table 1 overall quality assessment is presented. Patient characteristics and results of the included studies are shown in Table 2. The data could not be pooled because of clinical heterogeneity among the studies, for instance different inclusion criteria and different surgical procedures. Hence, only individual study results are presented.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Study design</th>
<th>Concealment of allocation</th>
<th>Intention to treat</th>
<th>Blinding and data collection</th>
<th>Comparability at baseline</th>
<th>Follow-up</th>
<th>Complete follow-up</th>
<th>Similar non-trial treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RCTs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basse et al.28</td>
<td>2005</td>
<td>RCT</td>
<td>Unclear</td>
<td>Yes</td>
<td>Patient: yes, Physician: no, Observer: yes</td>
<td>Yes</td>
<td>30 days</td>
<td>100 %</td>
<td>No In open group additional dose of epidural morphine</td>
</tr>
<tr>
<td>King et al.30</td>
<td>2005</td>
<td>RCT</td>
<td>Yes</td>
<td>Yes</td>
<td>Not blinded</td>
<td>Yes</td>
<td>3 months</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td><strong>CCTs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacKay et al.31</td>
<td>2006</td>
<td>CCT</td>
<td>No</td>
<td>Yes</td>
<td>Not blinded</td>
<td>Yes</td>
<td>3 months</td>
<td>88 %</td>
<td>Yes</td>
</tr>
<tr>
<td>Junghans et al.29</td>
<td>2006</td>
<td>CCT</td>
<td>No</td>
<td>Yes</td>
<td>Not blinded</td>
<td>Yes</td>
<td>30 days</td>
<td>100 %</td>
<td>Yes</td>
</tr>
<tr>
<td>Polle et al.32</td>
<td>2008</td>
<td>CCT</td>
<td>No</td>
<td>Yes</td>
<td>Not blinded</td>
<td>Yes</td>
<td>30 days</td>
<td>100 %</td>
<td>Yes</td>
</tr>
</tbody>
</table>

RCT = randomized controlled trial / CCT = controlled clinical trial
**Methodological quality of the studies**

Two studies, Basse et al.\textsuperscript{28} and King et al.\textsuperscript{30}, were RCTs. The others by Mackay et al.\textsuperscript{31}, Junghans et al.\textsuperscript{29} and Polle et al.\textsuperscript{32} were CCTs. The five studies\textsuperscript{28-32} had several limitations. All had small sample sizes. One\textsuperscript{28} of the 2 RCTs\textsuperscript{28,30} did not describe how randomization was performed. Hence, concealment of allocation was unclear. Only one study (Basse et al.\textsuperscript{28}) was double-blinded, i.e. for patients and assessors. Their patients had an opaque dressing covering their whole abdomen, which was applied after surgery and was not removed until the decision about discharge had been taken. In the other studies the nonblinded study design and data collection may have caused observer bias, which theoretically could have been in favour of the laparoscopic group. In the study by Basse et al.\textsuperscript{28} the nontrial treatment differed between the groups. Patients in the open group received an additional epidural dose of morphine. Only three studies applied well-defined discharge criteria, which is of major importance as hospital stay is one of the outcome parameters. The analysis of Polle et al.\textsuperscript{32} was a subgroup analysis. In this study patients were included who underwent an elective open or laparoscopic segmental colorectal resection within an enhanced recovery programme or traditional care setting. The investigators mainly focused on the difficulties implementing FT surgery.

**Primary outcome parameters**

**Primary and overall hospital stay**

All five studies\textsuperscript{28-32} reported on primary hospital stay. One RCT\textsuperscript{30} and one CCT\textsuperscript{29} stated a shorter PHS after laparoscopy. The randomized trial of King et al.\textsuperscript{30} showed a significant difference in PHS of 5 (IQR 3–6) days in the laparoscopic surgery group vs 8 (IQR 5–9.25) in the open surgery group (Table 2). In the study of Junghans et al.\textsuperscript{29} the authors reported a PHS of 4 (range 3–123) days in the laparoscopic group vs 6 (range 3–79) days in the open group.

Overall the PHS varied widely between the studies. The largest difference was seen between the RCT of Basse et al.\textsuperscript{28} and the CCT of MacKay et al.\textsuperscript{31} Basse et al.\textsuperscript{28} reported a PHS of 2 (range 2–20) days in the laparoscopic group vs 2 (range 2–5) days in the open group. MacKay et al.\textsuperscript{31} reported a PHS of 6 (IQR 5–9) days in the laparoscopic group vs 6 (IQR 5–10) days in the open group.

Overall hospital stay was shown in 3 studies\textsuperscript{28;30;32} The RCT of King et al.\textsuperscript{30} showed a significant shorter OHS in the laparoscopic group: 6 (IQR 3–11) days vs 8.5 (IQR 6–12.5) in the open group.

