# Enhanced Recovery after Surgery - A Colorectal Perspective

R Sim
Centre for Advanced
Laparoscopic Surgery, TTSH

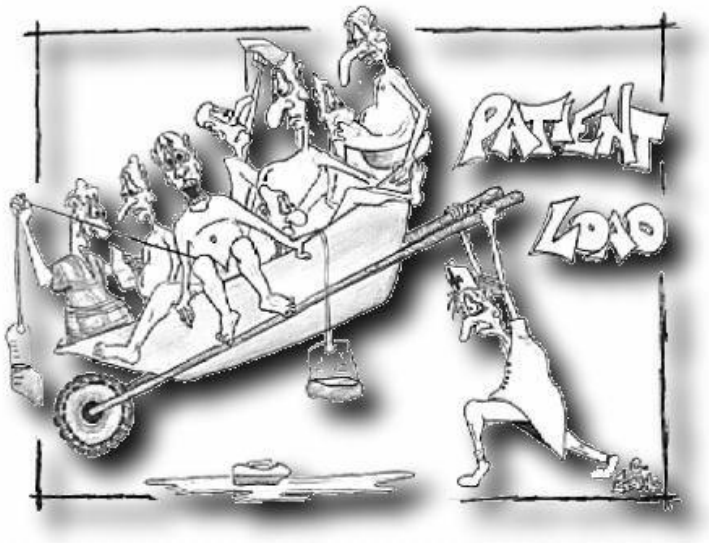
National Healthcare Group
Adding years of healthy life

CALS

# Conventional Surgery

Postop care

- Nasogastric tube
- Enteral feeds when ileus resolves
- Opioid analgesics




Results

- Morbidity, mortality
- LOS
- Oncologic outcomes – recurrence, survival

# Lessons from Laparoscopic Surgery

Postop care

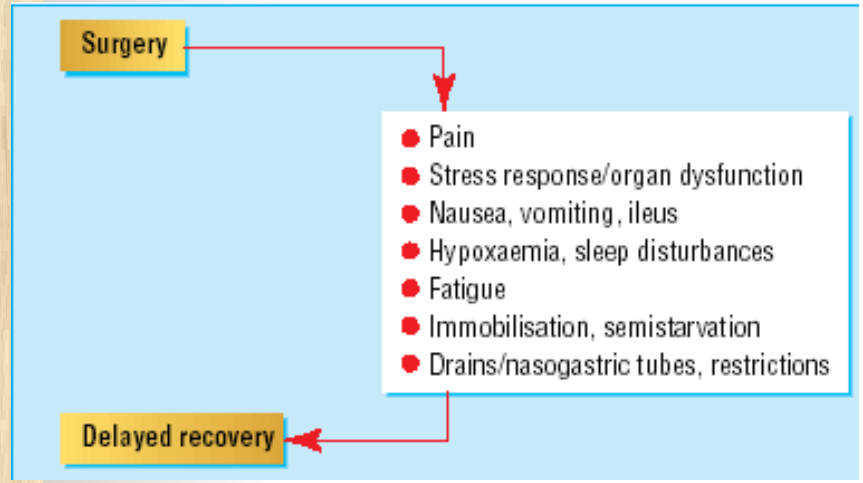
- Early feeding possible
- Smaller incisions, less pain, faster recovery
- Early ambulation

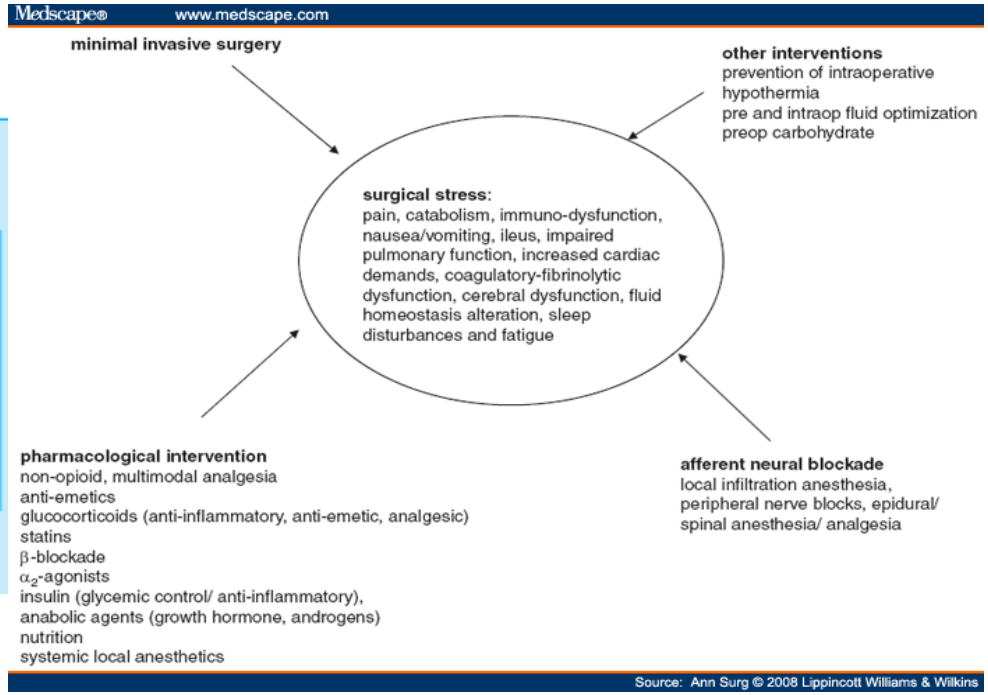
Results

- Return to work
- Fatigue level, QOL
- Cost vs Charge

# What is fast track surgery?

Fast track surgery aims to accelerate postoperative recovery by taking advantage of knowledge about the stress response to surgery to prevent the postoperative cascade that prolongs recuperation



