Discharging patients after colorectal surgery: a Medical Research Institute experience

Moustafa R. Abo Elsoud[a], Mohamed G. Soror[b]

[a]Department of General Surgery, Medical Research Institute, [b]Department of General Surgery, Faculty of Medicine, Alexandria University, Alexandria, Egypt

Correspondence to Moustafa R. Abo Elsoud, MD, General Surgery, Safwa Business Men 2, App 511, Smouha, Alexandria 21561, Egypt
Tel: +20 342 82373, +20 342 08598;
fax: +20 342 80529;
e-mail: darsh7620012001@yahoo.com

Received 11 June 2015
Accepted 28 July 2015

The Egyptian Journal of Surgery
2015, 34:264–271

Colorectal surgery comprises a sizeable proportion of health care resources and attention is increasingly directed toward accelerating postoperative recovery thus decreasing the requirement for patient hospitalization after surgery. The use of standardized hospital discharge criteria is considered valuable to reduce the risk of premature discharge and avoid unnecessary hospital stays.

Aim of the work

The aim of this study is to compare the criteria suggested by Fiore *et al.* international consensus against the standard method used in clinical and experimental surgery department, medical research institute Hospital, Egypt.

Patients and Methods

60 patients were divided into two equal groups. Group I included 30 patients discharged according to Fiore *et al.* criteria while Group II: included 30 patients discharged according to the usual practice in the unit.

Results

There were no differences in demographic data between the two groups. Regaining of normal peristalsis in both groups was also similar, both groups passed flatus and stool at about the same time. In our study, both groups had no difference in time of pain control by oral analgesia (opioid + NSAIDs or NSAIDs alone). In this study both groups had similar rates of wound infection, 30% for group I and 23% for group II, while both groups were similar in albumin level. Differences in social acceptance of hospital discharge were not statistically significant between both groups.

Conclusion

The end point of this study was the rate of readmission which was 6.7% in both groups. So not only these discharge criteria are applicable and achievable, but we can also say they proved to be dependable

Keywords:
colorectal surgery, Fiore and colleagues' criteria, hospital readmission, standardized hospital discharge, wound infection

Egyptian J Surgery 34:264–271

1110-1121

Introduction

Colorectal surgery involves the utilization of a sizeable proportion of healthcare resources [1,2]. Colorectal cancer is the fourth most common form of cancer worldwide. It represents 9.4% of all incident cancer cases in men and 10.1% in women. In Egypt it contributes to 6.5% of all cancer cases [3].

Because hospital services account for a large component of this cost, attention is being increasingly directed toward accelerating postoperative recovery and decreasing the requirement for patient hospitalization after surgery [3].

Over the past two decades, improvements in colorectal surgical techniques and perioperative care have led to considerable reduction in postoperative length of stay [4–8]. However, there are concerns that early discharge may increase the risk for postoperative morbidity and hospital readmission [5,8–10].

Unplanned readmission is reported to occur in 10–20% of patients undergoing colorectal surgery [9–16].

The use of standardized hospital discharge criteria is considered valuable for reducing the risk of premature discharge and for avoiding unnecessary hospital stays [5,8]. By applying discharge criteria, the surgical team may determine when a patient has recovered sufficiently from the surgical procedure to be safely managed outside the hospital [17]. The most appropriate criteria to indicate readiness for discharge following colorectal surgery are unknown. In a recent systematic review, it was found that there are no studies comparing discharge criteria following colorectal

surgery [18]. Moreover, the discharge criteria described in the literature are not only variable, but also poorly defined [17].

Philosophy of enhanced recovery after surgery

The main aim of the enhanced recovery after surgery protocol is to reduce the metabolic stress caused by surgical trauma and at the same time support the return of functions that allow patients to get back to normal activities, thus decreasing hospital stay (Fig. 1).

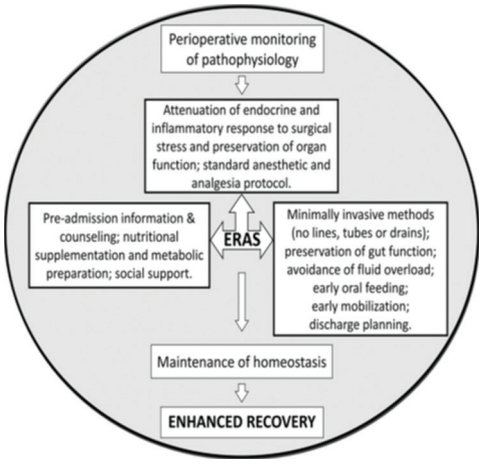
Determination of criteria of discharge after colorectal resection surgery