**Readmission rate**

Readmission rates were reported in four studies\textsuperscript{28,30-32} A large variation was observed in readmission rates among the studies (Table 2). In the laparoscopic surgery group the highest readmission rate of 20\% was reported by Basse et al.\textsuperscript{28} and the lowest (0\%) was reported by MacKay et al.\textsuperscript{31} In the open surgery group the same studies reported the highest (26.6\%) and lowest (3.4\%) readmission rates, respectively. MacKay et al.\textsuperscript{31} who readmitted the lowest number of patients observed the longest primary hospital stay; 6 days in both treatment groups.
### Table 2: Demographics, patient characteristics, and results of the included studies

<table>
<thead>
<tr>
<th>Reference</th>
<th>N</th>
<th>Age (years)</th>
<th>% ASA I&amp;II</th>
<th>Type of surgery</th>
<th>PHS (days)</th>
<th>OHS (days)</th>
<th>Readmissions % (n)</th>
<th>Morbidity % (n)</th>
<th>Mortality % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RCTs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basse et al.²⁸</td>
<td>30 / 30</td>
<td>75.5 / 75</td>
<td>83 / 63</td>
<td>RH, SR</td>
<td>2 (range 2-20) / 2 (range 2-5)</td>
<td>2 (NR) / 2 (NR)</td>
<td>20 (6) / 26.6 (8)</td>
<td>26.6 (8) / 20 (6)</td>
<td>0 / 10 (3)</td>
</tr>
<tr>
<td>King et al.³⁰</td>
<td>41 / 19</td>
<td>72.3 / 70.4 (mean)</td>
<td>78 / 84</td>
<td>LH, RH, SR, AR, APR</td>
<td>5 (IQR 3-6) / 8 (IQR 5-9.25)*</td>
<td>6 (IQR 3-11) / 8.5 (IQR 6-12.5)*</td>
<td>4.6 (2) / 26.3 (5)*</td>
<td>14.9 (6) / 26.3 (5)</td>
<td>2.4 (1) / 5.3 (1)</td>
</tr>
<tr>
<td><strong>CCTs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacKay et al.³¹</td>
<td>21 / 57</td>
<td>72.0 / 73.2</td>
<td>77 / 74</td>
<td>LH, RH, AR, HC</td>
<td>6 (IQR 5-9) / 6 (IQR 5-10)</td>
<td>NR</td>
<td>0 / 3.4 (2)</td>
<td>27.2 (6) / 22.4 (13)</td>
<td>4.5 (1) / 1.7 (1)</td>
</tr>
<tr>
<td>Junghans et al.²⁹</td>
<td>100 / 47</td>
<td>65 / 67</td>
<td>67 / 51.1</td>
<td>SR, RR</td>
<td>4 (range 3-123) / 6 (range 3-79)*</td>
<td>NR</td>
<td>NR</td>
<td>22 (22) / 44.7 (21)*</td>
<td>0 / 0</td>
</tr>
<tr>
<td>Polle et al.³²</td>
<td>29 / 26</td>
<td>46.4 / 50.4</td>
<td>100 / 100</td>
<td>SC, IR</td>
<td>4 (IQR 3-5.5) / 4.5 (IQR 4-8.25)</td>
<td>4 (IQR 3-6.5) / 5 (IQR 4-10.25)</td>
<td>10.3 (3) / 11.5 (3)</td>
<td>31.0 (9) / 23.1 (6)</td>
<td>0 / 0</td>
</tr>
</tbody>
</table>

Continuous data: median (IQR or range) / Lap = laparoscopy / Open = open surgery / ASA = american society of anesthesiologists / PHS = primary hospital stay / OHS = overall hospital stay / LH = left hemicolectomy / RH = right hemicolectomy / SC = subtotal colectomy / SR = sigmoid resection / RR = rectal resection / IR = ileocolic resection / AR = anterior resection / APR = abdominoperineal resection / HC = hartmann closure / NR = not reported / *P < 0.05
In the study by King et al.\textsuperscript{30} readmission rate was significantly lower in the laparoscopic group; absolute risk reduction (ARR) 21\% (95\% CI: 0.6–42.3\%), resulting in a number needed to treat (NNT) of 4.7 patients (95\% CI: 2.4–176). The other studies did not show a significant difference in readmission rates between both surgical techniques.

**Morbidity and mortality**

Morbidity rates were reported in all studies. Only in the study by Junghans et al.\textsuperscript{29} a 23\% difference in favour of the laparoscopic group was shown (95\% CI: 6.3–39.1\%), i.e. a NNT of 4.4 patients (95\% CI: 2.6–15.9). There were no significant differences between the treatment groups with regard to mortality (Table 3).

