Enhanced Recovery after Colon & Rectal Surgery

Marc Singer, MD, FACS, FASCRS
Division of Colon & Rectal Surgery
Loyola University Medical Center
Disclosures

• Speaker
  – Merck, Nestle, Applied

• Advisory Board
  – Recro Pharmaceuticals

• Consultant
  – Olympus, Ethicon

• Partner
  – Chicago Colorectal Symposium
Background

- What is Enhanced Recovery?

- Surgical recovery can be optimized with evidence-based pre-operative, intra-operative, and post-operative interventions. Patient education, nutrition, and preconditioning combined with intraoperative and postoperative standardization can improve patient safety, enhance quality of care, advance outcomes, and speed recovery, all while optimizing resource utilization and satisfaction.

  — American Society for Enhanced Recovery (ASER)
Background

• Bundle
• Perioperative management process
• Fast Track Protocols
• Accelerated Care Pathways
• Enhanced Recovery After Surgery (ERAS®)

• Enhanced Recovery is **NOT** an order set
Background

• Financing of Colectomy / Bundled Payments
• Emphasis on quality
• Public reporting outcomes
• Opioid crisis
Financing

• Affordable Care Act 2010
  – Fee-for-service → value-based payments
• Bundled Payments for Care Improvement Initiative
• Hospitals accept financial responsibility
Quality

- Health and Human Services
- National Action Plan to Prevent Health Care-Associated Infections
  - National Healthcare Safety Network (CDC)
  - Healthcare Cost and Utilization Project (HCUP)

- CLABSI
- CAUTI
- MRSA
- CDiff
- Surgical Site Infection (SSI)
  - 30% reduction SSI by 2020

Outcomes

• Length of Stay

• Postoperative Ileus
  – The transient impairment of intestinal motility occurring after an operation
  – Patient specific factors
  – Inflammation
  – Infection
  – Operative time
  – Bowel manipulation
  – Opioids

• No risk stratification model
• Can **NOT** accurately predict
Opioid Crisis
Quality
(Reduced SSI)

Cost
(Bundled Payments)

Outcomes (LOS)

Opioid Crisis
(Narcotic reduction)

Enhanced Recovery
Developing Enhanced Recovery Protocol

- Stakeholders
- Protocol – Evidenced based
- Implementation
- Monitor compliance / results
- Feedback
- Refine

Diagram:

- Protocol
  - Refinement
  - Feedback
  - Auditing
  - Results

Cycle:
- Protocol → Refinement → Feedback → Auditing → Results → Protocol
Stakeholders

- Champion
- Surgery
- Anesthesia
- Pain service
- Operating Room
  - Preop
  - PACU
- Inpatient Nursing
- Outpatient Nursing
- WOCN
- Physical therapy
- Nutrition
- Pharmacy
- Preop Clinic
- Administration
  - Quality
  - CMO
  - Data management
Where to Start?

• Volume of literature
• Not every protocol requires every element
• Define goals
• Review resources
Resources

**Clinical Practice Guidelines**

Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and Society of American Gastrointestinal and Endoscopic Surgeons

Joseph C. Carmichael, M.D. • Deborah S. Keller, M.S., M.D. • Gabriele Baldini, M.D.
Linda Bokdelman, M.D. • Eric Weiss, M.D. • Lawrence Lee, M.D., Ph.D.
Marylisa Beatross, M.D. • James McLane, M.D. • Elaine S. Feldman, M.D.
Scott R. Steele, M.D.

DCR 2017

**Collective Review**

Surgical Technical Evidence Review for Colorectal Surgery Conducted for the AHRQ Safety Program for Improving Surgical Care and Recovery

Kristen A Ban, MD, Melinda M Gibbons, MD, MSHS, FACS, Clifford Y Ko, MD, MS, MSHS, FACS, Elizabeth C Wick, MD, FACS

JACS 2017

**Global Guidelines for the Prevention of Surgical Site Infection**

World Health Organization

**CDC**

Centers for Disease Control and Prevention

CDC 24/7: Saving Lives, Protecting People™
Enhanced Recovery Protocol

**Preoperative**
- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

**Day of Surgery**
- NPO
- Carbohydrate loading
- Hair management
- Skin decontamination
- Patient Warming
- Ileus Prevention
- Glucose management
- Pain management
- DVT
- EPIC/Grease Board

