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# Attitudes of patients and care providers to enhanced recovery after surgery programs after major abdominal surgery

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## ABSTRACT

**Background:** Enhanced recovery after surgery (ERAS) is a well-established pathway of perioperative care in surgery in an increasing number of specialties. To implement protocols and maintain high levels of compliance, continued support from care providers and patients is vital. This survey aimed to assess the perceptions of care providers and patients of the relevance and importance of the ERAS targets and strategies.

**Materials and methods:** Pre- and post-operative surveys were completed by patients who underwent major hepatic, colorectal, or oesophagogastric surgery in three major centers in Scotland, Norway, and The Netherlands. Anonymous web-based and article surveys were also sent to surgeons, anesthetists, and nurses experienced in delivering enhanced recovery protocols. Each questionnaire asked the responder to rate a selection of enhanced recovery targets and strategies in terms of perceived importance.

**Results:** One hundred nine patients and 57 care providers completed the preoperative survey. Overall, both patients and care providers rated the majority of items as important and supported ERAS principles. Freedom from nausea (median, 10; interquartile range [IQR], 8–10) and pain at rest (median, 10; IQR, 8–10) were the care components rated the highest by both patients and care providers. Early return of bowel function (median, 7; IQR, 5–8) and avoiding preanesthetic sedation (median, 6; IQR, 3.75–8) were scored the lowest by care providers.

**Conclusions:** ERAS principles are supported by both patients and care providers. This is important when attempting to implement and maintain an ERAS program. Controversies still remain regarding the relative importance of individual ERAS components.

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## 1. Introduction

Enhanced recovery after surgery (ERAS) protocols have become established practice in patients undergoing major

resectional surgery [1]. The original success in colorectal cancer resections has been followed by its application in other fields including surgery for primary and secondary liver cancer [2], breast [3] and oesophagogastric cancer [4].

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The main measurements of success of enhanced recovery programs have been the reduced perioperative morbidity and mortality and reduced postoperative length of hospital stay [1]. However, deviation from ERAS protocols is commonly reported and this is associated with prolonged length of stay [5]. As well as, barriers to implementing fast track protocols are commonly encountered [6], with reluctance by care providers to accept care strategies that differ from personally preferred practice being a major factor [7].

Patient acceptance is vital when attempting to achieve successful results with enhanced recovery approaches. Moreover, care provider support for enhanced recovery care components is critical to successfully implement postoperative care pathways relying on multidisciplinary team input [7]. It is therefore necessary to explore the views of both patients and care providers regarding their personal priorities pertaining to recovery and the favored strategies used to achieve these aims. This information is crucial to determine whether enhanced recovery programs have the correct patient-centered approach to postoperative recovery and the appropriate support of care providers to optimize implementation.

In an attempt to investigate this issue, a survey of patients and health care professionals was performed to investigate these views and provide clarification of patient and clinician care priorities.

## 2. Materials and methods

After satisfying the requirements of the respective institutional review boards, a survey was carried out by the investigators across three Northern European centers—Edinburgh (United Kingdom), Tromsø (Norway), and Maastricht (The Netherlands). These institutions were selected as they represent the home institutions of the collaborating authors. They are high-volume tertiary referral centers experienced in delivering ERAS protocols in hepatic, colorectal, and oesophagogastric surgeries.

The authors developed a questionnaire for the purpose of this survey. The questionnaire aimed to quantify the responder's perception of the importance of individual enhanced recovery outcomes and strategies.

The questionnaire was divided into two sections. The first assessed individual targets to be achieved during recovery after abdominal surgery (questions 1–8). These incorporated the major domains of ERAS principles [8]—pain control, gut restitution, mobility, overall function, and hospital discharge. These items were identical for questionnaires given to care providers and patients. The second section assessed strategies on how to achieve the recovery targets specified in Section 1. The items chosen reflected common strategies used in enhanced recovery protocols as advocated by the best available evidence [8]. The patients were given four questions and the care providers were given 13 different questions relating to strategy (Appendices 1 and 2).

The questions were formulated in English and then translated into Dutch and Norwegian. A further separate translation of the questions back into English was performed to ensure accurate translation. The questionnaire was trialed locally to ensure satisfactory comprehension by responders.