### Table 3 Numbers needed to treat, absolute reduced risk and 95\% confidence intervals

<table>
<thead>
<tr>
<th>Reference</th>
<th>Readmissions</th>
<th>Morbidity</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NNT (95% CI)</td>
<td>ARR (95% CI)</td>
<td>NNT (95% CI)</td>
</tr>
<tr>
<td><strong>RCTs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basse et al.\textsuperscript{28}</td>
<td>NNT 15.0 (-6.8, 3.6)</td>
<td>ARR 0.067 (-0.147, 0.280)</td>
<td>NNT -15.0 (-3.5, 6.8)</td>
</tr>
<tr>
<td>King et al.\textsuperscript{30}</td>
<td>NNT 4.7 (2.4, 176)</td>
<td>ARR 0.214 (0.006, 0.423)</td>
<td>NNT 8.5 (-9.2, 2.9)</td>
</tr>
<tr>
<td><strong>CCTs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MacKay et al.\textsuperscript{31}</td>
<td>NNT 28.5 (-76.9, 12.0)</td>
<td>ARR 0.035 (-0.013, 0.083)</td>
<td>NNT -17.3 (-3.6, 6.1)</td>
</tr>
<tr>
<td>Junghans et al.\textsuperscript{29}</td>
<td>NR</td>
<td></td>
<td>NNT 4.4 (2.6, 15.9)</td>
</tr>
<tr>
<td>Polle et al.\textsuperscript{32}</td>
<td>NNT 84.0 (-6.5, 5.6)</td>
<td>ARR 0.012 (-0.153, 0.177)</td>
<td>NNT – 12.5 (-3.2, 6.5)</td>
</tr>
</tbody>
</table>

RCT = randomized controlled trail / CCT = controlled clinical trail / NNT = numbers needed to treat / ARR = absolute reduced risk / NP = not possible to calculate due to lack of data or zero in both groups / NR = not reported

**Number of fast track items**

Application of the 17 FT elements applied varied among the studies (Table 4). The median number of FT items as applied in the five studies was 13 (IQR 11.5–14.5). Preoperative counselling, fluid restriction, no routine use of nasogastric tubes, enforced postoperative oral feeding/mobilization and early removal of the bladder catheter was required by protocol in all studies. Other FT items, like no bowel preparation and no premedication, were less frequently executed.
Secondary outcome parameters

Quality of life
In the study of King et al.\textsuperscript{30} and MacKay et al.\textsuperscript{31} quality of life after surgery was evaluated. Neither of these studies showed a statistical difference between the treatment groups. King et al.\textsuperscript{30} did report that quality of life in both groups deteriorated 2 weeks after surgery, but improved in both groups after 6 weeks.

Gastrointestinal function
Three studies\textsuperscript{28,29,31} reported about gastrointestinal function. Basse et al.\textsuperscript{28} and MacKay et al.\textsuperscript{31} did not find any significant difference between the treatment groups regarding nausea scores. Median time to first defecation was 2 days in both groups in the study of Basse et al.\textsuperscript{28} In the study of Junghans et al.\textsuperscript{29} the median time (range) to first defecation was 1 (0–6) days postoperatively in the laparoscopic group vs 2 (0–6) days in the open group. This difference was reported as significant. In MacKay et al.\textsuperscript{31} time to first flatus and first defecation were similar between the treatment groups; median (IQR) 68.7 (55.8–76.5) h vs 69.2 (56.0–86.7) h and 127.1 (99.3–148.7) h vs 101.2 (75.2–139.1) h, respectively.
Pain medication

In the study by King et al.\textsuperscript{30} significantly more patients required additional opioid analgesics in the open group; ARR=52\% (95\% CI: 28.2–75.2\%) and NNT=1.9 patients (95\% CI: 1.3–3.5). There were no significant differences reported in use of morphine, paracetamol and tramadol between the groups in the study of MacKay et al.\textsuperscript{31}, mean difference 4 mg (95\% CI: –14.6–23.9 mg).

Discussion

This review points in the direction of superiority of laparoscopic surgery in fast track setting with respect to hospital stay, readmission rates and morbidity, based on a few, individual, study results. However, the available evidence is scarce due to a lack of good quality trials.

