



## Multimodal Approach to Colorectal Surgery

Value and Impact of Nutrition Interventions  
May 5, 2011

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## Educational Learning Objectives

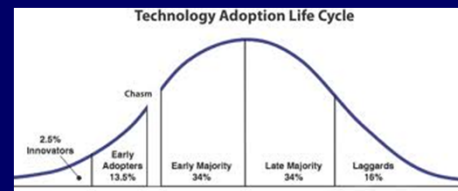
- Describe the importance of improving time to gastrointestinal recovery that occurs postsurgery and consider how this affects length of hospital stay and overall quality of patient care
- Evaluate the evidence for therapeutic options that may improve gastrointestinal recovery postsurgery and integrate these efforts toward supporting overall surgical quality measures
- Describe how interprofessional collaboration surrounding gastrointestinal surgery can result in better alignment with current surgical quality measures and formulate strategies to integrate this into current practice

## Audience

- a) Surgery / Critical Care
- b) Diet Office
- c) Recipient ?
- d) Other – how evidence is applied in practice

## Evidence into Practice

Rogers' Diffusion of Innovations



## Outline

- Background of multi-modal surgery
- introduction to project
- Baseline data
- Multi-modal and system changes
- Preliminary results

## Case Presentation

- 55-year-old WM with complicated sigmoid diverticulitis and several percutaneous drainage procedures for abscess
- He presents now for an elective open sigmoid colectomy

## Patient Case—Postoperative Course

- He develops abdominal distention with oral liquids on postoperative Day 4 and vomits a large volume of bilious fluid
- He has been on intravenous fentanyl PCA analgesia

PCA: patient-controlled analgesia

## Patient Case POD 5–9

- He has continued NG aspirates of 1200–1500 ml per day
- A PICC line is placed and he is placed on total parenteral nutrition for nutritional support
- He undergoes daily complete metabolic profiles and alternate day CBC's to monitor his status
- A CT scan is done on Day 7 to exclude abdominal abscess

PICC: peripherally inserted central catheter

## Patient Case POD 9–13

- He begins to pass flatus on POD 9 and his NG aspirate slowly decreases
- He begins clear liquids on POD 10 and is finally advanced to general diet and after a bowel movement is able to be discharged home on POD 13

## Large Bowel Resection Accounts Disproportionately for Surgical Morbidity

Table 4. Relative Contribution of 30 Procedures to Absolute Counts and Relative Length of Stay in General Surgery, American College of Surgeons - National Surgery Quality Improvement Program, 2005-2006

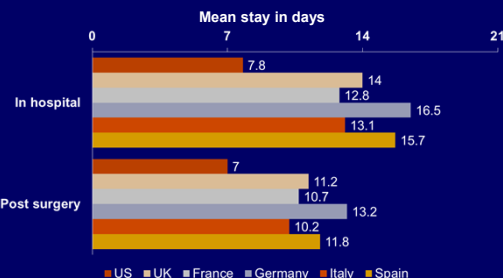
Procedure	Procedures n	Absolute count rate, %	Relative count, %	Relative length of stay rate, %
11 Colon resection	5716	2.9	32.9	1.9
12 Ileostomy	1171	0.6	13.1	0.7
13 Small bowel resection	7277	3.8	18.1	4.3
14 Appendectomy	1321	0.7	14.9	0.4
15 Appendicitis	3010	1.6	13.2	0.4
16 Gallbladder resection	6326	3.3	28.7	1.4
17 Cholecystectomy - subtotal or anatomical	1402	0.7	15.5	0.3
18 Liver resection	1323	0.7	20.1	0.5
19 Gastrectomy - subtotal or anatomical	4313	2.3	5.6	1.6
20 Splenectomy	1228	0.6	1.8	0.9
21 Gastrointestinal or pancreatic	731	0.4	28.7	1.4
22 Esophagectomy - radical	10270	5.4	2.6	1.4
23 Esophagectomy - minimally-invasive	45	0.0	0.0	1.2
24 Esophagectomy - radical	301	0.2	49.5	1.0
25 Esophagectomy - minimally-invasive	129	0.1	1.9	0.9
26 Esophagectomy - radical	254	0.2	55.1	0.9
27 Esophagectomy - minimally-invasive	495	0.3	20.2	0.6
28 Esophagectomy - radical	381	0.2	34.9	0.9
29 Esophagectomy - minimally-invasive	362	0.2	16.0	0.6
30 Esophagectomy - radical	1452	0.8	7.7	0.7
31 Esophagectomy - minimally-invasive	3209	1.7	11.1	0.5
32 Esophagectomy - radical	307	0.2	35.3	0.4
33 Esophagectomy - minimally-invasive	223	0.2	43.2	0.6
34 Esophagectomy - radical	710	0.4	16.1	0.6
35 Esophagectomy - minimally-invasive	184	0.1	47.3	0.2
36 Esophagectomy - radical	120	0.1	48.1	0.6
37 Esophagectomy - minimally-invasive	5391	2.9	1.7	0.4
38 Esophagectomy - radical	429	0.3	18.4	0.5
39 Esophagectomy - minimally-invasive	2525	1.3	11.1	0.5
40 Esophagectomy - radical	555	0.3	62.7	0.3
41 Esophagectomy - minimally-invasive	489	0.3	2.4	0.4
42 Esophagectomy - radical	158	0.1	25.5	0.2
43 Esophagectomy - minimally-invasive	40	0.0	45.0	0.1
44 Esophagectomy - radical	12	0.0	10.0	0.1

Schilling P, et al. *J Am Coll Surg*. 2008;207:698-704.