Responders in each institution were given a standardized verbal explanation as to what the survey entailed and advice regarding how to complete the survey. They were asked to rate each component from 0–10 on an 11-point Likert scale, depending on how important they believed each component was. The scale used indicator statements of “not important” and “very important” at the relevant extremes of the scale to assist with scoring. An example was performed by the investigator with each responder to ensure comprehension and then the patient was left to complete the questionnaire unaided.

The survey was conducted between November 2012 and November 2013. Consecutive patients scheduled for hepatic, colorectal, or oesophagogastric surgery were approached and asked to complete a questionnaire on the morning of their operation or during out-patient workup before surgery. This was repeated after surgery when the patient returned to the out-patient clinic 2–4 wk later. Because of the exploratory nature of this survey, a sample size calculation was not performed. However, it was determined that each center would recruit a minimum of 35 patients to complete the questionnaire before and after surgery. The exclusion criteria were an inability to comprehend the survey or unwillingness to participate.

A random sample of senior surgeons, anesthetists, and nurses working in the centers involved in the care of these patient groups were also surveyed. This questionnaire was administered using an Internet-based tool (Survey Monkey, Palo Alto, CA; for Tromsø: Questback) or an identical paper-based version depending on convenience.

Results were collated and analyzed with Excel 2010 (Microsoft Corp, Seattle, WA) and presented as median and interquartile range (IQR). Statistical analysis was performed with R (R Foundation for Statistical Computing, version 2.9.0, Vienna, Austria). Discrete variables were compared with Fisher exact or chi-square tests where appropriate. Continuous data were assessed with Mann–Whitney *U* test. Scores between care-provider specialties were compared with the Kruskal–Wallis test. Statistically significant differences between pre- and post-operative patient scores were assessed by the Wilcoxon signed-rank test. Significance tests were adjusted for multiple comparisons using the Bonferroni correction.

As we had devised a novel questionnaire, we undertook validation of the instrument. High internal consistency would be expected if responders scored items within the two sections (outcomes and strategies) similarly. Internal consistency of questionnaire components was determined with Cronbach alpha including 95% bootstrapped confidence intervals. Cronbach alpha increases with greater intercorrelation of questionnaire components and can be interpreted as an overall measure of internal consistency.

Exploratory factor analysis was performed to assess the underlying structure of the questionnaire. The questionnaire had two sections, “attitudes to outcomes” and “attitudes to strategies.” It might be expected that answers to questions assessing each of these domains would be correlated. The factor analysis examines whether questions might cluster into alternative groupings representing different underlying concepts. Principal component analysis was performed and eigenvalues generated (representing the proportion of the variance explained by each additional new factor). Eigenvalues were plotted on a scree plot and a cut-off determined.

Maximum likelihood factor analysis was then performed with varimax rotation retaining the appropriate number of factors. A confirmatory analysis using normalized variables (via power transformations) showed similar results.

### 3. Results

#### 3.1. Demographics

One hundred nine patients scheduled for major abdominal surgery were approached and participated in the preoperative survey (100% response). Patients were included from all three centers—Edinburgh ( $n = 38$ ), Tromsø ( $n = 36$ ), and Maastricht ( $n = 35$ ). The demographic and clinical characteristics of the

patients are shown in Table. Eighty-one percent of patients (88/109) responded to the follow-up survey administered after surgery. The postoperative nonresponders had higher ICU (intensive care unit) admission rates (29% versus 8%,  $P < 0.05$ ) and a higher proportion of oesophagogastric resections (24% versus 7%  $P < 0.05$ ) performed when compared with the patients who completed the postoperative questionnaire. Sixteen anesthetists (median age, 51 y; IQR, 42–61), 23 nurses (median age, 35 y; IQR, 29–38) and 18 surgeons (median age, 52 y; IQR, 43–59) were surveyed from across all three sites.