A3-round Delphi process was used to determine the criteria of discharge after colorectal resection surgery. The Delphi technique is a method of systematically surveying a group of experts to reach consensus on specific questions or issues [19–22]. It involves completion of a series of questionnaires interspersed with summary and feedback derived from previous responses. Experts remain anonymous to one another during the process. The Delphi provides several advantages over consensus methods that involve face-to-face meetings. It allows free discussion without the influence of personal status, enabling the alteration of personal views without embarrassment, and providing means to combine opinions from experts who are geographically dispersed [19–22]. This method has been widely and successfully used in healthcare [23–27] and surgical research [28–31].

Aim of the work

The aim of this study was to compare the international consensus criteria suggested by Fiore and colleagues against the standard method used in the Clinical and Experimental Surgery Department, Medical Research Institute Hospital, Alexandria University.

Figure 1



Philosophy of enhanced recovery after surgery (ERAS).

Patients and methods

This study was carried out on 60 randomly allocated patients who underwent colorectal surgery.

Selection criteria

This study included 60 patients who were admitted to the Clinical and Experimental Surgery Department, Medical Research Institute Hospital, to undergo colorectal surgery.

Methods

The patients were randomly allocated by means of the closed envelope technique into two groups:

Group A: This included 30 patients who were discharged according to the criteria mentioned in Table 1.

Group B: This included 30 patients who were discharged according to the usual practice in the unit.

Statistical analysis: Data were fed into the computer and analyzed using IBM SPSS software package version 20.0 (Armonk, NY, IBM Corp). Qualitative data were described using number and percentage. Quantitative data were described using mean and SD, median, and minimum and maximum values.

Comparison between groups regarding categorical variables was made using the χ^2-test. When more than 20% of cells have an expected count less than 5, correction for χ^2-test was conducted using Fisher's exact test or Monte Carlo correction.

The distributions of quantitative variables were tested for normality using the Kolmogorov–Smirnov test, the Shapiro-Wilk test, and the D'Agostino test. If the data were normally distributed, parametric tests were applied. If the data were abnormally distributed, nonparametric tests were used.

For normally distributed data, comparison between two independent populations was carried out using the independent *t*-test. For abnormally distributed data, comparison between two independent populations was made using the Mann–Whitney test.

Significance was ascertained as two-tailed probabilities. Significance of the obtained results was judged at the 5% level.

Table 1 Summary of preoperative recommendations

Preoperative elements	Rationale	Recommendations	Grade of evidence
Preadmission information and counseling	Preadmission counseling ensures a clear understanding of the intended perioperative care to be received, with emphasis on attaining specific preset targets, and would help in alleviating the stress responses to surgery [32]	Oral and written patient information regarding hospitalization, pain relief, and achieving postoperative targets, such as early nutrition, mobilization, and discharge	C
No bowel preparation	Bowel preparation leads to dehydration and changes in fluid and electrolyte balance [18] No change or rather an increased risk for complications, such as prolonged postoperative complications, and increased risk for anastomotic leakage from mechanical bowel preparation [33]	Patients undergoing elective colonic resection above peritoneal reflection should not receive routine oral bowel preparationMay be considered in low rectal resection where a diverting stoma is planned [34]	A
Preoperative nutritional support	Approximately 27–45% of hospitalized patients are malnourished [35] Increases risk for tissue wasting, impaired immune function, impaired healing, and organ dysfunction resulting in increased morbidity, length of stay, readmission rates, delayed recovery, hospital costs, and mortality [36] Preoperative carbohydrate loading reduces the incidence of complications [37] and facilitates accelerated recovery through early return of gut function and shorter hospital stay leading to improved perioperative well-being [38]	Patients at risk for malnutrition should be given preoperative nutritional support, orally if possible [39] Patients should receive carbohydrate enriched drinks preoperatively [40]	A
Preoperative fasting	Preoperative fasting and surgery predisposes to metabolic stress and insulin resistance [41]Overnight fasting does not reduce the risk for aspiration. Intake of clear fluids until 2 h before anesthesia is considered safe [42]	The consensus guidelines from a Cochrane review [42] and guidelines from anesthetic societies recommend clear fluids until 2 h before induction of anesthesia and a 6-h fast for solid food [40]	A
No long-acting sedatives/ premedication	Long-acting sedatives, hypnotics, and opioids (pre-emptive analgesia) were thought to reduce anxiety and stress related to surgery, but these effects are far outweighed by the risk for prolonged recovery caused by inability to drink or mobilize postoperativelyNo effect on postoperative pain relief by starting analgesic treatment before the operation [43]Short-acting anxiolytics have not shown prolonged recovery or length of stay [43]	Medications causing long-term sedation should be avoidedShort-acting medications given to facilitate insertion of epidural catheter are acceptable	A
Antimicrobial prophylaxis	Prophylactic antibiotics minimize infectious complications in colorectal surgery [44]	A single dose, 1 h before skin incision and further doses for procedures lasting more than 3 h [44]	A
Thromboembolic prophylaxis	Increased risk for thromboembolic complications in certain high-risk patients undergoing major abdominal surgery is associated with prolonged hospitalization and recovery	Subcutaneous low-dose unfractionated heparin or subcutaneous low-molecular-weight heparin [45]	C