## Elective Colorectal Surgeries And Length of Stay

What is the typical length of stay associated with elective bowel resection procedures?

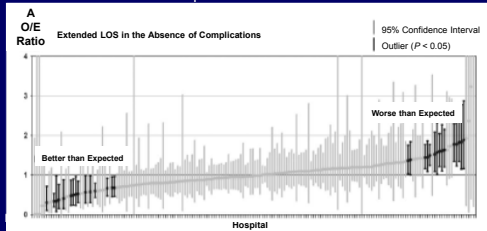
## International Mean Length of Stay: Still Long



Kehlet H, et al. *J Am Coll Surg*. 2006;202:45-54.

## Why the Outliers (? POI)

The data demonstrate variable LOS, however POI was not recorded as a complication in this data set



Cohen ME, et al. *Ann Surg.* 2009;250:901-907.

## Clinical and Financial Significance

- HCFA data (Medicare): 1999–2000
  - 161,000 major intestinal/colorectal resections
  - Mean post-op stay = 11.3 days
  - 1.8 million hospital bed-days
  - \$1.75 billion per annum

Senagore AJ. *Am J Health-Syst Pharm.* 2007;64(S13):S3-7.

## Elective Colorectal Surgeries and Length of Stay

- Although numerous studies have demonstrated that accelerated care pathways for colorectal surgeries are associated with reduced length of hospital stay, length of stay in the US and elsewhere is ~7-15 days. Gastrointestinal recovery is an important determinant of length of stay.

## Elective Bowel Resection and Perioperative Surgical Care Pathway

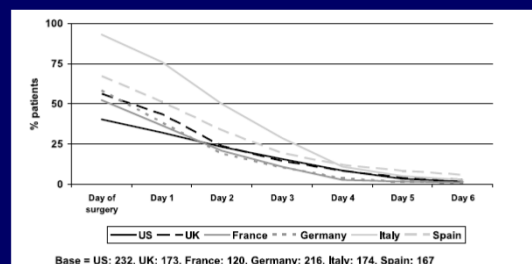
- A recent web-based survey of general and colorectal surgeons in the US indicated that only **30%** practice in hospitals with a perioperative surgical care pathway intended to accelerate GI recovery following elective bowel resections

Delaney C, et al. *Am J Surg.* 2010;199:299-304.

## Fast Track Protocol

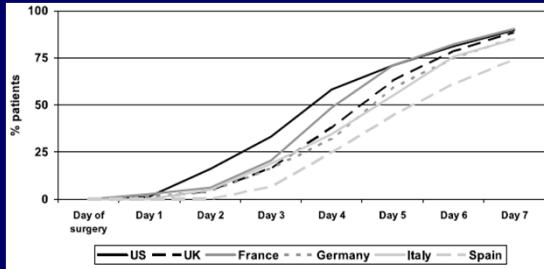
- Pre-operative information and education
- No NG, +/- epidurals
- PCA analgesia, supplementary i.v. ketorolac
- Encouraged to ambulate x 5 per day
- Liquids *ad lib* after surgery
- Diet from evening post-op Day 1
- Oral analgesia Day 2 if tolerating diet

## Nasogastric Tube Usage (more than you think)



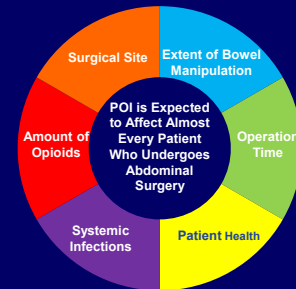
Kehlet H, et al. *J Am Coll Surg.* 2006;202:45-54.

## Time to General Diet (slower than you think)



Kehlet H, et al. *J Am Coll Surg*. 2006;202:45-54.

## There Are Numerous Risk Factors for POI



Resnick J, et al. *Am J Gastroenterol*. 1997;92:751-762.  
 Resnick J, et al. *Am J Gastroenterol*. 1997;92:934-940.  
 Senagore AJ. *Am J Health-Syst Pharm*. 2007;64(suppl 13):S3-S7.  
 Senagore AJ, et al. *Surgery*. 2007;142:478-486.  
 Woods MS. *Perspect Colon Rectal Surg*. 2000;12:57-76.

## Clinical Impact of POI<sup>1-4</sup>

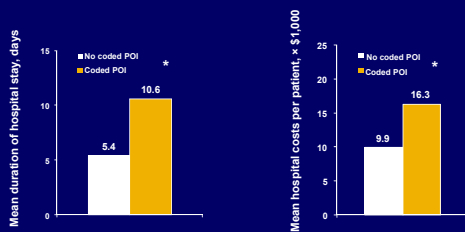
- Increased postoperative pain
  - Increased nausea and vomiting
    - Increased risk of aspiration
  - Prolonged time to regular diet
    - Delayed wound healing
    - Increased risk of malnutrition/catabolism
  - Prolonged time to mobilization
    - Increased pulmonary complications
  - Prolonged hospitalization
    - Increased health care costs
- } Delayed recovery

1. Woods MS. *Perspect Colon Rectal Surg*. 2000;12:57-76.  
 2. Kehlet H, Holte K. *Am J Surg*. 2001;182(5A suppl):3S-10S.  
 3. Behm B, Stollman N. *Clin Gastroenterol Hepatol*. 2003;1:71-80.  
 4. Leslie JB. *Ann Pharmacother*. 2005;39:1502-1510.