#### 3.2. Questionnaire validation

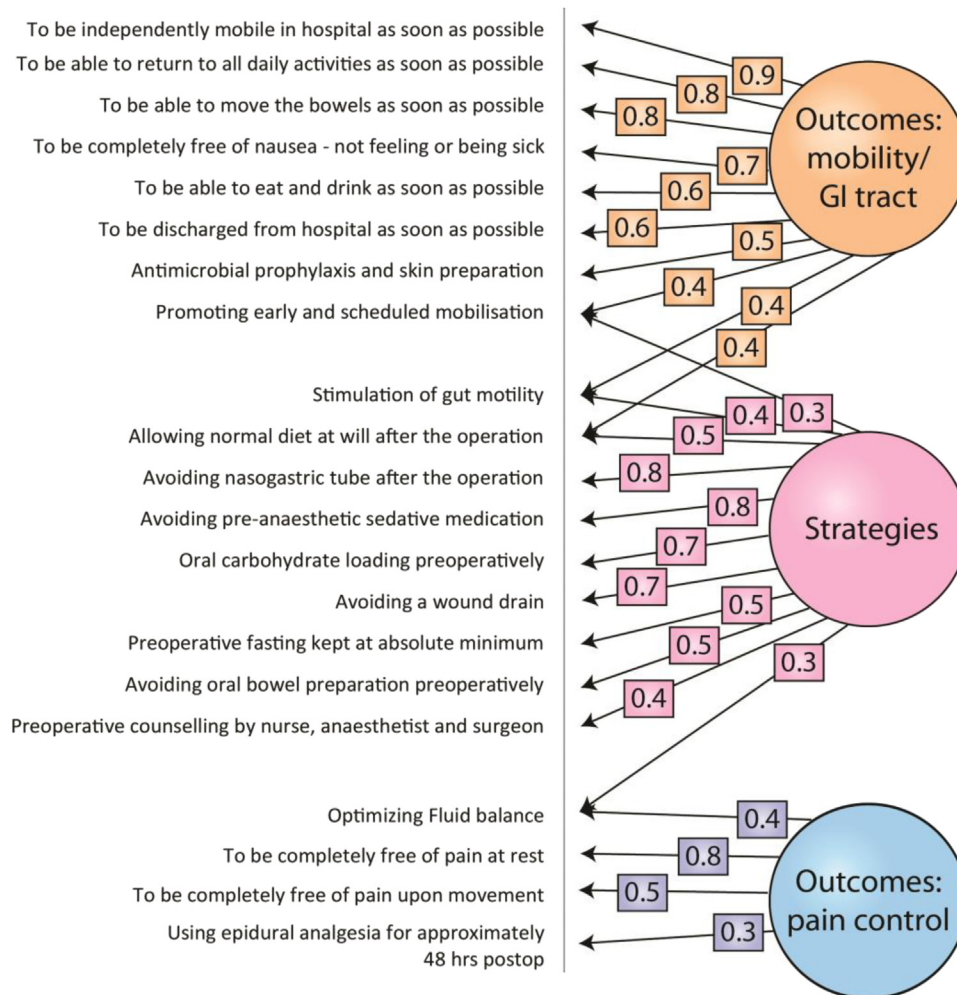
The intercorrelation of items within the two parts of the questionnaire was good suggesting internal consistency: care

**Table – Patient demographics and clinical details.**

Patient details	Tromsø ( $n = 36$ )	Edinburgh ( $n = 38$ )	Maastricht ( $n = 35$ )	Total ( $n = 109$ )	Postoperative nonresponders ( $n = 21$ )
Resection $n$ (%)					
Hepatic	2 (6)	38 (100)	20 (57)	60 (55)	3 (14)*
Colorectal/small bowel	19 (53)	—	15 (43)	34 (31)	9 (43)
Oesophagogastric	8 (22)	—	—	8 (7)	5 (24)*
Pancreatic	2 (6)	—	—	2 (2)	1 (5)
Other	5 (13)	—	—	5 (4)	3 (14)
Length of stay					
Days, median (range)	5 (3–96)	7 (4–38)	7 (3–30)	7 (3–96)	8.5 (1–96)
Complications $n$ (%)					
Yes	11 (31)	17 (45)	14 (40)	42 (39)	10 (47)
No	25 (69)	21 (55)	21 (60)	67 (61)	11 (53)
ICU admission $n$ (%)					
Yes	6 (17)	2 (5)	2 (6)	10 (8)	6 (29)*
No	30 (83)	36 (95)	33 (94)	99 (92)	15 (71)
Readmission $n$ (%)					
Yes	7 (19)	4 (11)	6 (17)	17 (16)	6 (29)
No	29 (81)	34 (89)	29 (83)	92 (84)	15 (71)
Pathology $n$ (%)					
CLM	2 (6)	25 (66)	19 (54)	46 (42)	3 (14)*
Cholangiocarcinoma	—	2 (5)	—	2 (2)	—
HCC	—	5 (13)	—	5 (4)	—
Other	4 (11)	3 (8)	—	7 (6)	—
Primary adenocarcinoma	28 (77)	—	16 (46)	44 (40)	17 (81)*
Benign	2 (6)	3 (8)	—	5 (5)	1 (5)
Previous hospital stay $n$ (%)					
Yes	27 (75)	32 (84)	32 (91)	91 (83)	14 (67)
No	9 (25)	6 (16)	3 (9)	18 (17)	7 (33)
Age (y)					
median (Range)	66 (35–93)	63.5 (32–79)	65 (36–85)	64 (35–93)	63 (35–93)
Sex $n$ (%)					
M	25 (69)	25 (66)	20 (57)	70 (64)	13 (62)
F	11 (31)	13 (34)	15 (43)	39 (36)	8 (38)
ASA $n$ (%)					
I	2 (6)	4 (11)	5 (14)	11 (10)	1 (4.5)
II	25 (69)	28 (74)	17 (49)	70 (64)	13 (62)
III	8 (22)	6 (15)	13 (37)	27 (25)	6 (29)
IV	1 (3)	—	—	1 (1)	1 (4.5)
Employment status $n$ (%)					
Employed	12 (33)	16 (42)	7 (20)	35 (32)	5 (24)
Retired	22 (61)	18 (47)	22 (63)	62 (57)	15 (71)
Unemployed	2 (6)	4 (11)	6 (17)	12 (11)	1 (5)