Of the two RCTs\textsuperscript{28;30} found, only one\textsuperscript{30} showed a significantly lower primary and overall postoperative hospital stay was significantly lower in the laparoscopic group. The differences between these RCTs\textsuperscript{28;30} in PHS and OHS were considerable. There are several possible explanations. In the study of King et al.\textsuperscript{30} only patients with diagnosed colorectal carcinoma are included. Basse et al.\textsuperscript{28} included patients with benign as well as malignant conditions. The condition of the patients in the study of King et al.\textsuperscript{30} could therefore be worse resulting in a longer postoperative recovery period. Patients requiring a rectal resection or not living independently were excluded in the study of Basse et al.\textsuperscript{28}, but were included by King et al.\textsuperscript{30}

In the university hospital of Basse et al.\textsuperscript{28} fast track surgery has been developed. Therefore, the results of their programme are likely to be most favourable. Basse et al.\textsuperscript{28} demonstrated that a postoperative hospital stay of 2–3 days after colonic surgery can be achieved both after laparoscopic and open colectomy if performed in fast track setting. However, these results were achieved at the expense of readmission rates up to 26.6\%.

Basse et al.\textsuperscript{28} showed a remarkable high mortality rate in the open group (10\%). This can be explained by the higher ASA scores in that group.

The study of King et al.\textsuperscript{30} was not blinded. It is unclear how this affects hospital stay. On one hand an observer bias favouring the laparoscopic group, could have influenced the results of the study of King et al.\textsuperscript{30}, reporting a significantly worse PHS, OHS and readmission rate in the open group. On the other hand, blinding with large bandages might give the patient the impression they had open surgery hampering recovery and discharge.

In the three CCTs\textsuperscript{29;31;32} found, one study\textsuperscript{29} stated a significantly shorter PHS in the laparoscopic group. In this study\textsuperscript{29} however, almost 50\% of the patients in the open group had an ASA score III or IV and more patients in this group were operated because of a carcinoma (60\%). In their laparoscopic treatment group, 33\% of the patients had an ASA score of III or IV and 41\% had a carcinoma. This could be an explanation for the longer PHS and the higher morbidity in the open group. In the study of Polle et al.\textsuperscript{32} only patients with an ASA score of I and II were included.

Morbidity was around 20–30\% in four studies. Junghans et al.\textsuperscript{29} reported a 23\% reduction in morbidity in the laparoscopic group, but their morbidity of 44.7\% in the open group is
very high. However, it was not clear whether patients with more than one complication were counted twice resulting in this high morbidity percentage. A readmission rate of 0% in the laparoscopic group and 3.4% in the open group in the study of MacKay et al.\textsuperscript{31} indicates that the longer the mean hospital stay, the lower the readmission rate is. Recently, Kehlet’s group confirmed this relation between hospital stay and readmission rate achieving lower readmission rates when hospital stay was prolonged by 1 day.\textsuperscript{35} The longer hospital stay in the study of MacKay et al.\textsuperscript{31} may be caused by their use of patient-controlled instead of epidural analgesia.

Allocation bias could have influenced the results in favour of laparoscopic surgery in the three CCTs by MacKay et al.\textsuperscript{31}, Polle et al.\textsuperscript{32} and Junghans et al.\textsuperscript{39}, because the surgeon decided which patient would undergo laparoscopic or open surgery.

This systematic review was limited by a low number of studies. All studies had small sample sizes and only one study used a proper sample size calculation. Overall quality of the selected studies was found to be moderate. Of the five included studies\textsuperscript{28-32}, three studies were CCTs\textsuperscript{29;31;32}, which increases the probability bias will occur. Due to clinical heterogeneity the data could not be pooled. Mean differences and 95% CIs could not be calculated as data were not normally distributed.

Fast track perioperative care in colonic surgery has been introduced more then 10 years ago. In all studies\textsuperscript{28-32} the number of applied fast track items in the protocol were reported, but only one study, Polle et al.\textsuperscript{32}, reported the number of FT items actually achieved. In this study 15 fast track elements have been applied and 13 elements have been evaluated. An average of 7.4 of 13 fast track modalities were successfully achieved per patient. Nevertheless, despite this low success rate of implementing the fast track items, it was reported that a significantly faster recovery of the fast track group resulted in a shorter hospital stay. It is clear that a full implementation of all items encompassing the fast track protocol requires a learning curve and a dedicated multidisciplinary functioning team. Although there is evidence about most items of the programme, it seems hard to implement all different elements of fast track as every discipline has to break with longstanding traditions.

In conclusion, the presently available evidence does not allow a robust conclusion on the outcomes of laparoscopic vs open surgery within a fast track setting. Only five studies were available for analysis. So, the question remains whether fast track or modern traditional care, laparoscopic or open surgery, or a combination of both is the preferred strategy. This research question is the objective of the LAFA study\textsuperscript{36}, comprising over 400 patients, that will hopefully provide the answer to this question in the middle of 2009.
References

21) Lacy AM, Garcia-Valdecasas JC, Delgado S, Castells A, Taura P, Pique JM et al. Laparoscopy-assisted...