**Intraoperative**
- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

**Postoperative**
- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination
- Audit compliance
- Reporting
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

- Patient engagement
- Patient expectations
- Improved experience
- Improved compliance
- Improved outcomes
  - Zhuang DCR 2013
  - Greco World J Surg 2014
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immune stimulation
- Bowel preparation
- Carbohydrate loading
- NPO Status

Enhanced Recovery After Colon & Rectal Surgery

**LOYOLA MEDICINE**

**We also treat the human spirit.**
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

Postop coordination to begin preoperatively
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

Universal HgbA1c
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

![SCOAP: Albumin and Complications]

Elective Colon/Rectal Procedures

Traditional Nutrition
Immunonutrition

- Arginine
- ω – 3 Fatty Acids
- Nucleotides

- 1 box TID x 5 days
- 15 pack distributed preoperatively
Immunonutrition

Braga M et al, Arch Surg 2002

- **Malnourished** (n=150)
  - Complications: 18%, 28%, 42%
  - P<0.02
  - Infection: 10%, 12%, 32%
  - P=0.02

Braga M et al. Surgery 2002

- **Well-nourished** (n=200)
Immunonutrition

- 35 RCTs in major elective surgery (n= 3438)
- Evaluated pre-, peri- and post-operative use of immunonutrition

Primary Outcome
Infectious complications
(p<0.00001)
Reduced 41%

Secondary Outcomes
Hospital LOS reduced
(p<0.00001)
Reduced 2.38 Days

No Complications

Drover J Am Coll Surg 2011
Preoperative

• Patient Education
• Smoking Cessation
• Prehabilitation
• Care coordination
• Diabetes control
• Skin decontamination
• Immunonutrition
• Bowel preparation
• Carbohydrate loading
• NPO Status

• Changing trends

• Mechanical AND Oral Antibiotic
  – WHO, ASCRS
  – ERAS Society against MBP

• Reduced SSI 16% to 7.2%
Bowel Preparation

Suprep (split dose), Neomycin, Metronidazole
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

- Convert fasting state to fed state
- Glucose/insulin
- Anxiety/thirst
- Hydration
- Postop ileus
- Decrease muscle breakdown

- Meta analysis 27 trials – complex carbohydrates (maltodextrin) NOT fructose or sucrose
  - Improved blood glucose
  - Small reduction LOS
    - Smith. Cochrane 2014

2 bottles night prior to surgery
1 bottle morning of surgery
Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status

“Say NO to NPO”

ASA Guidelines

Preoperative

- Patient Education
- Smoking Cessation
- Prehabilitation
- Care coordination
- Diabetes control
- Skin decontamination
- Immunonutrition
- Bowel preparation
- Carbohydrate loading
- NPO Status
Day of Surgery

- NPO
- Carbohydrate loading
- Hair management
- Skin decontamination
- Patient Warming
- Ileus Prevention
- Glucose management
- Pain management
- DVT
- EPIC/Grease Board
Day of Surgery

- NPO
- Carbohydrate loading
- Hair management
- **Skin decontamination**
- Patient Warming
- Ileus Prevention
- Glucose management
- Pain management
- DVT
- EPIC/Grease Board
• Patient warming
• Ileus Prevention
• Glucose management
• Pain management
• DVT
• EPIC/Grease Board
Day of Surgery

- NPO
- Carbohydrate loading
- Hair management
- Skin decontamination
- Patient Warming
- Ileus Prevention
- Glucose management
- Pain management
- DVT
- EPIC/Grease Board

- Alvimopan
  - μ receptor antagonist
  - Inhibits narcotic induced ileus
  - Must dose preop
Day of Surgery

- NPO
- Carbohydrate loading
- Hair management
- Skin decontamination
- Patient Warming
- Ileus Prevention
- **Glucose management**
- Pain management
- DVT
- EPIC/Grease Board