Results

Comparison between the studied groups according to demographic data:

The study included 13 male and 17 female patients in group I and 15 male and 15 female patients in group II. The mean age was 55.23 years in group I and 50.90 years in group II.

There were no statistically significant differences between the two groups.

Comparison between the studied groups according to diagnosis

The study included 12 cases of rectal cancer, seven cases of right colon cancer, six cases of left colon cancer, two cases of left diverticular disease, two cases of familial adenomatous polyps, and one case of left colonic volvulus in group I; in group II there were 10 cases of rectal cancer, seven cases of right colon cancer, eight cases of left colon cancer, one case of left diverticular disease, three cases of familial adenomatous polyps, and one case of left colonic volvulus (Table 2).

There was no statistical significance between the two groups according to diagnosis.

Comparison between the studied groups according to preoperative duration of fasting (h), surgeon, duration of surgery (min), and indication of surgery

Twenty-seven surgeries were conducted by consultants and three by specialists in group I, whereas 25 surgeries

were conducted by consultants and five by specialists in group II. No statistical significance existed between the two groups.

The mean duration of fasting was 12.45 ± 6.14 h in group I and 14.50 ± 5.42 h in group II. No statistical significance existed between the two groups. Twenty-nine surgeries were elective and one was emergency in both groups, with a mean duration of 134.33 ± 15.24 min in group I and 132.67 ± 22.27 min in group II. No statistical significance existed between the two groups (Table 3).

Comparison between the studied groups according to duration of pain control with oral analgesia (days): No statistical significance existed between the two groups according to duration of pain control with oral analgesia; median time was 4 days for opioid analgesia and 6 days for nonopioid use in both groups (Table 4).

Comparison between the studied groups according to tolerance to oral intake (one solid meal+>1000 ml fluids) (days): Median time of tolerance to oral intake (one solid meal+>1000 ml fluids) was 4 days in both groups. No statistical significance existed between the two groups (Table 5).

Comparison between the studied groups according to recovery of lower gastro-intestinal tract (GIT) function (days): Median time of passing flatus was 3 and 2.5 days in groups I and II, respectively; however, median time of passing stool was 5 days in both groups.

No statistical significance existed between the two groups (Table 6).

Comparison between the studied groups according to time to fulfilling discharge criteria (P.O. days): Median time to fulfilling discharge criteria was 5 days in both groups. No statistical significance existed between the two groups.

Comparison between the studied groups according to postoperative hospital stay (days)

Median time of postoperative hospital stay was significantly lower in group I (6 days) than in group II (8.5 days) ($P \leq 0.001$) (Table 7).

Comparison between the studied groups according to causes of delayed discharge after fulfilling the criteria

All patients in group I were discharged after fulfilling the criteria without delay, whereas all patients had delayed discharge in group II as seven cases were not controlled on nonopioid oral analgesia (23.3%), eight cases were not tolerant to more than one solid meal+1000 ml oral fluids (26.7%), eight cases did not

Table 2 Comparison between the studied groups according to diagnosis

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30) [n (%)]	Group II (n = 30) [n (%)]	P
Diagnosis			
Rectal cancer	12 (40.0)	10 (33.3)	0.919
Right colon cancer	7 (23.3)	7 (23.3)	
Left colon cancer	6 (20.0)	8 (26.7)	
Left diverticular disease	2 (6.7)	1 (3.3)	
Familial adenomatous polyposis	2 (6.7)	3 (10.0)	
Left colonic volvulus	1 (3.3)	1 (3.3)	

P, *P* value for Monte Carlo test between the two studied groups.