Protocol for Anesthesia, Surgery, and Rehabilitation Program After Colonic Resection With Conventional Care (Group 1) and Multimodal Rehabilitation (Group 2)

| | Group 1 | Group 2 |
|---|---|---|
| Anesthesia | Premedication: oral diazepam 10 mg<br>Epidural catheter<br>$T_8$-$T_{10}$<br>Carbocaine 2% (4 + 4) ml with epinephrine<br>Carbocaine 2% 4 ml with epinephrine hourly<br>General anesthesia<br>Fentanyl 0.1 mg<br>Thiomebumal 3-5 mg/kg<br>Rocuronium<br>O2-N2O-sevoflurane<br>Dextran 70 (Macrodex®) 500 ml<br>Saline 3000 ml (max) | Premedication: none<br>Epidural catheter<br>Right hemicolectomy: $T_6$-$T_7$<br>Sigmoid resection: $T_9$-$T_{10}$<br>Test: lidocaine 2% 3 ml with epinephrine<br>Bupivacaine 0.5% (6 + 6) ml<br>Bupivacaine 0.25% 5 ml 2 hours intraoperatively<br>Morphine 2 mg if < 70 year<br>Morphine 1 mg if ≥ 70 year<br>General anesthesia<br>Remifentanil 1 µg/kg/min<br>Propofol 2–4 mg/kg/h<br>Cisatracium 0.15 mg/kg<br>Hydroxyethyl starch (HAES®) 500 ml<br>Saline 1,500 ml (max)<br>Ondansetron 4 mg<br>Ketorolac 30 mg<br>Bupivacaine 0.25% 20 ml (incision) |
| Surgery | Median laparotomy | Transverse or curved incision[2] |
| Postoperatively | Continuous epidural analgesia (3 days): bupivacaine 0.25% 4 ml and morphine 0.2 mg hourly<br>Breakthrough pain: morphine im or IV<br>After removal of epidural catheter: morphine 10 mg pn orally<br>No standard care program: fluid, food, mobilization and discharge depending on the attending surgeon<br>Postoperative nasogastric tube depending on surgeon who performed the operation<br>Physiotherapy: breathing exercise 10 min per day during the first 2 postoperative days and only on working days | Continuous epidural analgesia (2 days): bupivacaine 0.25% 4 ml and morphine 0.2 mg/h<br>Breakthrough pain: ibuprofen 600 mg orally<br>Bupivacaine 0.125% 6 ml epidurally<br>Morphine 10 mg orally (last choice)<br>Food, protein drink 60–80 g protein per day and mobilization from the day of surgery following a well-defined nursing care program<br>Day of surgery start: acetaminophen (slow release) 2 g 12 hourly<br>Magnesia 1 g 12 hourly<br>Cisapride 20 mg 12- hourly<br>1st postoperative day: remove bladder catheter in the morning<br>2nd postoperative day: remove epidural catheter in the morning; discharge after lunch |

# Lord Nelson returned to work half an hour after losing arm

Lord Horatio Nelson was giving orders 30 minutes after his arm was amputated, according to journals in the National Archive that illustrate the importance of medical skill in securing Britain's naval might.

**By Alastair Jamieson**
11:23AM GMT 28 Oct 2009

A collection of 1,200 naval journals, not seen for 200 years, depicts the horror of life on board British fighting vessels in the 18th and 19th centuries, including details of the medical treatment given to Nelson.

Researchers at the National Archives in Kew have gathered personal accounts written by surgeons at sea, revealing some of the first scientific investigations into diseases such as scurvy.

Among the documents, reported in *The Independent*, is a handful of journals describing the remarkable speed and skill with which medics nursed Nelson back to health from surgery – twice.



World J Surg
DOI 10.1007/s00268-012-1772-0

World Journal of Surgery

# Guidelines for Perioperative Care in Elective Colonic Surgery: Enhanced Recovery After Surgery (ERAS®) Society Recommendations

U. O. Gustafsson · M. J. Scott · W. Schwenk · N. Demartines · D. Roulin · N. Francis · C. E. McNaught · J. MacFie · A. S. Liberman · M. Soop · A. Hill · R. H. Kennedy · D. N. Lobo · K. Fearon · O. Ljungqvist



**Abstract**

*Background* This review aims to present a consensus for optimal perioperative care in colonic surgery and to provide graded recommendations for items for an evidenced-based enhanced perioperative protocol.

*Methods* Studies were selected with particular attention paid to meta-analyses, randomised controlled trials and large prospective cohorts. For each item of the perioperative treatment pathway, available English-language literature was examined, reviewed and graded. A consensus recommendation was reached after critical appraisal of the literature by the group.

*Results* For most of the protocol items, recommendations are based on good-quality trials or meta-analyses of good-quality trials (quality of evidence and recommendations according to the GRADE system).

*Conclusions* Based on the evidence available for each item of the multimodal perioperative care pathway, the Enhanced Recovery After Surgery (ERAS) Society, Inter-

# www.erassociety.org

ERAS® Society

*"The immediate challenge to improving the quality of surgical care is not discovering new knowledge, but rather how to integrate what we already know into practice".* [Urbach DR, Baxter NN. BMJ 2005]

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Enhanced RECOVERY

ERAS Society (UK)

**3rd ERAS UK Conference**
**8th November 2013 Bethel Convention Centre, Birmingham**


ERAS® Interactive Audit System Login

Expert Reviews

Centers of Excellence

Surgical Clinics of North America

Volume 93, Issue 1, February 2013, Pages 21–32

Complications, Considerations, and Consequences of Colorectal Surgery

# Fast-Track Pathways in Colorectal Surgery

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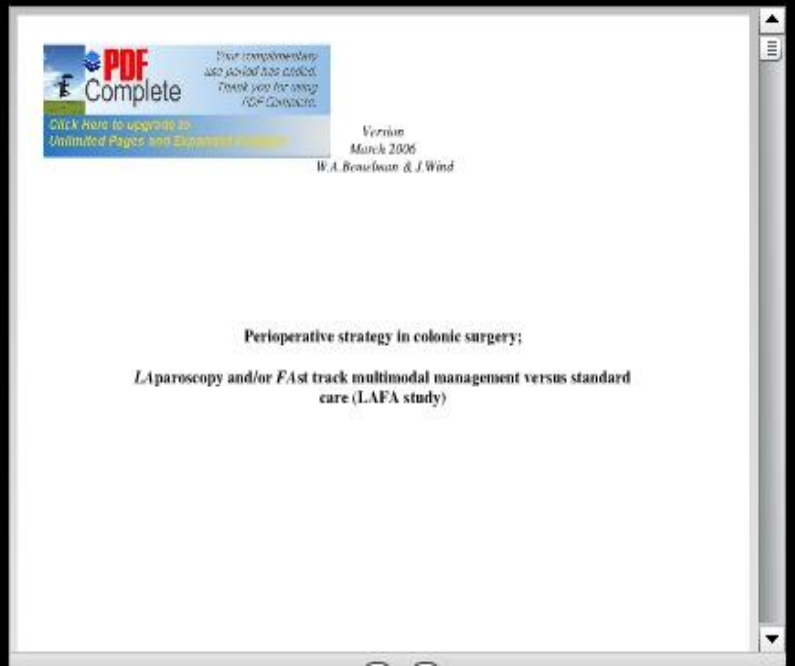
# www.ftsurgery.com