All patients to have preop finger stick
Day of Surgery

- NPO
- Carbohydrate loading
- Hair management
- Skin decontamination
- Patient Warming
- Ileus Prevention
- Glucose management
- Pain management
- DVT
- EPIC/Grease Board

- Celecoxib 400mg PO
- Gabapentin 600mg PO
Day of Surgery

- NPO
- Carbohydrate loading
- Hair management
- Skin decontamination
- Patient Warming
- Ileus Prevention
- Glucose management
- Pain management
- DVT
- EPIC/Grease Board

Notify entire care team
Intraoperative

- Patient Warming
- **Skin preparation**
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

**Chlorhexidine-alcohol versus povidone iodine for surgical-site antisepsis**


New England Journal of Medicine 2010; 362: 18-26

**Incidence of SSIs by surgery type (%)**

- Povidone iodine
- Chlorhexidine

<table>
<thead>
<tr>
<th>Surgery Type</th>
<th>Povidone iodine</th>
<th>Chlorhexidine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal</td>
<td>22.0</td>
<td>13.1</td>
</tr>
<tr>
<td>Biliary</td>
<td>9.3</td>
<td>5.6</td>
</tr>
<tr>
<td>Small intestinal</td>
<td>29.6</td>
<td>22.7</td>
</tr>
<tr>
<td>Gastro-esophageal</td>
<td>26.7</td>
<td>22.7</td>
</tr>
<tr>
<td>Thoracic</td>
<td>7.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Gynaecologic</td>
<td>5.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Urologic</td>
<td>2.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

- RN to prep
- Scrub
- 3 mins drying time
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

Not just for Ortho!
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

Clinical Review & Education

JAMA Surgery | Special Communication

Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017

- Weight Based Antibiotics within 60 min of incision
- Ceftriaxone 2g
- Metronidazole 500mg
- Stop within 24 hours
- Drains are NOT an indication
- Do NOT apply topical antibiotics

JAMA 2017
**Intraoperative**

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- **IVF Management**
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

- IVF restriction can reduce morbidity and LOS
- Tissue edema – organ dysfunction

![Diagram showing complications and volume load](image)

- Hypoperfusion
- Organ dysfunction
- Adverse outcome
- Edema
- Organ dysfunction
- Adverse outcome

- Maintenance 1.5-2ml/kg/h
### Intraoperative Management

#### Patient Warming

- **Skin preparation**
- **OR Traffic**
- **Antibiotics**
- **IVF Management**
- **Glucose management**
- **Supplemental Oxygen**
- **PONV Prevention**
- **Pain management**
- **NGT / Drains**
- **MIS**
- **Near infrared vascular imaging**
- **Wound Protector**
- **Closing Protocol**
- **Wound management**
- **Residual neuromuscular weakness**
- **Wound classification**

#### Blood Glucose Initial Management Ongoing Management

<table>
<thead>
<tr>
<th>Blood Glucose</th>
<th>Initial Management</th>
<th>Ongoing Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40 mg/dL</td>
<td>Confirm most recent diabetes medication / insulin dose. Administer 50 mL dextrose 50% (25 g) or equivalent IV x 1.</td>
<td>Re-check every 15 min and treat accordingly until glucose ≥ 80 mg/dL, then re-check in 30 min and resume hourly glucose monitoring and management</td>
</tr>
<tr>
<td>40-59 mg/dL</td>
<td>Confirm most recent diabetes medication / insulin dose. Administer 25 mL dextrose 50% (12.5 g) or equivalent x 1.</td>
<td>Re-check every 15 min and treat accordingly until glucose ≥ 80 mg/dL, then re-check in 30 min and resume hourly glucose monitoring and management</td>
</tr>
<tr>
<td>60-79 mg/dL</td>
<td>Confirm most recent diabetes medication / insulin dose. Administer 15 mL dextrose 50% (7.5 g) or equivalent x 1.</td>
<td>Re-check every 15 min and treat accordingly until glucose ≥ 80 mg/dL, then re-check in 30 min and resume hourly glucose monitoring and management</td>
</tr>
<tr>
<td>80-119 mg/dL</td>
<td>Confirm most recent diabetes medication / insulin dose. Monitor.</td>
<td>Re-check in 1 hour.</td>
</tr>
<tr>
<td>120-180 mg/dL</td>
<td>Confirm most recent diabetes medication / insulin dose. Monitor.</td>
<td>Re-check in 1 hour.</td>
</tr>
<tr>
<td>&gt;180 mg/dL</td>
<td>If anticipated procedure time &gt;3 hours, start insulin infusion. If anticipated procedure time &lt; 3 hours, give lispro SQ as follows:</td>
<td>If anticipated procedure time &lt; 3 hours, give lispro SQ as follows:</td>
</tr>
</tbody>
</table>