Table 3 Comparison between the studied groups as regards duration of fasting (h), surgeon, indication of surgery, and duration of surgery (min)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30) [n (%)]	Group II (n = 30) [n (%)]	Test of significance
Surgeon			
Consultant	27 (90.0)	25 (86.2)	^{FE}P=0.706
Specialist	3 (10.0)	4 (13.8)	
Duration fasting (h)			
Minimum–maximum	12.0–24.0	12.0–24.0	^{t}P=0.176
Mean ± SD	12.45 ± 6.14	14.50 ± 5.42	
Median	14.0	14.0	
Elective and emergency			
Elective	29 (96.7)	29 (96.7)	^{FE}P=1.000
Emergency	1 (3.3)	1 (3.3)	
Duration (min)			
Minimum–maximum	110.0–170.0	130.0–160.0	^{t}P=0.736
Mean ± SD	134.33 ± 15.24	132.67 ± 22.27	
Median	130.0	132.50	

FE, Fisher exact test; *P*, *P* value between the two studied groups; *t*, Student *t*-test.

Table 4 Comparison between the studied groups according to duration of control with oral analgesia (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
Opioid			
Minimum–maximum	2.0–7.0	3.0–5.0	0.654
Mean ± SD	3.93 ± 1.01	4.03 ± 0.67	
Median	4.0	4.0	
Nonopioid			
Minimum–maximum	4.0–9.0	5.0–8.0	0.633
Mean ± SD	5.83 ± 1.15	5.97 ± 1.0	
Median	6.0	6.0	

P, *P* value for the Student *t*-test between the two studied groups.

Table 5 Comparison between the studied groups according to tolerance to oral intake (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
1 solid meal+>1000 ml fluids			
Minimum–maximum	3.0–5.0	3.0–5.0	0.069
Mean ± SD	4.37 ± 0.56	4.07 ± 0.69	
Median	4.0	4.0	

P, *P* value for the Student *t*-test between the two studied groups.

pass stool (26.7%), seven cases had wound infection (23.3%), five cases had rectal bleeding (16.7%), another five had a low serum albumin level (16.7%), and finally six cases had an elevated white blood cell count (20%).

There was statistical significance in favor of group I with respect to the causes of delayed discharge after fulfilling the criteria ($P < 0.05$) (Table 8).

Comparison between the studied groups according to readmission

Two cases were readmitted in both groups. No statistical significance existed between the studied groups. The cause of readmission was burst abdomen and pelvic collection in group I and anastomotic leak and pelvic collection in group II.

Table 6 Comparison between the studied groups according to recovery of lower GIT function (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
Flatus			
Minimum–maximum	2.0–4.0	1.0–6.0	0.897
Mean ± SD	2.80 ± 0.66	2.83 ± 1.23	
Median	3.0	2.50	
Stool			
Minimum–maximum	3.0–6.0	3.0–7.0	0.169
Mean ± SD	4.70 ± 0.75	5.0 ± 0.91	
Median	5.0	5.0	

Table 7 Comparison between the studied groups according to postoperative hospital stay (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
Postoperative hospital stay			
Minimum–maximum	5.0–9.0	6.0 ± 12.0	<0.001*
Mean ± SD	6.50 ± 1.11	8.53	
Median	6.0	8.50	

P, P value for the Student t-test for comparing between the two studied groups; *Statistically significant at $P \leq 0.05$.

Discussion

Currently, little information exists regarding the specific criteria that indicate readiness for discharge following colorectal surgery. In a systematic review Fiore *et al.* [17] identified 156 studies that described 70 different sets of criteria to indicate readiness for discharge. To ensure an international perspective to this consensus, they recruited a panel of 15 experts from 15 different countries using the Delphi technique. Experts reached consensus that patients should be considered ready for hospital discharge when there is tolerance of oral intake, recovery of lower gastrointestinal function, adequate pain control with oral analgesia, ability to mobilize and self-care, and no evidence of complications or untreated medical problems [46].

In colorectal surgery, drains are expected to prevent hematoma, fluid collection, or abscess formation, to act as an indicator of postoperative complication, and to minimize the severity of complication-related symptoms [47].

Routine drainage has not been advocated by meta-analyses as drains have failed to demonstrate any benefit in reducing anastomotic leak rate, minimizing symptoms, or in serving as a warning function [48]. Despite the controversial results, the choice of using a drain is left to the individual surgeon's preference. Close follow-up of patients is essential on its use. It is important that the duration of drainage not be unnecessarily extended. Any complications directly associated with the use of drains should be avoided [48]. In this study, the surgeon's preference was to use a drain. In both groups a drain was inserted, and removed at approximately the same time (in 3–5 days in group I and in 4–5 days in group II).