Fast Track Enhanced Recovery surgery.com

*When time does matter*

## LAparoscopy and/or FAst track multimodal management versus standard care (LAFA study)

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Hide Cover

[Randomized Controlled Trials]

# Laparoscopy in Combination with Fast Track Multimodal Management is the Best Perioperative Strategy in Patients Undergoing Colonic Surgery: A Randomized Clinical Trial (LAFA-study)

Vlug, Malaika S. MD, PhD[*]; Wind, Jan MD, PhD[*]; Hollmann, Markus W. MD, PhD, DEAA[†]; Ubbink, Dirk T. MD, PhD[‡]; Cense, Huib A. MD, PhD[§]; Engel, Alexander F. MD, PhD[¶]; Gerhards, Michael F. MD, PhD[**]; van Wagensveld, Bart A. MD, PhD[††]; van der Zaag, Edwin S. MD[‡‡]; van Geloven, Anna A.W. MD, PhD[§§]; Sprangers, Mirjam A.G. PhD[¶¶]; Cuesta, Miguel A. MD, PhD[***]; Bemelman, Willem A. MD, PhD[*]; LAFA study group

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[Current Status] ◄ Previous Article | Table of Contents | Next Article ►

# Meta-analysis of Laparoscopic Versus Open Colorectal Surgery Within Fast-Track Perioperative Care

Li, Ming-zhe M.D.; Xiao, Long-bin M.D.; Wu, Wen-hui M.D.; Yang, Shi-bin M.D.; Li, Shou-zhi M.D.; Dunn, Kelli Bullard M.D.; Section Editor

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International Journal of Colorectal Disease
Clinical and Molecular Gastroenterology and Surgery

10.1007/s00384-012-1577-5

Review

# The enhanced recovery after surgery (ERAS) pathway for patients undergoing colorectal surgery: an update of meta-analysis of randomized controlled trials

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[Current Status] ◄ Previous Article | Table of Contents | Next Article ►

# Enhanced Recovery After Surgery Programs Versus Traditional Care for Colorectal Surgery: A Meta-analysis of Randomized Controlled Trials

Zhuang, Cheng-Le M.D.[1]; Ye, Xing-Zhao M.D.[1]; Zhang, Xiao-Dong M.D.[1]; Chen, Bi-Cheng Ph.D.[2]; Yu, Zhen Ph.D.[1]

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Drs Zhuang and Ye contributed equally to this work.

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**Epidural anesthesia-analgesia shortens length of stay after laparoscopic segmental colectomy for benign pathology.** Senagore et al. Surgery 2001;129(6):672-6

N=44

**CONCLUSION:**

Thoracic epidural anesthesia-analgesia has a significant and favorable impact on dietary tolerance and length of stay after LAC. A thoracic epidural appears to be an important component of a postoperative care protocol, which adds further advantage to LAC without the need for labor-intensive and costly patient care plans.

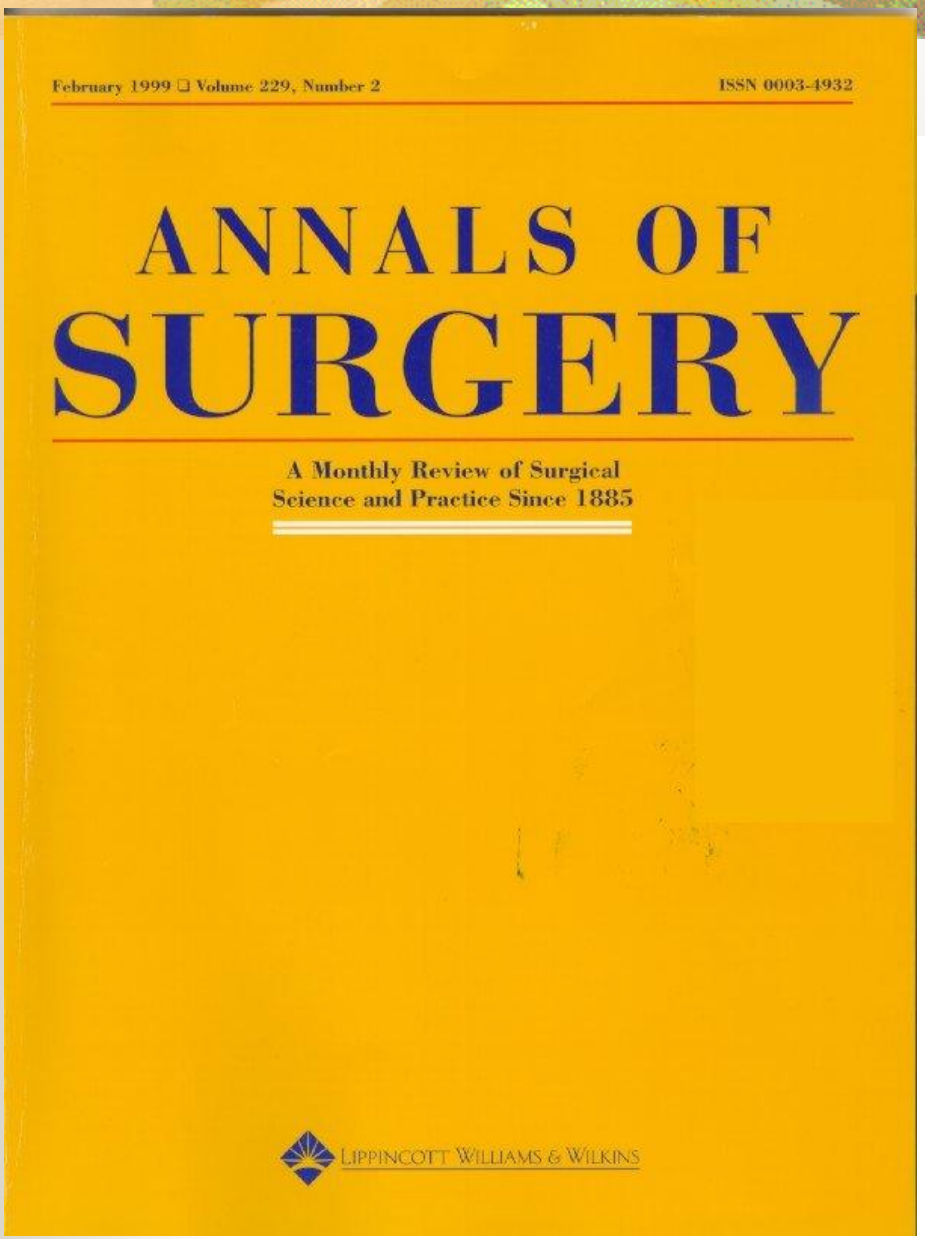
## Randomized clinical trial comparing epidural anaesthesia and patient-controlled analgesia after laparoscopic segmental colectomy.