## GI Recovery and Cost Considerations

What is the economic impact of delayed GI recovery following bowel resection procedures?

## Hospital LOS and Total Costs



\*P < 0.01 for patients with coded POI versus patients with no coded POI.

Senagore AJ, et al. ASCRS 2005 Annual Meeting, Philadelphia, PA.

Postoperative ileus increases cost primarily due to what reason?

- A. Increased rate of anastomotic leak
- B. Increased use of imaging and laboratory investigation
- C. Increased risk of incisional dehiscence
- D. Increased cost of analgesics

## POI and Costs

Additional costs associated with POI primarily include increasing length of stay, labor costs, imaging/diagnostic studies, laboratory costs, and parenteral nutrition

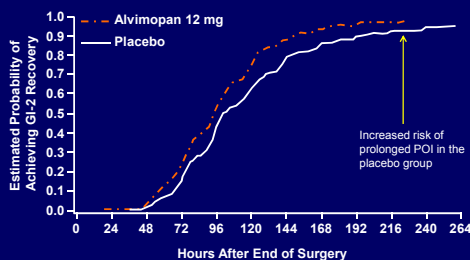
## GI2\* Recovery Following Bowel Resection

Study	Placebo (Mean h)	Alvimopan 12 mg (Mean h)	Difference (Mean h)	Hazard Ratio (95% CI)
1	111.8	92.0	19.8	1.533 (1.293, 1.816)
2	132.0	105.9	26.1	1.625 (1.256, 2.102)
3	130.3	116.4	14.0	1.365 (1.057, 1.764)
4	119.9	106.7	13.2	1.400 (1.035, 1.894)
5	109.5	98.8	10.7	1.299 (1.070, 1.575)

\*GI2 = time to toleration of solid food and first bowel movement  
CI = confidence interval

[http://www.accessdata.fda.gov/drugsatfda\\_docs/label/2009/021775s004tbl.pdf](http://www.accessdata.fda.gov/drugsatfda_docs/label/2009/021775s004tbl.pdf). Accessed May 2010.

## GI Recovery Data From 5 Bowel Resection Studies



1. Wolff BG, et al. *Ann Surg*. 2004;240:728-735.  
2. Delaney CP, et al. *Dis Colon Rectum*. 2005;48:1114-1125.  
3. Viscusi E, et al. *Surg Endosc*. 2006;20:67-79.  
4. Ludwig K, et al. *Arch Surg*. 2008;143:1098-1105.  
5. Buchler M, et al. *Aliment Pharmacol Ther*. 2008;22:312-325.  
[http://www.accessdata.fda.gov/drugsatfda\\_docs/label/2009/021775s004tbl.pdf](http://www.accessdata.fda.gov/drugsatfda_docs/label/2009/021775s004tbl.pdf). Accessed May 2010.

## Enhanced Recovery Pathway Departmental Length of Stay (LOS)

	1991-1999		1999		March-June/2000	
	n	LOS	n	LOS	n	LOS
DRG 148						
ERP open	1784	9.5	185	8.6	62	5.7*
other CR teams	6459	9.8	824	8.8	162	10.1
Laparoscopic					24	3.2*
DRG 149						
ERP open	742	6.4	69	5.2	44	3.5†
other CR teams	2256	6.4	327	5.1	111	4.5
Laparoscopic					18	2.5*
DRG 148 & 149						
ERP open	2526	8.6	254	7.7	106	4.7§
other CR teams	8715	8.9	1151	7.7	273	7.7
Laparoscopic					42	2.9*

\*  $P < 0.0001$ ; †  $P = 0.002$ ; §  $P < 0.001$ , Student's t test

Delaney C, et al. *Br J Surg*. 2001;88:1533-1538.

LAP: laparoscopy  
CR: colorectal surgery

## GI Recovery, LOS, and Cost

- GI recovery influences LOS, which impacts overall hospitalization costs
- Strategies to enhance GI recovery are expected to ultimately translate into cost savings
  - Enhanced recovery pathway
    - Preoperative patient education and optimization
    - Minimally invasive surgery where appropriate
    - Early removal of NG tubes
    - Early resumption of diet
    - Opioid-sparing techniques
    - Peripheral opioid antagonism where appropriate
    - Early ambulation

## Patient Case Summary

- Patient developed prolonged POI with an extended length of stay
- Increased cost of care due to imaging, parenteral nutrition, and metabolic monitoring
- Patient experienced significant impairment of quality of life and delayed recovery

## Outline

- Background of multi-modal surgery
- **introduction to project**
- Baseline data
- Multi-modal and system changes
- Preliminary results



Dr. Hayashi, Surgeon



Dr. Wood, Anesthetist



Dr. Karimuddin, Surgeon

It takes a team . . . . .



Rob Calnan,  
Nurse Manager



Courtney Addis, RD  
Manager, Surgery



Prof. Carli, Anesthetist, Researcher  
McGill University, brought in to  
Present to nurses and physicians  
At medical rounds

## Fast-Track Surgery/ MMCR

What is fast-track surgery?