Lassen *et al.* [40] in his consensus review of optimal perioperative care in colorectal surgery found that, although fasting from midnight has been standard practice to avoid pulmonary aspiration in elective surgery, a review has found no evidence to support this.

Table 8 Comparison between the studied groups according to cause of delayed discharge after fulfilling criteria

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30) [n (%)]	Group II (n = 30) [n (%)]	Test of significance
Discharged after fulfilling criteria	30 (100.0)	0 (0.0)	$\chi^2 P$<0.001*
Not controlled on nonopioid oral analgesia	0 (0.0)	7 (23.3)	^{FE}P=0.011*
Not tolerant to (more than 1 solid meal+1000 ml oral fluids)	0 (0.0)	8 (26.7)	^{FE}P=0.005*
Not passing stool	0 (0.0)	8 (26.7)	^{FE}P=0.005*
Presence of wound infection	0 (0.0)	7 (23.3)	^{FE}P=0.011*
Presence of rectal bleeding	0 (0.0)	5 (16.7)	^{FE}P=0.049*
Level of serum albumin	0 (0.0)	5 (16.7)	^{FE}P=0.049*
Elevated WBC	0 (0.0)	6 (20.0)	^{FE}P=0.024*
No social acceptance and home status	0 (0.0)	3 (10.0)	^{FE}P=0.237

FE, Fisher's exact test; P, P value for comparing between the two studied groups; WBC, white blood cell; *Statistically significant at $P \leq 0.05$.

Equally, a Cochrane review of 22 randomized controlled trials in adult patients provides robust evidence that reducing the preoperative fasting period for clear fluids to 2 h does not increase complications [42].

A metabolically fed state in patients undergoing surgery can be achieved by providing a clear carbohydrate-rich beverage before midnight and 23 h before surgery. This reduces preoperative thirst, hunger, and anxiety and postoperative insulin resistance. Patients in a more anabolic state have less postoperative nitrogen and protein loss as well as better-maintained lean body mass and muscle strength [42]. Data from randomized controlled trials indicate accelerated recovery and shorter hospital stay in patients receiving preoperative carbohydrate loading in colorectal surgery [49]. In this study, all patients underwent 12–24 h of fasting before surgery. However, this did not affect their tolerance to oral intake, which was similar in both groups (3–5 days).

Regaining of normal peristalsis in both groups was similar. In group I it was 1–3 days and in group II it was 1–4 days. This is consistent with what Wilson [50] found that following laparotomy colonic pressure activity first occurs after 40–48 h.

Andersen and colleagues performed a Cochrane review that included 14 randomized controlled trials representing a total of 1224 patients all undergoing gastrointestinal surgery. In their study they compared early postoperative feeding against traditional management to estimate the relative risk of postoperative complications. They concluded that there is no obvious advantage in keeping patients nil by mouth following gastrointestinal surgery and supported early commencement of enteral feeding [51]. In our study both groups met the discharge criteria to tolerate at least one solid meal and more than 1000 ml oral fluids at equal times, which were from 3 to 5 days with a mean of about 4 days. In all, 26.7% of group II stayed at the hospital for an additional 1–3 days after fulfilling the discharge criteria until they were able to tolerate more than one solid meal.

Chan and Law [52] and Klappenbach *et al.* [53] in their review of postoperative ileus management set passage of flatus or stool as a sign of resolution of ileus and Delaney [54] in his study of feasibility of discharge within 24–72 h after laparoscopic colorectal surgery also set passage of either flatus and stool as the criterion for patient discharge. These studies did not show significant readmission differences because of early discharge of their patients. In this study, group I patients passed flatus with a mean of 2.8 days, whereas group II patients passed flatus at about the same time. Both groups passed stool with a similar mean of 5 days, which is acceptable as compared with these studies.

Opioid analgesia is the most commonly used method of postoperative pain management. Pain is a subjective and extremely variable experience. Variability in the patient's perception of pain coupled with variability in the pharmacokinetic behavior of opioids results in a huge variation in analgesic requirements [55].

In the past decades we have focused on the pursuit of the ideal analgesic agent. The administration of oral analgesics can begin as soon as the patient can tolerate oral fluids.

In our study, both groups had no difference in the duration of pain control by oral analgesia (opioid+NSAIDs or NSAIDs alone). But in group II, seven patients (23.3%) were discharged about 2 days later after their pain was controlled on NSAIDs alone after fulfilling other discharge criteria.