CLM = colorectal liver metastases; HCC = hepatocellular carcinoma.

\*  $P < 0.05$  (Comparisons made between total patients surveyed and postoperative nonresponders).



**Fig. 1 – Factor analysis of questionnaire items. Each number represents the factor loading, which can be thought of as a correlation coefficient between a questionnaire item and one of the three factors. Three distinct groups were identified as illustrated previously. This signifies uniformity of scoring patterns occurring within these three groups. (For interpretation of the references to color in this figure, the reader is referred to the web version of the article).**

providers' outcomes  $\alpha = 0.89$  (0.83–0.93), care providers' strategies  $\alpha = 0.83$  (0.75–0.89); and patients' outcomes  $\alpha = 0.96$  (0.79–1.00.), patients' strategies  $\alpha = 1.00$  (0.34–1.00).

An exploratory factor analysis was performed on the questionnaire components for care providers to assess underlying structure. Three factors were shown to provide an adequate fit. Items relating mainly to enhanced recovery outcomes loaded onto one factor and those relating to individual strategies to a second. Interestingly, four items (two outcomes and two strategies)—“to be completely free from pain at rest,” “to be completely free from pain on movement,” “using epidural analgesia for 48 h,” and “optimizing fluid balance”—loaded onto a third factor, suggesting additional structure not appreciated in the original questionnaire design (Fig. 1).

### 3.3. Patient outcomes

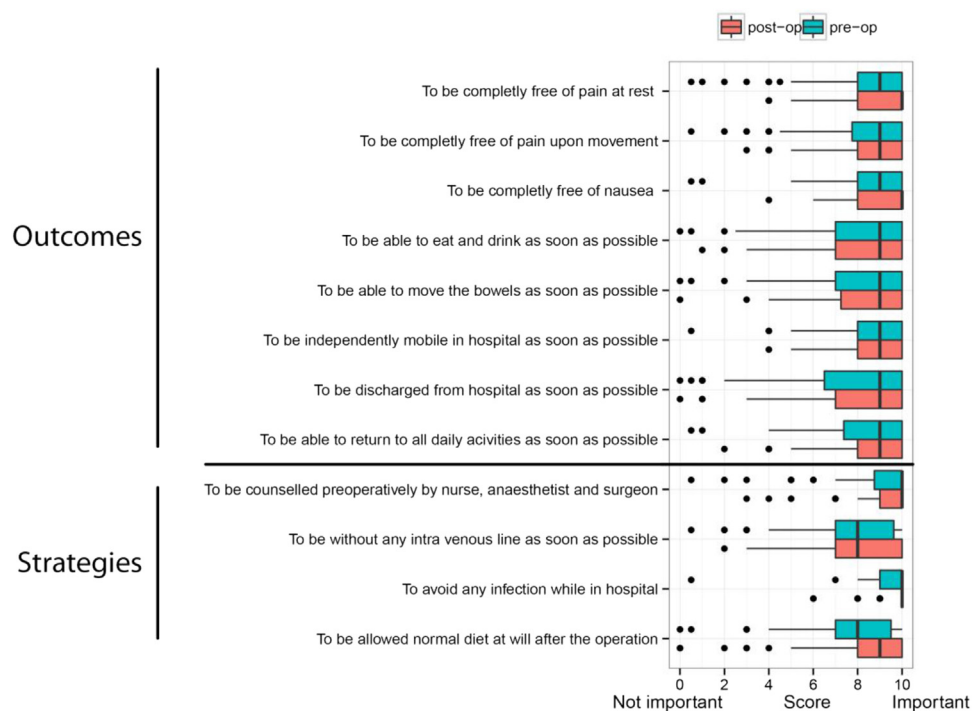
The overall scores were high with the lowest median score being 8 of 10. The preoperative impressions of patients