## Basic Concept

- Pre-op patient education
- New techniques: anaesthetic, analgesic, surgical
  - Reduce: stress, pain, discomfort
- Aggressive post-op rehab
- Use same D/C criteria as traditional care

Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Goals

- Lower risk, better outcome
- Accelerate recovery
- Reduce morbidity, complications (pulmonary, cardiac, thromboembolic, infectious)
- Shorten convalescence

Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Fast-Track Surgery

What should we do pre-operatively?

## Patient Education

- Tell patients what to expect
  - Improves patient collaboration with team
  - ↓ anxiety
  - ↓ analgesia needs
- Tell patients their role in recovery
- Optimize patients medically
  - Including smoking, EtOH cessation

Fearon KC, et al. Clin Nutr. 24: 466, 2005  
Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## No Pre-Op Bowel Prep

- Bowel prep → ↑ anastomotic dehiscence
- (Recommendations not clear yet for low anterior resections)

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006  
Wind J, et al. Br J Surg. 93: 800, 2006

## Limited Fasting

- Solids until 6 hours before surgery
- Clear fluids until 2 hours before surgery
  - Safe
  - Beneficial
- Carbohydrate-loaded liquid pre-op
  - ↓ post-op catabolism
  - ↓ insulin resistance, ↓ hypoglycemia
  - ↓ muscle loss

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006  
Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## Prophylactic Antibiotics

- Single dose immediately pre-op
  - Anaerobes
  - Aerobes

Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## No Routine Pre-medication

- Anxiolytics only when absolutely necessary
- No pre-emptive analgesia

Fearon KC, et al. Clin Nutr. 24: 466, 2005

## VTE Prophylaxis

- Pre-op heparin
- Heparin q12h until fully mobilizing
- TEDS

Fearon KC, et al. Clin Nutr. 24: 466, 2005

# Fast-Track Surgery

## What should we do intra-operatively?

# Anaesthesia

- Best anaesthetics and opioids:
  - Rapid-onset
  - Short-acting
- Maximize use of regional anaesthesia
  - Spinal / epidural better than general anaesthetic
  - Post-op epidural (controversial?)

Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

# Less Invasive Surgery

- Smaller incisions
- Curved, transverse incisions?
- Laparoscopic
  - ↓ inflammatory response
  - ↑ pulmonary function
  - ↓ length-of-stay?

Fearon KC, et al. Clin Nutr. 24: 466, 2005  
Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

# Maintain Normothermia

- Mild hypothermia
  - ↑ wound infection
  - ↑ blood loss
  - ↑ cardiac events
- Core temperature monitoring
- Bair huggers
- Warmed IV fluids

Fearon KC, et al. Clin Nutr. 24: 466, 2005  
Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

# Avoid Fluid Overload

- Fluid overload →
  - ↑ ileus
  - “major and minor morbidity”
  - ↑ length of stay

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006  
Wind J, et al. Br J Surg. 93: 800, 2006

# Pharmacologic Intervention

- Glucocorticoid
  - ↓ inflammation
  - ↓ nausea, vomiting
  - ↓ pain
- Beta-blockers
  - ↓ cardiac morbidity
- Anabolic agents
  - Studies inconclusive

Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice



## Fast-Track Surgery

What should we do post-operatively?

## Avoid Drains

- JP drains
  - Do not use routinely (except post-mastectomy)
- NG tubes
  - Do not use routinely
- Foleys
  - Do not use routinely
  - D/C after 24h (even with epidural in place)

Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## Early Activity

- ↓ muscle loss
- ↓ thromboembolism
- ↑ pulmonary function
- ↑ tissue oxygenation

Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Early Activity

- Environment should encourage independence
- Out of bed x 2h on day of surgery
- Out of bed x 6h every day after

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006

## Early Feeding

- ↓ infection, ↓ gut permeability
- ↓ hospital stay
- ↓ catabolism
- No ↑ dehiscence

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006  
Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## Early Feeding

- Start clear fluids 2h post-op
- Aim > 800mL fluids on day of surgery
- DAT 4h post-op
- Routine nutritional supplements
- ↓ IV appropriately, avoid fluid overload, aim D/C IV on POD#1

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006  
Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## Prevent Nausea and Vomiting

- Ondansetron, droperidol, dexamethasone
- Anti-emetic polypharmacy?
- Minimize narcotics
- O<sub>2</sub>
- Useless: metoclopramide

Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002  
Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Prevent Ileus

- ↓ ileus with post-op epidural
- Avoid
  - Narcotics
  - Fluid overload
- Mg supplements
- Control medically: novel peripherally acting opioid antagonist (alvimopan)
- Continue feeding

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006  
Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Routine Laxatives, Pro-kinetics

- Suggested in a few studies

Wind J, et al. Br J Surg. 93: 800, 2006

## Optimize Analgesia

- Critical for
  - Mobilization
  - Oral intake
  - ↓ stress response
- Epidural x 2d
- Multi-modal: NSAIDs, routine acetaminophen
- APS

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006  
Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002  
Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Routine Oxygen

- ↓ sats ←
  - Anaesthetic effects
  - Supine position → ↓ pulmonary function
  - Sleep disturbances
- Routine O<sub>2</sub> administration →
  - ↓ nausea, vomiting
  - ↓ infection
  - ↓ HR
  - ↓ confusion

Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## Continue Medications

- Continue with patient's home meds

Kehlet H, Wilmore DW. Am J Surg. 183: 630, 2002

## Nursing

- Nurses good resource for psychological support
  - Early oral intake
  - Early mobilization
  - Self-care
- Care maps with daily goals are useful

Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Discharge Planning

- Usual criteria
  - Adequate pain control with oral analgesia
  - Taking solid foods
  - No IV fluids
  - Independently mobile
  - Patient willing to go home

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006

## Discharge Planning

- Goals
  - ↓ readmissions
  - ↑ patient safety
  - ↑ patient satisfaction
- Outline for patient
  - Expected recovery time course
  - Recommendations
  - Encourage oral nutrition, mobilization

Kehlet H, Sawyer F. Fast Track Surgery, ACS Surgery: Principles & Practice

## Follow Up

- Structured follow-up plan
  - Phone call: 1-2d
  - Out-patient clinic: 7-10d
  - Phone call: 30d
- Pathways for prompt readmission when necessary
  - Symptom relief
  - Overnight stay

Soop M, et al. Curr Opin Crit Care. 12: 166, 2006

## Fast-Track Surgery

What are the outcomes?

### Systematic review of enhanced recovery programmes in colonic surgery

J. Wind<sup>1</sup>, S. W. Polle<sup>1</sup>, P. H. P. Fung Kon Jin<sup>1</sup>, C. H. C. Dejong<sup>2</sup>, M. F. von Meyenfeldt<sup>3</sup>, D. T. Ubbink<sup>4</sup>, D. J. Gouma<sup>1</sup> and W. A. Bemelman<sup>1</sup> on behalf of the Laparoscopy and/or Fast Track Multimodal Management *Erasmus* Standard Care (LAFM) study group and the Enhanced Recovery After Surgery (ERAS) group

<sup>1</sup>Department of Surgery, Academic Medical Centre, Amsterdam; <sup>2</sup>Department of Surgery, Academic Hospital Maastricht and Nutrition and Toxicology Research Institute Maastricht (NUTRIM), Maastricht University and <sup>3</sup>Department of Clinical Epidemiology and Biostatistics, Academic Medical Centre, Amsterdam, The Netherlands  
Correspondence to: Dr W. A. Bemelman, Department of Surgery, Academic Medical Centre, Postbox 22660, 1100 DD Amsterdam, The Netherlands (e-mail: w.a.bemelman@amc.uva.nl)

**Background:** Fast track (FT) programmes optimize perioperative care in an attempt to accelerate recovery, reduce morbidity and shorten hospital stay. The aim of this review was to assess FT programmes for elective segmental colonic resections.

**Methods:** A systematic review was performed of all randomized controlled trials and controlled clinical trials on FT colonic surgery. The main endpoints were number of applied FT elements, hospital stay, readmission rate, morbidity and mortality. Quality assessment and data extraction were performed independently by three observers.

**Results:** Six papers were eligible for analysis (three randomized controlled and three controlled clinical trials), including 512 patients. FT programmes contained a mean of nine (range four to 12) of the 17 FT elements as defined in the literature. Primary hospital stay (weighted mean difference - 1.56 days, 95 per cent confidence interval (c.i.) - 2.61 to - 0.50 days) and morbidity (relative risk 0.54, 95 per cent c.i. 0.42 to 0.69) were significantly lower for FT programmes. Readmission rates were not significantly different (relative risk 1.47, 95 per cent c.i. 0.73 to 1.86). No increase in mortality was found.

**Conclusions:** FT appears to be safe and shortens hospital stay after elective colorectal surgery. However, as the evidence is limited, a multicentre randomized trial seems justified.

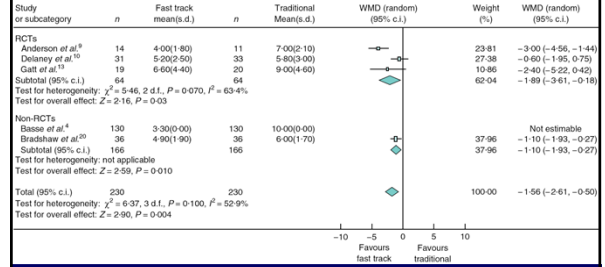
## Interventions, Outcomes

Reference	Type	n	Fast track items																								
			Morbidity	Mortality	Reoperations	Emergency hospital stay	Total hospital stay	Minimised 30 days' follow-up	Preoperative counselling	Preoperative fasting	Spivetics	No bowel preparation	No premedication	Fluorimetrics	Preoperative high O <sub>2</sub> concentrations	Active prevention of hypothermia	Editorial analysis	Minimally invasive techniques	No routine use of NG tubes	No use of drains	Enhanced postoperative mobilization	Enhanced postoperative analgesia	No systemic morphine use	Standardization	Early removal of bladder catheter		
Anderson et al. <sup>8</sup>	RCT	25	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Delaney et al. <sup>10</sup>	RCT	84	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gatt et al. <sup>13</sup>	RCT	39	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Basse et al. <sup>4</sup>	CCT	260	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Raue et al. <sup>19</sup>	CCT	52	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bradshaw et al. <sup>20</sup>	CCT	72	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓, Adequately described/better; ✓, not adequately described/poorly present. RCT, randomized controlled trial; CCT, controlled clinical trial; NG, nasogastric.