Despite the use of preoperative antibiotic prophylaxis, infections still represent the most frequent cause of perioperative morbidity. Intra-abdominal infections are related primarily to anastomotic leaks and are potentially life-threatening. Anastomotic leaks occur with a frequency of up to 23%. In roughly half of the patients, anastomotic leaks are clinically silent and may first become evident after a median of 8 days, often when patients have developed critical illness [56].

It is important to diagnose infectious complications early in order to initiate either surgical or conservative treatment, preventing serious postoperative morbidity or death [56]. However, there is presently no reliable diagnostic test with sufficient accuracy available to detect anastomotic leaks at an early stage. In most cases, the patient will present with signs of sepsis: tachypnea, tachycardia, and fever at the sixth to eighth postoperative day. There is often abdominal pain or distension suggesting an ileus, but clinically the abdomen may show signs of peritonitis. Inflammatory markers will be elevated; the diagnosis may be difficult to make as the patients display features consistent with other postoperative infectious complications [57].

The discharge criteria proposed by Fiore and colleagues were not only achieved by an international consensus, but also these criteria are applicable and achievable. In our study both groups fulfilled the discharge criteria at about the same time, which is from 4 to 8 days with a mean of 5.5 days. However, group II had a significantly longer hospital stay of 6–12 days with a mean of 8.5 days in comparison with group I, with 5–9 days of hospital stay with a mean of 6.5 days.

The cause of readmission was burst abdomen and pelvic collection in group I and anastomotic leak and pelvic collection in group II.

Conclusion

The endpoint of this study was the rate of readmission, which was 6.7% in both groups. Therefore, not only were these discharge criteria applicable and achievable but they proved to be dependable.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Elixhauser A, Andrews RM. Profile of inpatient operating room procedures in US hospitals in 2007. Arch Surg 2010; 145:1201–1208.

2 Schilling PL, Dimick JB, Birkmeyer JD. Prioritizing quality improvement in general surgery. J Am Coll Surg 2008; 207:698–704.

3 Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Ann Surg 2008; 248:189–198.

4 Abraham NS, Young JM, Solomon MJ. Meta-analysis of short-term outcomes after laparoscopic resection for colorectal cancer. Br J Surg 2004; 91:1111–1124.

5 Gouvas N, Tan E, Windsor A, Xynos E, Tekkis PP. Fast-track vs standard care in colorectal surgery: a meta-analysis update. Int J Colorectal Dis 2009; 24:1119–1131.

6 Reza MM, Blasco JA, Andradas E, Cantero R, Mayol J. Systematic review of laparoscopic versus open surgery for colorectal cancer. Br J Surg 2006; 93:921–928.

7 Varadhan KK, Lobo DN, Ljungqvist O. Enhanced recovery after surgery: the future of improving surgical care. Crit Care Clin 2010; 26:527–547,

8 Wind J, Polle SW, Fung Kon Jin PH, Dejong CH, von Meyenfeldt MF, Ubbink DT, *et al.* Systematic review of enhanced recovery programmes in colonic surgery. Br J Surg 2006; 93:800–809.

9 Kariv Y, Wang W, Senagore AJ, Hammel JP, Fazio VW, Delaney CP. Multivariable analysis of factors associated with hospital readmission after intestinal surgery. Am J Surg 2006;191:364–371.

10 Kiran RP, Delaney CP, Senagore AJ, Steel M, Garafalo T, Fazio VW. Outcomes and prediction of hospital readmission after intestinal surgery. J Am Coll Surg 2004;198:877–883.

11 Azimuddin K, Rosen L, Reed JFIII, Stasik JJ, Riether RD, Khubchandani IT. Readmissions after colorectal surgery cannot be predicted. Dis Colon Rectum 2001; 44:942–946.

12 O'Brien DP. Predictors and outcome of readmission after laparoscopic intestinal surgery. World J Surg 2007; 31:2138–2143.

13 Guinier D, Mantion GA, Alves A, Kwiatkowski F, Slim K, Panis Y, *et al.* Risk factors of unplanned readmission after colorectal surgery: a prospective, multicenter study. Dis Colon Rectum 2007; 50:316–23.

14 Andersen J, Hjort-Jakobsen D, Christiansen PS, Kehlet H. Readmission rates after a planned hospital stay of 2 versus 3 days in fast-track colonic surgery. Br J Surg 2007; 94:890–893.