Senagore et al. Br J Surg 2003;90(10):1195-9

N=38

**CONCLUSION:**

Thoracic epidural analgesia significantly improved early analgesia following laparoscopic colectomy but did not affect the length of hospital stay.




1998 Nov; 228(5):652-63

Surgical manipulation of the gut elicits an intestinal muscularis inflammatory response resulting in postsurgical ileus

**Effect of prednisolone on the systemic response and wound healing after colonic surgery.** Schulze et al. Arch Surg 1997;132(2):129-35

N=24

**CONCLUSION:**

Treatment with a single high-dose glucocorticoid before colonic surgery may improve postoperative pulmonary function and mobilization and reduce plasma cascade system activations, the inflammatory response, and immunofunction, but without detrimental effects on wound healing.

**The impact of prophylactic dexamethasone on nausea and vomiting after laparoscopic cholecystectomy: a systematic review and meta-analysis.** Karanicolas et al. Ann Surg 2008; 248(5):751-62

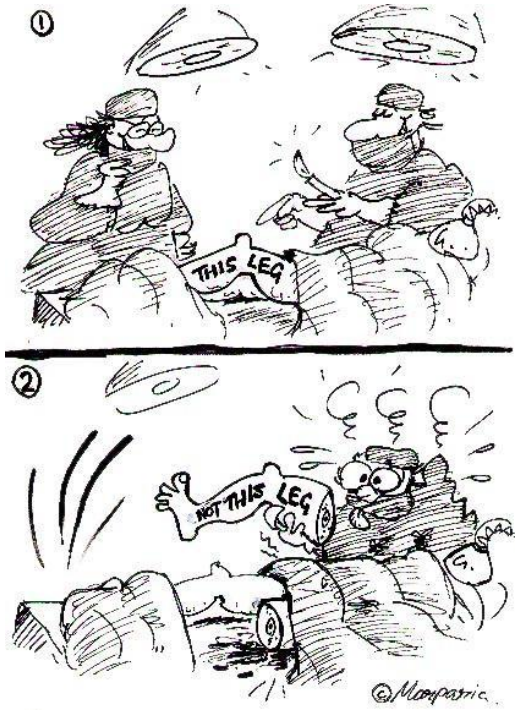
N=17 trials, >1200 patients

**CONCLUSION:**

Dexamethasone significantly reduced postoperative nausea (by 41%), vomiting (by 59%), and nausea or vomiting (by 45%). Doses of 8 to 16 mg were significantly more effective than doses of 2 to 5 mg in reducing postoperative nausea or vomiting and postoperative pain.