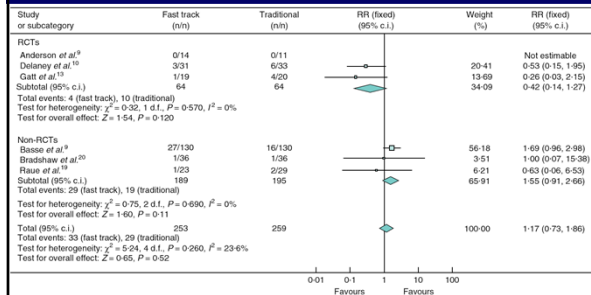
Wind J, et al. Br J Surg. 93: 800, 2006

## Primary Hospital Stay



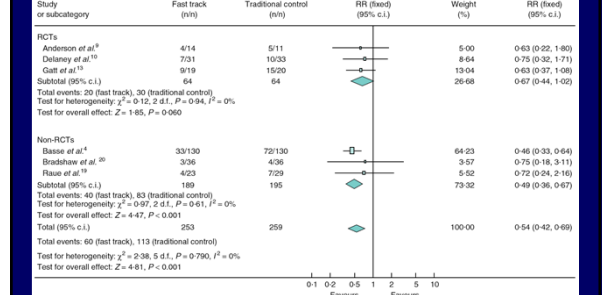
Wind J, et al. Br J Surg. 93: 800, 2006

## Readmission



Wind J, et al. Br J Surg. 93: 800, 2006

## Morbidity



Wind J, et al. Br J Surg. 93: 800, 2006

## Gut Function

Reference	n	Reinserted NG tubes		First bowel movement (days)		Tolerance of normal diet (days)	
		FT	TC	FT	TC	FT	TC
Anderson et al. <sup>8</sup>	25					2	3*
Delaney et al. <sup>10</sup>	64	2	3				
Gatt et al. <sup>13</sup>	39					2	3*
Basse et al. <sup>4</sup>	260	2	20*	2	4.5*		
Raue et al. <sup>19</sup>	52	3	6	2	3*	1	2*
Bradshaw et al. <sup>20</sup>	72			2 (2.5)	3 (3.7)	1 (1)	2 (2.9)†

Continuous data are given as median (mean). \*P < 0.050. †Tolerance of fluid diet. NG, nasogastric; FT, fast track; TC, traditional care.

- Fast-track →
  - ↓ NGT
  - Faster BM
  - Earlier DAT

Wind J, et al. Br J Surg. 93: 800, 2006

## The Pathway through the "System"

## Principles for the entire pathway...

- ▶ Implementing multimodal best practices based on available evidence that simplifies care and treatment processes and includes:
  - Minimizing pain
  - Normalizing GI Function
  - Optimizing Preoperative Nutrition
  - Feeding postoperatively as soon as appropriate
  - Optimizing Ambulation
  - Discontinuing attached lines, tubes, and/or drains as soon as appropriate
  - Promoting self management and care
  - Optimizing respiratory function

## The Journey Begins

- At the surgeon's office after there has been a decision for the surgery
- The preoperative colon resection clinical order set is completed and arrives with the booking package
- Once it arrives on site, a preadmission appointment is booked about a week before surgery

## Preparing for Surgery

### Before

- Inconsistent preoperative instructions were given (for example – bowel care)
- No clear expectations about the goals of care

### Now

- "Before, During and After Colon Resection" Booklet
- The nurses review with the patient and family:
  - Bowel Prep, CHG Washes
  - The pathway post surgery on each day for:
    - Activity
    - Eating
    - Pain
  - The target for discharge is Day 4!
  - What they need to know for going home....

## The result we hoped for:

- Well prepared patients and families that have clear expectations and goals for their surgical stay!

## Operating Room

### Before

- Inconsistent practice

### Now

- ▶ Consistent Practice
- ▶ Anesthesia Protocol was developed. Key points:
  - Consider Spinal for all minimally invasive surgery
  - Consider Epidural for all open cases unless contraindicated
  - All patients to receive antiemetics
  - Perioperative heparin to be administered to all patients
  - Lactated Ringers is solution of choice, and restrict maintenance fluid to 15cc/kg/hr
  - Active warming of the patient
  - Use of FiO2 of .8
  - Timely antibiotic administration

## Care Post Operatively

### Before

- ▶ Diet
  - Slow progression of ice chips to fluids
- ▶ Activity
  - Slow to mobilize
- ▶ Investigations
  - Different depending on surgeon
- ▶ Foley
  - Stayed in until epidural removed
- ▶ Pain Control
  - variable

### Now

- ▶ Diet
  - Full Fluids POD 0, Light diet by POD 1
- ▶ Activity
  - Dangle POD 0 → 5hours or more of activity by POD 4
- ▶ Investigations
  - Standardized bw on POD 1 & 3
- ▶ Foley
  - Removed on POD 2
- ▶ Pain Control
  - Goal: 3 or less on pain scale
  - Around the clock tylenol

## Care Post Operatively

### Before

- ▶ Wound Care
  - At the discretion of nurses
- ▶ DVT proph
  - Varied by surgeon
- ▶ Epidural
  - Removed approx day 4 or 5
- ▶ IV
- ▶ Discharge
  - Varied by surgeon

### Now

- ▶ Wound Care
  - No change
- ▶ DVT proph
  - Standardized (SC Heparin)
- ▶ Epidural
  - Stopped Day 2, removed day 3
- ▶ IV
  - SL when intake is 1200 cc/day or until no longer needed
- ▶ Discharge
  - Standing criteria
  - Target: Discharge on POD 4

## Tools used to support the changes

- Education Book
- Nursing Documentation Care Pathways
  - Documentation by exception
  - A different path for each post operative day
- Clinical Order Sets
  - PreOp
  - Post Op
  - Colon Specific Epidural Orders
- Anesthesia Protocol

## Home...

- No changes – Home support and other referrals are still done as required, follow up appointments still occur...
- The only difference is education book is resource – “After” section is dedicated to instructions for when patients go home.