15 Basse L, Billesbolle P, Kehlet H. Early recovery after abdominal rectopexy with multimodal rehabilitation. Dis Colon Rectum 2002; 45:195–199.

16 Basse L, Jakobsen DH, Bardram L, Billesbolle P, Lund C, Mogensen T, *et al.* Functional recovery after open versus laparoscopic colonic resection: a randomized, blinded study. Ann Surg 2005; 241:416–423.

17 Fiore JFJr, Browning L, Bialocerkowski A, Gruen RL, Faragher IG, Denehy L. Hospital discharge criteria following colorectal surgery: a systematic review. Colorectal Dis 2012; 14:270–281.

18 Holte K, Nielsen KG, Madsen JL, Kehlet H. Physiologic effects of bowel preparation. Dis Colon Rectum 2004; 47:1397–1402.

19 Murphy MK, Black NA, Lamping DL, McKee CM, Sanderson CF, Askham J, *et al.* Consensus development methods, and their use in clinical guideline development. Health Technol Assess 1998; 2:i-iv. 1–88

20 Jones J, Hunter D. Consensus methods for medical and health services research. Bmj 1995; 311:376–380.

21 Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. J Adv Nurs 2000; 32:1008–1015.

22 Powell C. The Delphi technique: myths and realities. J Adv Nurs 2003; 41:376–382.

23 Elwyn G, O'Connor A, Stacey D, Volk R, Edwards A, Coulter A, *et al.* Developing a quality criteria framework for patient decision aids: online international Delphi consensus process. BMJ 2006; 333:417.

24 Griffin SC, Barber JA, Manca A, Sculpher MJ, Thompson SG, Buxton MJ, *et al.* Cost effectiveness of clinically appropriate decisions on alternative treatments for angina pectoris: prospective observational study. BMJ 2007; 334:624.

25 Banks DE, Shi R, McLarty J, Cowl CT, Smith D, Tarlo SM, *et al.* American College of Chest Physicians consensus statement on the respiratory health effects of asbestos. Results of a Delphi study. Chest 2009; 135:1619–1627.

26 Hejblum G, Ioos V, Vibert JF, Boelle PY, Chalumeau-Lemoine L, Chouaid C, *et al.* A web-based Delphi study on the indications of chest radiographs for patients in ICUs. Chest 2008; 133:1107–1112.

27 Ferri CP, Prince M, Brayne C, Brodaty H, Fratiglioni L, Ganguli M, *et al.* Global prevalence of dementia: a Delphi consensus study. Lancet 2005; 366:2112–2117.

28 Phitayakorn R, Delaney CP, Reynolds HL, Champagne BJ, Heriot AG, Neary P, *et al.* Standardized algorithms for management of anastomotic leaks and related abdominal and pelvic abscesses after colorectal surgery. World J Surg 2008; 32:1147–1156.

29 Dixon E, Armstrong C, Maddern G, Sutherland F, Hemming A, Wei A, *et al.* Development of quality indicators of care for patients undergoing hepatic resection for metastatic colorectal cancer using a Delphi process. J Surg Res 2009; 156:32-38.

30 Burt CG, Cima RR, Koltun WA, Littlejohn CE, Ricciardi R, Temple LK, *et al.* Developing a research agenda for the American Society of Colon and Rectal Surgeons: results of a Delphi approach. Dis Colon Rectum 2009; 52:898–905.

31 McGory ML, Kao KK, Shekelle PG, Rubenstein LZ, Leonardi MJ, Parikh JA, *et al.* Developing quality indicators for elderly surgical patients. Ann Surg 2009; 250:338–347.

32 Blazeby JM, Soulsby M, Winstone K, King PM, Bulley S, Kennedy RH. A qualitative evaluation of patients' experiences of an enhanced recovery programme for colorectal cancer. Colorectal Dis 2010; 12:e236–e242.

33 Jung B, Pahlman L, Nystrom PO, Nilsson E. Mechanical Bowel Preparation Study G. Multicentre randomized clinical trial of mechanical bowel preparation in elective colonic resection. Br J Surg 2007; 94: 689–695.

34 Platell C, Barwood N, Makin G. Randomized clinical trial of bowel preparation with a single phosphate enema or polyethylene glycol before elective colorectal surgery. Br J Surg 2006; 93:427–433.

35 Schutz T, Pirlich M. Malnutrition in the hospital: age as a special risk factor. Pflege Zeitschrift 2006; 59:778–779.

36 Stratton RJ, Elia M. Encouraging appropriate, evidence-based use of oral nutritional supplements. Proc Nutr Soc 2010; 69:477–487.