# Maintain body temperature in OR

Forced-air warming units



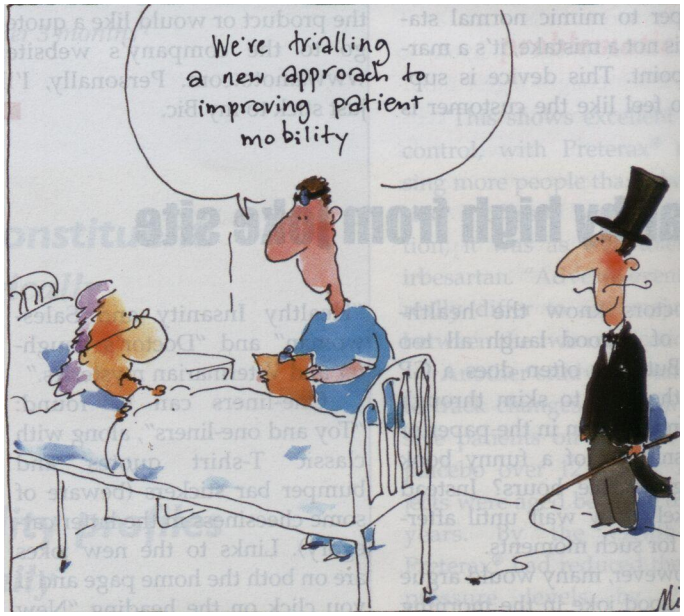
# Early postoperative ambulation

All patients undergoing laparotomy

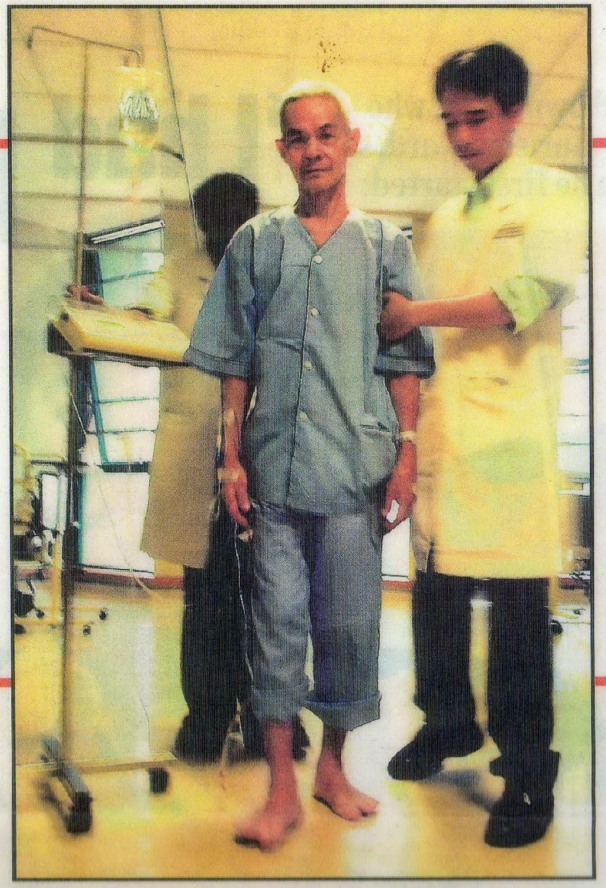
First postoperative day

Educate, encourage, enforce

Adequate pain relief



# Walk 24 hours after op



Picture: DEURBON CHOW

By Ng Wan Ching
wanching@sph.com.sg

MAJOR abdominal surgery can leave a scar stretching down the middle of your torso.

But 24 hours after the operation, don't be surprised if your doctor says: "Get up and walk."

It is happening at Tan Tock Seng Hospital, where a six-month clinical

So Mr Yeo decided to try and walk, as doctors and nurses were all encouraging him to do so.

"I walked and walked and it was fine. I'm very happy I didn't have to bother the nurses when I wanted to go to the toilet," he said.

He was discharged a week later.

Dr Bernard Lee, director and consultant at pain management services and the department of anaesthesiology, is spearheading the

These included:

- The most seriously ill patients,

# Early enteral feeding versus "nil by mouth" after gastrointestinal surgery: systematic review and meta-analysis of controlled trials.

Lewis et al. BMJ 2001;323:773-6

N=11 trials including 837 patients

**CONCLUSION:**

Early feeding reduced the risk of any type of infection and the mean length of stay in hospital. Risk reductions were also seen for anastomotic dehiscence, wound infection, pneumonia, intra-abdominal abscess, and mortality, but these failed to reach significance. The risk of vomiting was increased among patients fed early.

# Drugs to decrease postoperative ileus

Propranolol, dihydroergotamine, neostigmine, erythromycin, cisapride, metoclopramide, cholecystokinin, octreotide and vasopressin - most with either limited effect or limited applicability because of adverse effects.

5HT4 receptor agonist - prucalopride, tegaserod

New peripherally selective mu-opioid antagonists - Alvimopan, MNTX

# COX-2 inhibitors

**Original article** doi:10.1111/j.1463-1318.2006.00998.x

## Prospective randomized, double-blind, placebo-controlled study of pre- and postoperative administration of a COX-2-specific inhibitor as opioid-sparing analgesia in major colorectal surgery

**R. Sim*, D. M. Cheong*, K. S. Wong†, B. M. K. Lee‡ and Q. Y. Liew‡**

*Department of Surgery, Tan Tock Seng Hospital, †Department of Surgery, National University Hospital and ‡Department of Anaesthesiology, Tan Tock Seng Hospital, Singapore

Received 12 October 2005; accepted 9 December 2005

### Abstract

**Purpose** To demonstrate the opioid-sparing effect and reduction in postoperative ileus obtained with valdecoxib 40 mg administered pre- and postoperatively in patients undergoing colorectal resection.

**Methods** Patients for elective colorectal resection from December 2002 to June 2004 were randomized to receive either valdecoxib or placebo with standard patient-controlled analgesia (PCA) morphine. In the study arm, the first dose of valdecoxib 40 mg was administered orally as close as possible to 1 h prior to the start of surgery. Each subsequent dose was admin-

incision length, and duration and types of operations. Mean PCA doses at 12 and 24 h were 18.6 and 28.3 mg in the study arm *vs* 26.2 and 41.2 mg in controls, representing a one-third opioid reduction. Bowel sound and movement first appeared at medians of 12 and 72 h in the study arm *vs* 24 and 84 h, respectively, in controls ($P < 0.05$). Tolerance of solid diet was at a median of 60 h and discharge at a median of 4 days in the study arm *vs* 72 h and 6 days in controls ($P < 0.05$ and $P < 0.01$, respectively). Seven (18%) morbidities occurred in the control *vs* six (15%) in the study arm.

# Safety





## Bextra (valdecoxib) Apr 2005

**Audience:** Healthcare professionals and consumers

After concluding that the overall risk versus benefit profile is unfavorable, FDA has requested Pfizer, Inc. to voluntarily withdraw Bextra (valdecoxib) from the market. This request is based on:

- The lack of adequate data on the cardiovascular safety of long-term use of Bextra, along with the increased risk of adverse cardiovascular (CV) events in short-term coronary artery bypass surgery (CABG) trials that FDA believes may be relevant to chronic use.
- Reports of serious and potentially life-threatening skin reactions, including deaths, in patients using Bextra. The risk of these reactions in individual patients is unpredictable, occurring in patients with and without a prior history of sulfa allergy, and after both short- and long-term use.
- Lack of any demonstrated advantages for Bextra compared with other NSAIDs.

Patients currently taking Bextra should contact their physicians to consider alternative treatments. FDA is also asking manufacturers of all marketed prescription NSAIDs, including Celebrex (celecoxib), a COX-2 selective NSAID, to revise the labeling (package insert) for their products to include a boxed warning and a Medication Guide. The boxed warning will highlight the potential for increased risk of CV events with these drugs and the well-described, serious, and potentially life-threatening gastrointestinal (GI) bleeding associated with their use. The Medication Guide will accompany every prescription NSAID at the time it is dispensed to better inform patients about the CV and GI risks. Finally, FDA is asking manufacturers of non-prescription (OTC) NSAIDs to revise their labeling to include more specific information about the potential GI and CV risks, and information to assist consumers in the safe use of the drug. This announcement does not apply to aspirin as it has clearly been shown to reduce the risk of serious adverse CV events in certain patient populations.