awaiting surgery were unchanged by the subsequent surgery, with no significant differences observed between pre- and post-operative scores (i.e.,  $P > 0.05$  for each comparison after adjustment for multiple comparisons), as determined by the Wilcoxon signed-rank tests (Fig. 2).

Patients scored freedom from nausea (median, 10; IQR, 8–10) and freedom from pain at rest (median, 10; IQR 8–10) as the two most important factors. Achieving independent mobility was also scored highly by patients (median, 9; IQR, 8–10). Early discharge (median, 9; IQR, 6.5–9) and early return of bowel movements (median, 9; IQR, 7.25–10) received the lowest scores when taking the IQR into account (Fig. 2).

### 3.4. Patient strategy

Patients highlighted preoperative counseling (median, 10; IQR, 8.75–10) and avoiding infection in hospital (median, 10; IQR, 9–10) as a priority in achieving recovery (Fig. 2).



**Fig. 2 – Patient ratings of ERAS outcomes and strategies. Preoperative scores are compared with postoperative scores for each item. Wilcoxon signed-rank test was used to compare scores. No statistically significant differences were observed between scores. (For interpretation of the references to color in this figure, the reader is referred to the web version of the article).**

### 3.5. Care provider outcomes

Outcomes were in general scored highly by the care providers with all items being scored with a median of 7 of 10 or higher. The outcomes scored as most important by care providers were control of nausea (median, 9; IQR, 8–10) and being free from pain at rest (median, 9; IQR, 8–10) (Fig. 3).

Being able to move the bowels as soon as possible was scored the lowest (median, 7; IQR, 5–8) by the care providers. Also being discharged from hospital as soon as possible received lower scores (median, 8; IQR, 6–9) as did returning to daily activities as soon as possible (median, 8; IQR, 5.5–10) (Fig. 3).

### 3.6. Care provider strategy

The range of scores was more varied in this area of responses. The highest rated items of care strategy as scored by the care providers were: provision of preoperative counseling (median, 10; IQR, 9–10); promotion of early mobilization (median, 9.5; IQR, 9–10) and optimization of intravenous (IV) fluid administration (median, 9; IQR, 8–10) (Fig. 4).

Avoiding wound drains (median, 7; IQR, 4.5–8), avoiding bowel preparation (median, 7; IQR, 4–8), and avoiding anesthetic premedication (median, 6.5; IQR, 3.5–8) were scored the lowest (Fig. 4).

Subgroup analyses using the Kruskal–Wallis test were performed to compare scores of each item by individual specialties of care providers and between the care provider