37 Svanfeldt M, Thorell A, Hausel J, Soop M, Rooyackers O, Nygren J, *et al.* Randomized clinical trial of the effect of preoperative oral carbohydrate treatment on postoperative whole-body protein and glucose kinetics. Br J Surg 2007; 94:1342–1350.

38 Yuill KA, Ricardson RA, Davidson HI, Garden OJ, Parks RW. The administration of an oral carbohydrate-containing fluid prior to major elective upper-gastrointestinal surgery preserves skeletal muscle mass postoperatively — a randomized clinical trial. Clin Nutr 2005; 24:32–7.

39 Weimann A, Braga M, Harsanyi L, Laviano A, Ljungqvist O, Soeters P, *et al.* ESPEN Guidelines on Enteral Nutrition: surgery including organ transplantation. Clin Nutr 2006; 25:224–244.

40 Lassen K, Soop M, Nygren J, Cox PB, Hendry PO, Spies C, *et al.* Consensus review of optimal perioperative care in colorectal surgery: Enhanced Recovery After Surgery (ERAS) Group recommendations. Arch Surg 2009; 144:961–969.

41 Thorell A, Nygren J, Ljungqvist O. Insulin resistance: a marker of surgical stress. Curr Opin Clin Nutr Metab Care 1999; 2:69–78.

42 Brady M, Kinn S, Stuart P. Preoperative fasting for adults to prevent perioperative complications. Cochrane Database Syst Rev 2003; 4:CD004423.

43 Moiniche S, Kehlet H, Dahl JB. A qualitative and quantitative systematic review of preemptive analgesia for postoperative pain relief: the role of timing of analgesia. Anesthesiology 2002; 96:725–741.

44 Song F, Glenny AM. Antimicrobial prophylaxis in colorectal surgery: a systematic review of randomized controlled trials. Br J Surg 1998; 85:1232–1241.

45 Wille-Jorgensen P, Rasmussen MS, Andersen BR, Borly L. Heparins and mechanical methods for thromboprophylaxis in colorectal surgery. Cochrane Database Syst Rev 2003; 4:CD001217.

46 Fiore JFJr, Bialocerkowski A, Browning L, Faragher IG, Denehy L. Criteria to determine readiness for hospital discharge following colorectal surgery: an international consensus using the Delphi technique. Dis Colon Rectum 2012; 55:416–423.

47 Tsujinaka S, Konishi F. Drain vs no drain after colorectal surgery. Indian J Surg Oncol 2011; 2:3–8.

48 Jesus EC, Karliczek A, Matos D, Castro AA, Atallah AN. Prophylactic anastomotic drainage for colorectal surgery. Cochrane Database Syst Rev 2004; 4:CD002100.

49 Subrahmanyam M, Venugopal M. Perioperative fasting: a time to relook. Indian J Anaesth 2010; 54:374–375.

50 Wilson JP. Postoperative motility of the large intestine in man. Gut 1975; 16:689–692.

51 Andersen HK, Lewis SJ, Thomas S. Early enteral nutrition within 24 h of colorectal surgery versus later commencement of feeding for postoperative complications. Cochrane Database Syst Rev 2006; 4:CD004080.

52 Chan MKY, Law WL. Use of chewing gum in reducing postoperative ileus after elective colorectal resection: a systematic review. Dis Colon Rectum 2007; 50:2149–2157.

53 Klappenbach RF, Yazyi FJ, Alonso Quintas F, Horna ME, Alvarez Rodríguez J, Oría A. Early oral feeding versus traditional postoperative care after abdominal emergency surgery: a randomized controlled trial. World J Surg 2013; 37:2293–2299.

54 Delaney CP. Outcome of discharge within 24 to 72 h after laparoscopic colorectal surgery. Dis Colon Rectum 2008; 51:181–185.

55 Goudas LC, Carr DB. Postoperative opioid analgesia – reconsider, don't reject. J Clin Anesth 1996; 8:439–440.

56 Reibetanz J, Germer CT. Anastomoseninsuffizienz in der Kolorektalchrirurgie: Identifikation signifikanter Risikofaktoren. Der Chirurg; Zeitschrift für alle Gebiete der Operativen Medizen 2013; 84: 330–331.

57 Bellows CF, Webber LS, Albo D, Awad S, Berger DH. Early predictors of anastomotic leaks after colectomy. Tech Coloproctol 2009; 13:41–47.