[April 07, 2005 - Public Health Advisory - FDA]
[April 07, 2005 - Drug Information Page - FDA]
[April 07, 2005 - Questions and Answers - FDA]

# Nonsteroidal anti-inflammatory drugs and anastomotic dehiscence in bowel surgery; Systematic review and meta-analysis of randomized, controlled trials

12 March 2013

Burton TP, Mittal A, Soop M

Dis Colon Rectum 2013;56:126-134

## Abstract

**Background**: ENonsteroidal anti-inflammatory drugs are a key component of contemporary perioperative analgesia. Recent experimental and observational clinical data suggest an associated increased incidence of anastomotic dehiscence in bowel surgery.

**Objective**: The aim of this study was to conduct a systematic review and meta-analysis of anastomotic dehiscence in randomized, controlled trials of perioperative nonsteroidal anti-inflammatory drugs.

**Data sources**: Published and unpublished trials in any language reported 1990 or later were identified by searching electronic databases, bibliographies, and relevant conference proceedings.

**Study selection**: Trials of adults undergoing bowel surgery randomly assigned to perioperative nonsteroidal anti-inflammatory drugs or control were included. The number of patients with a bowel anastomosis and the incidence of anastomotic dehiscence had to be reported or be available from authors for the study to be included.

**Intervention**: At least 1 dose of a nonsteroidal anti-inflammatory drug was given perioperatively within 48 hours of surgery.

**Main outcome measures**: The primary outcome measured was 30-day incidence of anastomotic dehiscence as defined by authors.

**Results**: Six trials comprising 480 patients having a bowel anastomosis met inclusion criteria. In 4 studies, anastomotic dehiscence rates were higher in the intervention groups. Overall rates were 14/272 participants (5.1%) in intervention arms vs 5/208 (2.4%) in control arms. Peto OR was 2.16 (95% CI 0.85, 5.53; p = 0.11), and there was no heterogeneity between studies (I statistic 0%).

**Limitations**: Sizes of available trials were small, preventing firm conclusions and subset analysis of drugs of different cyclooxygenase specificity. A precise and consistent definition of anastomotic dehiscence was not used across trials.

**Postoperative ileus-related morbidity profile in patients treated with Alvimopan after bowel resection.** Wolff, et al. JACS 2007; 204(4): 609-16

N=4 trials, 1409 patients

**CONCLUSION:**

Less likely to experience POI-related morbidity (alvimopan, 7.6%; placebo, 15.8%, odds ratio=.44, $p<0.001$). There was also a lower incidence of postoperative NGT insertion, and other GI-related adverse events on postoperative day 3 to 6 in the alvimopan group than the placebo group. Opioid consumption was comparable between the two groups.

Asao T, Kuwano H, Nakamura J, et al. Gum chewing enhances early recovery from postoperative ileus after laparoscopic colectomy. J Am Coll Surg 2002 Jul; 195(1):30-2.

Le Blanc-Louvry I, Costaglioli B, Boulon C, et al. Does mechanical massage of the abdominal wall after colectomy reduce postoperative pain and shorten the duration of ileus? Results of a randomized study. J Gastrointest Surg 2002 Jan-Feb; 6(1):43-9.

Walch JM, Rabin BS, Day R, et al. The effect of sunlight on postoperative analgesic medication use: a prospective study of patients undergoing spinal surgery. Psychosom Med. 2005 Jan-Feb; 67(1): 156-63.

# preload

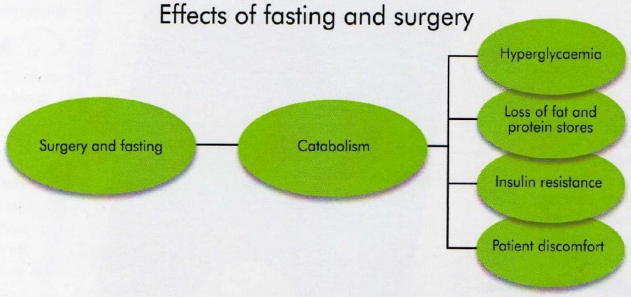
Enhancing Patient Recovery

## The Story so far

Traditionally, the 'nil by mouth' rule has been used prior to surgery to reduce the risk of pulmonary aspiration during anaesthesia.[1]

Since the early 1990s, several studies have questioned the need for such a prolonged fast.[1] The 2006 ESPEN guidelines and the European Society of Anaesthesiology state Grade A evidence that patients undergoing surgery who are considered to have no specific risk for aspiration may drink clear fluids 2 hours before anaesthesia.[2, 3]

## Effects of fasting and surgery




It is well documented that surgical trauma is associated with postoperative hyperglycaemia, protein losses and insulin resistance.[4]

There is growing evidence to support carbohydrate loading before surgery as it pre-empts the catabolic response to surgery.[5] The aim of an Enhanced Recovery Pathway is to attenuate the stress response to surgery and enable rapid recovery.[6]

With this in mind, Vitaflo has produced preload; a powdered, neutral-tasting carbohydrate loading drink mix for the pre-operative dietary management of patients undergoing surgery. Preload is presented in 50g dose related sachets which when added to water produce a solution with low osmolality.

## Effects of preload

The Freeman Hospital, Newcastle-upon-Tyne, used preload to assess the effect of pre-operative carbohydrate administration on hospital stay, gut function and grip strength following elective colorectal surgery.

| | Results | | |
|---|---|---|---|
| | preload | Fasting | Water |
| Mean discharge time | **7.5 days** | 10 days | 13 days |
| Median first flatus | **1.5 days** | 3 days | 3 days |
| First bowel movement | **3 days** | 4 days | 5 days |
| Reduction in grip strength | **5%** | 11% | 8% |

## Conclusion

Pre-operative administration of preload leads to significantly reduced postoperative stay, and a trend towards earlier return of gut function when compared with fasting or supplementary water.[7]

## Why use preload?

**Clinically trialled** - The Freeman Hospital found preload to be convenient to use and demonstrated a reduction in postoperative hospital stay and a trend towards earlier gut function.[7]

**Safe** - No adverse effects reported during anaesthesia.[7]

**Effective** - Surgery produces catabolism with associated insulin resistance and breakdown of protein and fat stores. Studies have shown that carbohydrate loading reverses this process and benefits patients both physically and psychologically.[7]

**Convenient** - The dose related 50g sachet ensures an easy and convenient way of administering preload.


**Economical** - By using preload, a simple carbohydrate loading drink mix, a significant reduction in hospital stay can be achieved.[7]

**Choice** - The Freeman Hospital have designed 2 packs of preload.

- A hospital pack - 90 x 50g sachets is available for ward use for those patients admitted to hospital the night before their surgery.
- A "home patient" pack - 3 x 50g sachets is available for pre-admission clinics for those patients arriving at hospital on the morning of their surgery.