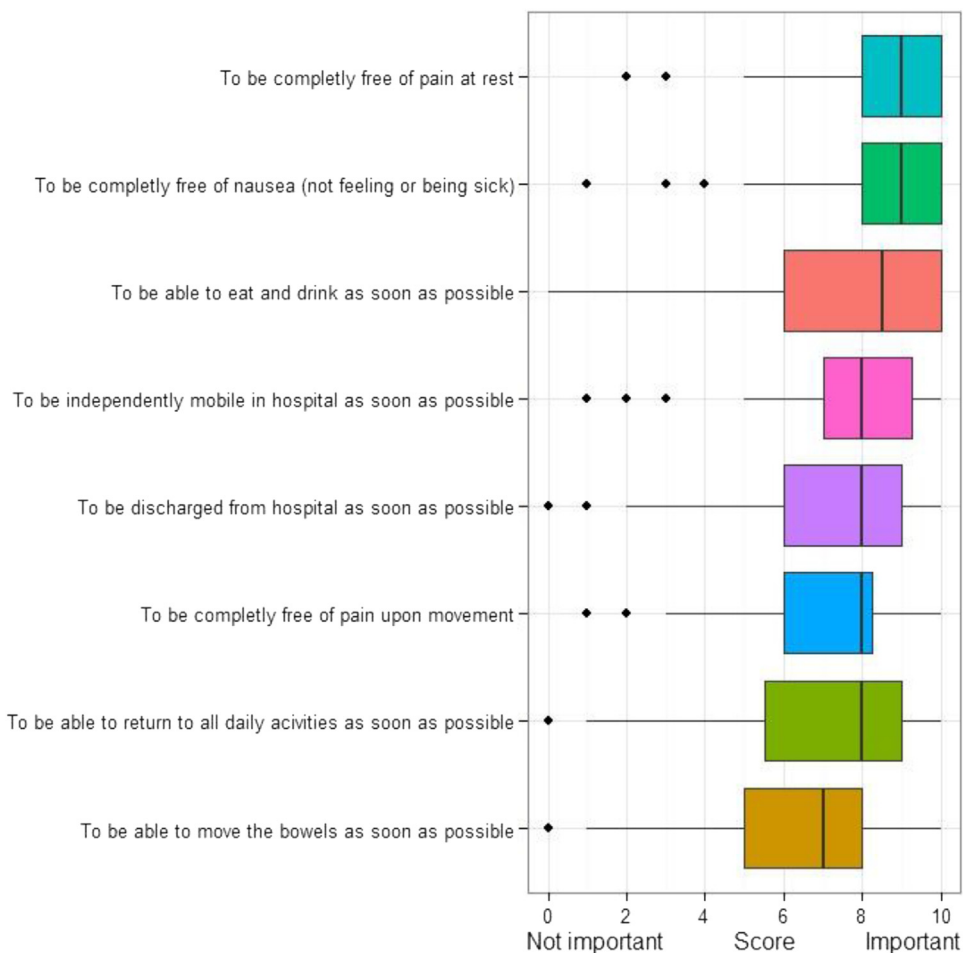
nationalities. After adjustment for multiple comparisons, no significant differences between care provider specialty, and nationality scores were observed.

## 4. Discussion

This study investigated the opinions and perceptions of both providers and receivers of enhanced recovery protocols after major abdominal resectional surgery in three European countries. It is the first study of its kind.

The postoperative response rate or 81% was satisfactory. The nonresponders underwent a greater proportion of oesophagogastric resections and fewer hepatic resections than those who completed the postoperative questionnaire. Although the ICU admission rate was higher in this subgroup, readmission and complication rates remained unchanged. This likely reflects a tendency for oesophagogastric resections to be managed initially in ICU routinely, which was not the case for hepatic resections, and their absence was not thought to adversely influence the postoperative responses observed.

The novel questionnaire was designed for the purposes of this study and validated successfully. Good internal consistency was observed, and the factor analysis performed revealed a logical separation of items into ERAS outcomes and strategies. This suggests consistent and distinct scoring patterns within these groups of questionnaire items indicating satisfactory validity of the items selected. These results also reflect the consistently high scores throughout the survey and