## Colon Care Map – The Data

- Successes:
  - Better patient education
  - Standardization of care
  - Adherence to best practices
    - Pre-emptive analgesia
    - DVT prophylaxis
    - Antibiotic Timing
    - Normothermia
    - Regional Anaesthetic te

## Patient Education

- 32 Pages – Before, During and After Surgery
- One of the keys to the success of this project was having well prepared patients

## Education Book Survey

- N= 15 or about 50%
- The median and average responses to the questions were 5 (strongly agreed). Patients said:
  - Easy to understand, that they read the book, it answered their questions, liked the layout, and would recommend it to others
  - The recommended that nothing in the book be removed

## A few quotes

- *"Excellent booklet! Wish I'd had it a little earlier than the preadmission meeting. Really liked the way it was set up – before, during and after the surgery. I would have been lost without all the information. The caregiver also found it useful. Thank you"*
- *"... It took the anxiety out of the process"*
- *"This booklet is an excellent source of information for the patient and family"*
- *"I cannot say enough in praise of the nurses, doctors, and staff on 7A when I was a patient. They were terrific. No problems at all with the education book".*

## Colon Care Pathway Outcomes: A Comparison of Pre and Post-Pathway Data

Sarah Madison BSc  
UBC IMP Yr 3

## Colon Care Pathway

- Dr. A. Hayashi
- Dr. C. Watters
- Dr. A. Karimuddin
- Dr. S. Leacock
- C. Addis

## Objectives

- Background Information on the Colon Care Pathway
- Comparison of Pre and Post-Pathway Data
- Summary

## The Beginning: 2009

- Literature review
  - Best practise around colorectal surgery
- Current practise at VGH
  - Retrospective chart review of 44 pts who underwent colorectal surgery in 2009
- Comparison of lit review to current practise

## 2010: Pilot Project

- Goals
  - Reduce morbidity
  - Hasten functional improvement / recovery
- Pilot Project order sets
  - Based on results of literature review & discussions with anesthesia, nursing, gen surg, nutrition services
- Chart review
  - 31 charts of pts who underwent colorectal surg with new pathway

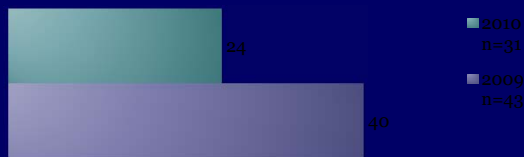
## A Look at the Data

- 2009: Pre-pathway
  - 44 charts
  - Date range: Nov '08 – Apr '09
  - Excluded: pediatrics, emergency
- 2010: Post-pathway
  - 31 charts reviewed to date
  - Date range: Feb – Apr 20
  - Excluded: pediatrics, emergency, pouches

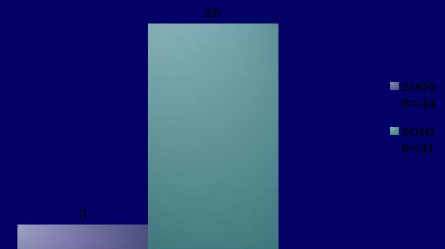
## Patient Demographics

Median (Range)	2009 Pre-Pathway n= 44	2010 Colon Pathway n = 31
Age	65 (31 – 91)	62 (48 - 86)
Gender	30 M 14 F	15 M 16F
BMI	27.8 (18.2 – 43.4)	26.4 (19.0 – 49.2)
Pre-op ASA Class	2.0 (1 – 3)	2.0 (1 – 3)
Surgery Length (mins)	184.0 (77 – 364)	120.0 (69 – 219)
Open Procedure	32	12
Laparoscopic	12	19
Malignant Disease	24	12