**Palatable** - preload has a neutral taste to aid compliance.

**Comfort** - Carbohydrate loading before surgery has physical and psychological benefits for the patient, both in the pre-operative and postoperative periods.[5] It also helps to reduce pre-operative thirst, hunger and anxiety.[7]

## Enhancing Patient Recovery

Preload - a powdered, neutral tasting carbohydrate loading drink mix for the pre-operative dietary management of patients undergoing surgery

Available in 2 Pack Sizes:

Hospital Pack - 90 x 50g sachets

Home Patient pack - 3 x 50g sachets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Brunswick Business Park, Liverpool L3 4BQ

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E-mail: vitaflo@vitaflo.co.uk Web: www.vitafloweb.com



Code: Pre2.1112.V2

# Step 1 + Step 2 + Step 3

BAPEN
www.bapen.org.uk

## Step 1
### BMI score

| BMI kg/m² | Score |
|---|---|
| >20 (>30 Obese) | = 0 |
| 18.5-20 | = 1 |
| <18.5 | = 2 |

## Step 2
### Weight loss score

**Unplanned weight loss in past 3-6 months**

| % | Score |
|---|---|
| <5 | = 0 |
| 5-10 | = 1 |
| >10 | = 2 |

## Step 3
### Acute disease effect score

If patient is acutely ill **and** there has been or is likely to be no nutritional intake for >5 days
**Score 2**

*If unable to obtain height and weight, see reverse for alternative measurements and use of subjective criteria*

*Acute disease effect is unlikely to apply outside hospital. See 'MUST' Explanatory Booklet for further information*

## Step 4
### Overall risk of malnutrition

Add Scores together to calculate overall risk of malnutrition
Score 0 Low Risk  Score 1 Medium Risk  Score 2 or more High Risk

## Step 5
### Management guidelines

### 0 Low Risk
**Routine clinical care**

- Repeat screening
  Hospital – weekly
  Care Homes – monthly
  Community – annually
  for special groups
  e.g. those >75 yrs

### 1 Medium Risk
**Observe**

- Document dietary intake for 3 days
- If adequate – little concern and repeat screening
  - Hospital – weekly
  - Care Home – at least monthly
  - Community – at least every 2-3 months
- If inadequate – clinical concern

### 2 or more High Risk
**Treat***

- Refer to dietitian, Nutritional Support Team or implement local policy
- Set goals, improve and increase overall nutritional intake
- Monitor and review care plan
  Hospital – weekly
  Care Home – monthly
  Community – monthly

**Effect of salt and water balance on recovery of gastrointestinal function after elective colonic resection: a randomised controlled trial.** Lobo et al. Lancet 2002; 359: 1812–18

N=20

**CONCLUSION:**

Positive salt and water balance sufficient to cause a 3 kg weight gain after surgery delays return of gastrointestinal function and prolongs hospital stay in patients undergoing elective colonic resection.

**Effects of Intravenous Fluid Restriction on Postoperative Complications: Comparison of Two Perioperative Fluid Regimens: A Randomized Assessor-Blinded Multicenter Trial.** The Danish Study Group on Perioperative Fluid Therapy. Ann Surg 2003; 238(5):641-648

N=172

**CONCLUSION:** Cardiopulmonary (7% versus 24%, P = 0.007) and tissue-healing complications (16% versus 31%, P = 0.04) were significantly reduced and no patients died in the restricted group compared with 4 deaths in the standard group. Restricted periop iv fluid regimen aiming at unchanged body weight reduces complications after elective colorectal resection.