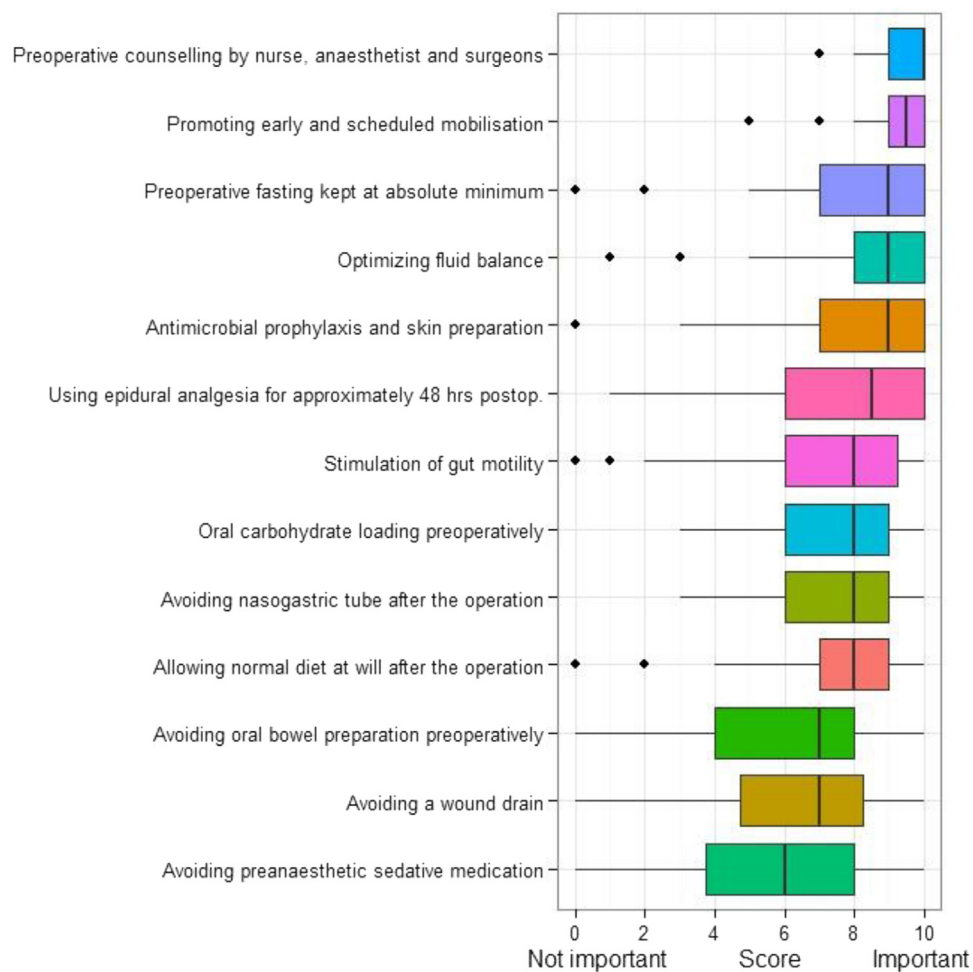
**Fig. 3 – Combined care providers' ratings of ERAS outcomes. (For interpretation of the references to color in this figure, the reader is referred to the web version of the article).**

overall support for the outcomes and strategies used in the questionnaire. Furthermore the third section identified, which showed a similarity of scoring patterns of the items relating to epidurals, pain control, and IV fluid management highlighted a separate group of related items, which are discussed in further detail in the following.

Patients attributed high importance to all of the ERAS outcomes asked of them. This represents concordance between patients' beliefs and current recommendations by ERAS experts [8], and this finding should be used to encourage and develop ERAS implementation. Moreover, we did not show a difference in patient opinion pre- and post-operatively, suggesting that patient support for such care plans does not change even after having gained experience of the care principles. A qualitative assessment of patient experience after ERAS surgery [9] found that decreased satisfaction was reported in a subgroup of patients who suffered a complication after discharge. Our survey sample included patients who suffered complications at rates that would be expected from these types of surgery. This did not cause significantly different pre- and post-operative patient scoring, and so we do not concur with the view that the development of a complication negatively impacts on patients' support for the ERAS principles.

The clinicians also scored highly for the majority of outcomes, and good interspecialty agreement was observed, representing streamlined support for ERAS principles. The opinions of different professional groups involved in delivering ERAS programs regarding ERAS protocol components has not been assessed before and represents a novel finding of the study and justification for continued implementation.

However, the finding of high acceptance of ERAS items by both patients and care providers raises further questions. ERAS implementation and sustainability remains a challenge. Previous studies have shown that compliance with ERAS protocols can be compromised resulting in deviation from care plans and poorer outcomes [5]. Our results show that patient and care provider support for the ERAS process is high, and we suggest that it is unlikely that lack of patient or clinician acceptance is the main cause of deviation from protocols. This raises the issue that there may be other facets of care delivery that may contribute to the failure of pathway implementation. A recent qualitative survey of health care professionals identified factors related to implementation failure and suggested that education, coordination, and communication between a diverse multidisciplinary team network and having the resources to maintain the service provision were crucial factors in protocol success [10]. This



**Fig. 4 – Combined care providers' ratings of ERAS strategies. (For interpretation of the references to color in this figure, the reader is referred to the web version of the article).**

highlights the complexity of ERAS implementation and requires further clarification to determine the targets for intervention.