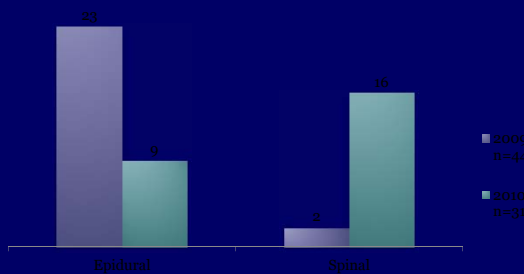
## Pre-operative Bowel Prep



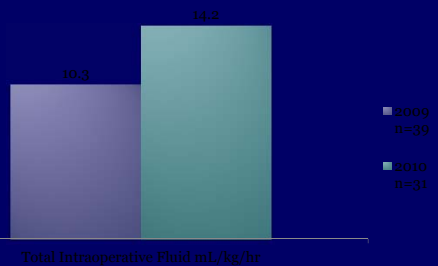
## Pre-Operative Analgesia



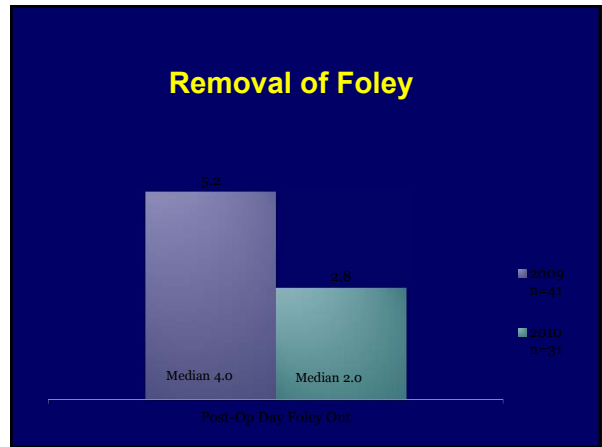
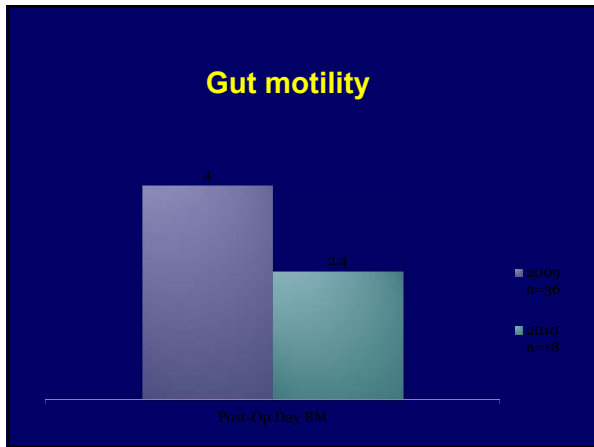
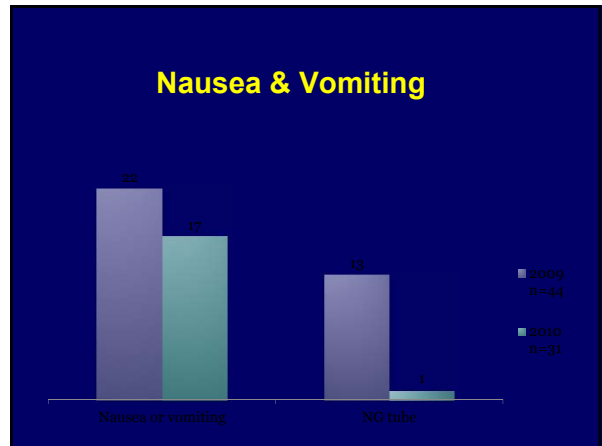
## Analgesia



## Intraoperative Fluid

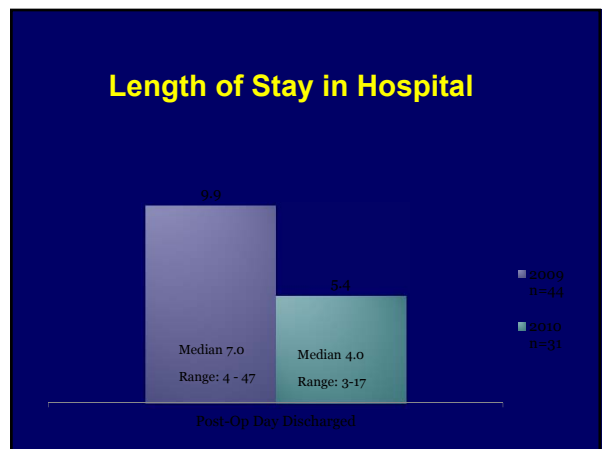


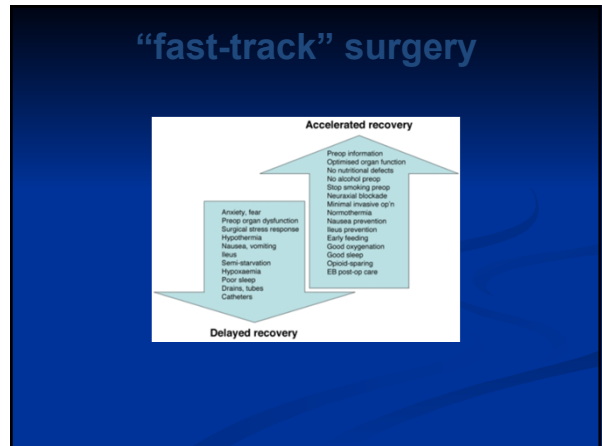




### Complications

	2009	2010
Patients with Complication	17 39%	6 19%
Types	Abscess, anastomotic leak, wound infection pneumonia, UTI, bowel obstruction, PE, compartment synd	Abscess, hematoma, C. diff, wound infection
Re-operations	5	1
Re-admissions	5	4
Deaths in Hospital	3	0





- ### Summary
- Under the Colon Care Pathway:
    - Increased pre-op analgesia
    - Fewer bowel preps
    - Tolerating solids sooner
    - Shorter duration of ileus
    - Epidurals & foleys removed sooner
    - Fewer complications
    - Shorter length of stay

- ### What is Most Important?
- Education, education, education
    - Patient: pre- and post-op
    - Care team
  - Collaboration, collaboration, collaboration
    - Dietitians
    - Surgeons
    - Anaesthetists, APS team: intra- and post-op
    - Nurses
    - Physiotherapists

- ### Other centers
- Ronald Stone, RD indicates Mayo Clinic in Florida has implemented the multi-modal/ fast track approach, 4-5 yrs ago, “Nutrition rarely intervenes now as they are in and out by day 3”