Epidural

Nurse facilitator

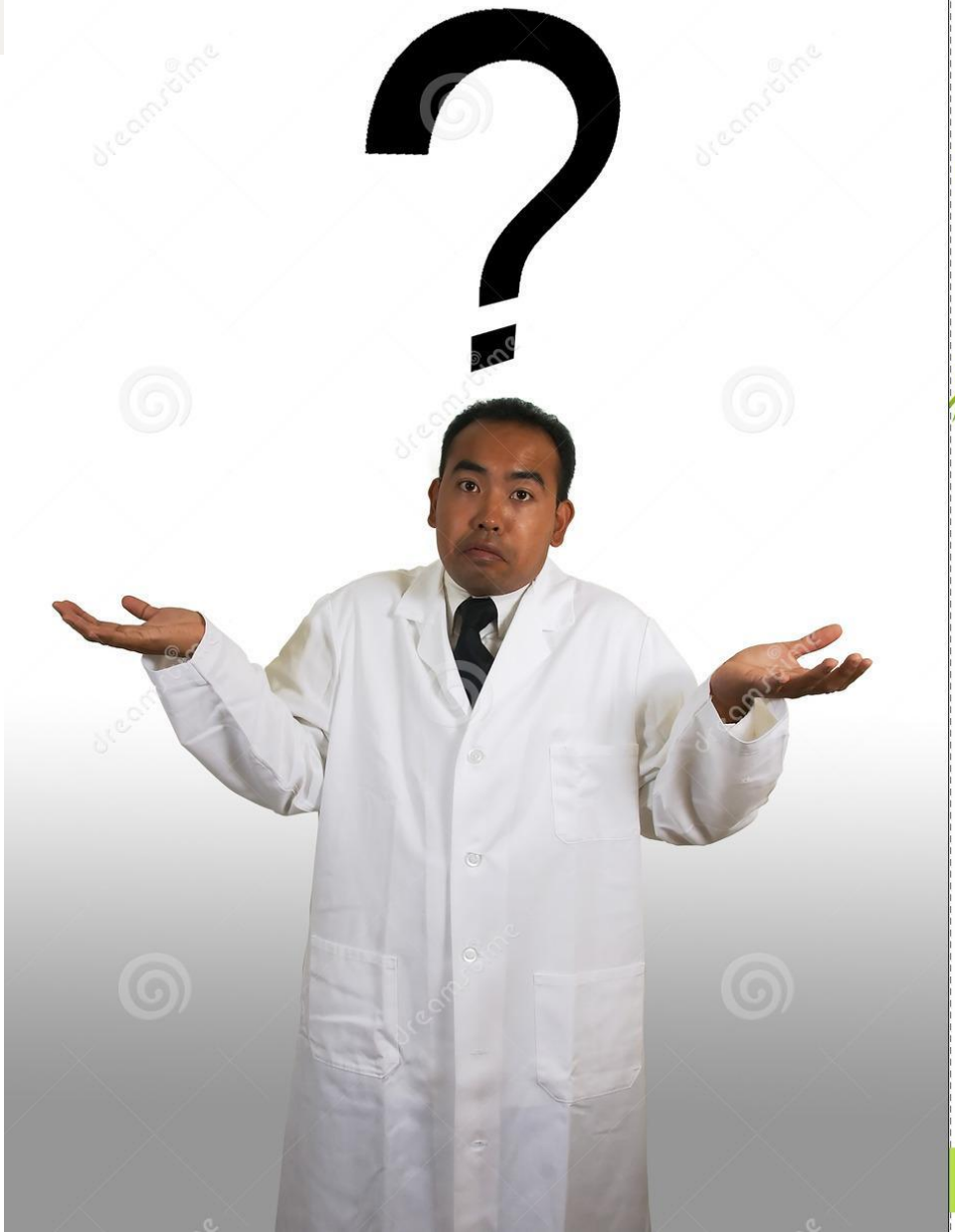
Cost

Laparoscopic

Preop CHOn load

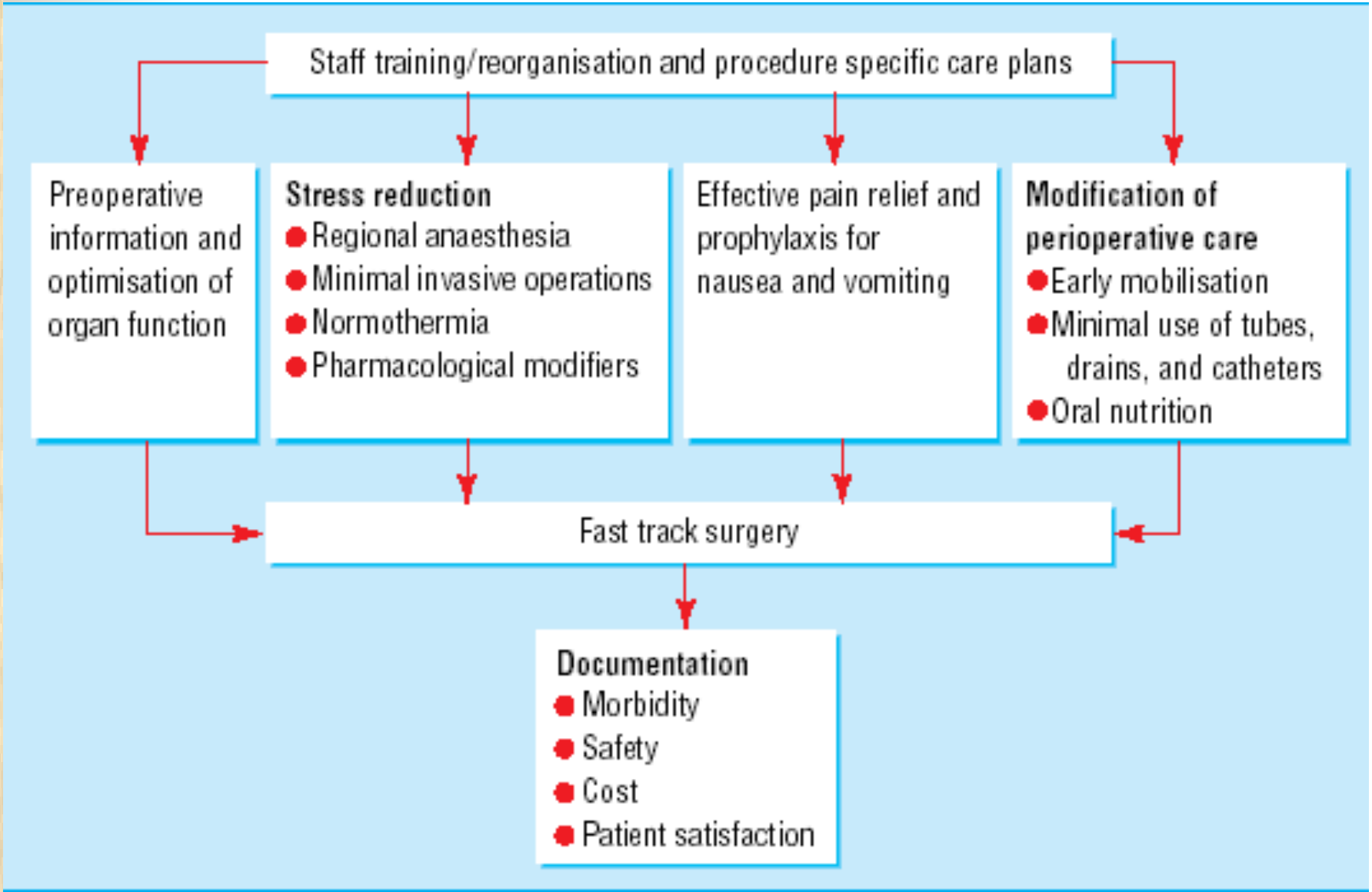
CPET

Goal directed fluids



# Classical Bundle Price

# Interventions for major improvement in surgical outcome



# Conclusion

- Postoperative pain and ileus are two major determinants that prevent early discharge after major abdominal surgery.

- Multimodal fast tracking involves thorough patient education, a multidisciplinary team approach to surgical management, minimally invasive techniques, epidural anesthetic, avoidance of opioids, maintenance of the patient's body temperature in the OR, early enteral nutrition and ambulation, and judicious postoperative intravenous fluids.

# Better Colonoscopy