In a similar result to the outcomes, the scores by both the patients and the clinicians when assessing care strategies were scored highly with the majority of median scores above eight of 10. This again suggests an overall approval, and support of the methods used to achieve the delivery of ERAS protocols. However, among the care providers, there were some strategies of note that scored less highly than others.

Strategies scored lowest overall by care providers were the avoidance of postoperative abdominal drains, oral bowel preparation, and preanesthetic sedatives. There is high-level evidence in colorectal surgery advocating against drain insertion [11]. Similarly, there is good evidence suggesting no benefit of routine bowel preparation before abdominal surgery [12].

The stimulation of gut motility was also scored in the lower half of results, particularly by anaesthetists and, to a lesser degree, surgeons. Liberal laxative use to prevent constipation and achieve restoration of bowel function is often advocated as a preventative measure against postoperative ileus [13,14] and is a component of many enhanced recovery protocols. However, this is a controversial issue with a conflicting

evidence base particularly after colorectal surgery [15]. The broad range of scores observed in this survey potentially reflects the spectrum of views of this issue.

These results may be partly due to the presence of resections other than colorectal in the study population where there is less clear evidence for the benefits of drain avoidance and less relevance of bowel preparation and stimulation. However, the reluctance to abandon previously well-established practice despite evidence to the contrary is recognized in the literature [6,16]. This is a potential obstacle to the implementation and continued establishment of ERAS principles and is a phenomenon that continues to be observed [17] and requires attention when addressing failing ERAS implementation.

The third section identified by the factor analysis was a group comprised epidurals, pain, and fluid management. There was a broad range of scores for the importance of epidurals, particularly from surgeons (range, 1–10). This reflects the controversy that surrounds routine epidural use [18]. The use of alternative analgesic modalities, such as intrathecal analgesia and continuous wound infiltration, has become increasingly popular [19,20]. The UK Department of Health's Enhanced Recovery Partnership Programme consensus

opinion [21] has subsequently advocated less routine epidural use and increased alternative analgesic methods.

Fluid balance optimization was scored highly by care providers. Both inappropriate fluid restriction and excessive fluid administration have been shown to be associated with prolonged hospital stays [22] and increased postoperative morbidity [23] reflecting the importance of accurate fluid balance. Epidural use is associated with vasodilation and hypotension and can be associated with excessive IV fluid administration [18]. It may be that these perceived drawbacks associated with epidural use are contributory to its lower rating. Indeed the fact that the factor analysis identified epidural use, fluid balance and minimization of pain as a distinct group separate from ERAS outcomes and strategies, reflects an independent but uniform scoring pattern for these items by the care providers.

Potential drawbacks to the study are the relatively small sample size and the postoperative response rate. It is also acknowledged that because of the small sample size and the high concordance in the overall scoring, it is not possible to determine which items are considered more important relative to each other. However, it is possible to determine those items scored the highest and the lowest, and an appropriate qualitative assessment of these items was performed. Additionally, the overall high internal consistency of the results suggests that the sample provides valid results and is an acceptable number for this descriptive analysis.

Of note is that the individual ERAS programs undertaken between the three units varied according to both the unit and the procedure in question. This may have introduced a bias into the patient and care provider responses due to variation of the perceived importance of the included ERAS items to the respective procedure. Also the survey was performed on patients, for the most part, undergoing major open abdominal surgery for malignant disease processes. This therefore represents a population representative of the majority of ERAS recipients, although is not strictly relevant to nonabdominal surgery.

In conclusion, this novel study has shown good patient and multidisciplinary care provider approval for the principles of enhanced recovery care after surgery and supports on going development and implementation of such programs. It highlights potential areas of concern for care providers, namely epidural use and fluid administration. These issues remain controversial and could be a focus for future research. Finally, we identified several items scored less highly by care providers despite there being a strong evidence base supporting said items. Although it is accepted that not all items will be supported equally, personal preference over an evidence base remains a potential barrier to ERAS implementation and requires consideration and education if continued sustainability and development of ERAS programs is to be achieved.

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## Disclosure

The authors reported no proprietary or commercial interest in any product mentioned or concept discussed in the article.

## Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.jss.2014.06.032>.

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