#### Blood Glucose SQ Lispro Insulin Dose

<table>
<thead>
<tr>
<th>Blood Glucose</th>
<th>SQ Lispro Insulin Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>181-200 mg/dL</td>
<td>1 unit</td>
</tr>
<tr>
<td>201-250 mg/dL</td>
<td>2 units</td>
</tr>
<tr>
<td>251-300 mg/dL</td>
<td>3 units</td>
</tr>
<tr>
<td>&gt;301 mg/dL</td>
<td>4 units</td>
</tr>
</tbody>
</table>

- Re-check in 1 hour.
- DO NOT re-dose supplemental insulin more frequently than every 2 hours.
- If 2 SQ doses of insulin are given and glucose remains >180 mg/dL, begin insulin infusion.
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

- $\text{FiO}_2$ 80%
  - CDC and WHO
  - During surgery and immediate postoperative period (6 hours)
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

- PONV as high as 80%
  - Increases costs
  - Reduces patient satisfaction
  - Delay discharge

- RCT combination is superior to single

- Dexamethasone at induction

- Ondansetron at emergence

- Does not effect diabetics
  - Abdelmalak Anesth Analg. 2013
Intraoperative

- Minimize narcotics
- Epidural for open
- TAP for laparoscopy
  - Liposomal bupivacaine
  - IV Acetaminophen 1000 mg
  - Ketorolac 30mg
  - Ketamine drip
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular
- Wound classification

- Minimize narcotics
- Epidural for open
- TAP for laparoscopy
  - Liposomal bupivacaine
- IV Acetaminophen 1000 mg
- Ketorolac 30mg
- Ketamine drip

Pain Pract. 2012
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

- No routine NG tubes
  - Do NOT prevent nausea, vomiting
  - Delay diet and discharge
  - Pulmonary complications

Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

- **No routine drains**
- **No data supporting routine drains**
- **Not related to location of anastomosis**
  - Karliczek. Colorectal Dis 2006
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

- MIS Colectomy produces reduced LOS, morbidity, wound complications, pulmonary complications, narcotics, short term Q of L
  - Schwenk Cochrane Database Syst Rev 2005
  - Kuhry Cochrane Database Syst Rev 2008
  - Zhao Int J Colorectal Dis 2016
Status of MIS Colectomy?

• MIS utilization for colectomy lags general surgery
  – Technically challenging
  – Training surgeons

• Current rates in USA?

• Loyola University
  – NSQIP 2017
  – Lap 47%

• Nationwide Inpatient Sample 188,326
  – 36% lap
  – 15% conversion
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- **Near infrared vascular imaging**
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

![Perfusion Assessment in Laparoscopic Left-Sided/Anterior Resection (PILLAR II): A Multi-Institutional Study](image)

- Anastomotic leak 1.4%
- 147 patients

- Jafari JACS 2015

- Liberal utilization
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

• Wound protector
• SSI 23% to 5%

• Routine utilization

**ORIGINAL CONTRIBUTION**

Barrier Wound Protection Decreases Surgical Site Infection in Open Elective Colorectal Surgery: A Randomized Clinical Trial

Kate Reid, B.Med.¹ • Peter Pockney, D.M., F.R.C.S.²

¹ Canberra Hospital, Canberra City, Australian Capital Territory, Australia
² Department of GI Surgery, Imperial College Healthcare Trust, London, United Kingdom
³ Division of Surgery, John Hunter Hospital, University of Newcastle, Newcastle, New South Wales, Australia
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

- Regown and reglove
- Redrape patient
- Closing Pack / Tray
- Antibiotic sutures
- Wound irrigation
- Sterile Stoma appliance
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen

**Systematic review**

**Meta-analysis and trial sequential analysis of triclosan-coated sutures for the prevention of surgical-site infection**

S. W. de Jonge¹, J. J. Attema¹, J. S. Solomkin² and M. A. Boermester³

Departments of Surgery, ¹Academic Medical Centre, Amsterdam, The Netherlands and ²University of Cincinnati College of Medicine, Cincinnati, Ohio, USA

Correspondence to: Professor M. A. Boermester, Department of Surgery, Academic Medical Centre, Meibergdreef 9, 1100 DD Amsterdam, The Netherlands (e-mail: m.a.boermester@amc.uva.nl)

### Congress abstracts

<table>
<thead>
<tr>
<th>Arslan et al.⁴¹</th>
<th>8 of 86</th>
<th>18 of 91</th>
<th>4:1</th>
<th>0:47 (0:22, 1:02)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defazio et al.²⁰</td>
<td>4 of 43</td>
<td>4 of 50</td>
<td>1:6</td>
<td>1:16 (0:31, 4:37)</td>
</tr>
<tr>
<td>Khachatryan et al.²⁸</td>
<td>6 of 65</td>
<td>14 of 68</td>
<td>3:3</td>
<td>0:45 (0:18, 1:10)</td>
</tr>
<tr>
<td>Singh et al.³³</td>
<td>6 of 50</td>
<td>16 of 50</td>
<td>3:5</td>
<td>0:38 (0:16, 0:88)</td>
</tr>
<tr>
<td>Yam and Ortina⁴⁰</td>
<td>1 of 12</td>
<td>5 of 14</td>
<td>0:8</td>
<td>0:23 (0:03, 1:73)</td>
</tr>
</tbody>
</table>

**Subtotal**

25 of 256
57 of 273
13:2
0:47 (0:30, 0:73)

Heterogeneity: \( \tau^2 = 0:00; \chi^2 = 2:55, 4 \text{ d.f.}, P = 0:64; \hat{I}^2 = 0\% \)
Test for overall effect: \( Z = 3:36, P < 0:001 \)

**Total**

330 of 3208
450 of 3254
100:0
0:72 (0:60, 0:86)

Heterogeneity: \( \tau^2 = 0:04; \chi^2 = 28:53, 20 \text{ d.f.}, P = 0:10; \hat{I}^2 = 30\% \)
Test for overall effect: \( Z = 3:60, P < 0:001 \)
Test for subgroup differences: \( \chi^2 = 5:81, 2 \text{ d.f.}, P = 0:05; \hat{I}^2 = 65:6\% \)
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector

- Regown and reglove
- Redrape patient
- Closing Pack / Tray
- Antibiotic sutures
- Wound irrigation
- Sterile Stoma appliance
- Wound classification
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Regown and reglove
- Redrape patient
- Closing Pack / Tray
- Antibiotic sutures
- Wound irrigation
- Sterile Stoma appliance
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

Prevena up to 7 days
Intraoperative

- Patient Warming
- Skin preparation
- OR Traffic
- Antibiotics
- IVF Management
- Glucose management
- Supplemental Oxygen
- PONV Prevention
- Pain management
- NGT / Drains
- MIS
- Near infrared vascular imaging
- Wound Protector
- Closing Protocol
- Wound management
- Residual neuromuscular weakness
- Wound classification

**CLASS I/CLEAN WOUNDS**—an uninfected surgical wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered.

**CLASS III/CONTAMINATED WOUNDS**—open, fresh, accidental wounds. In addition, surgical procedures in which a major break in sterile technique occurs (eg, open cardiac massage) or there is gross spillage from the gastrointestinal tract and incisions in which acute, nonpurulent inflammation is encountered are included in this category.

**CLASS II/CLEAN-CONTAMINATED WOUNDS**—a surgical wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination.

**Class IV/Dirty-Infected**
Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

[http://www.cdc.gov/hicpac/SSI/tables7-8-9-10-SSI.html](http://www.cdc.gov/hicpac/SSI/tables7-8-9-10-SSI.html)
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- **Ileus management**
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination
- Audit compliance
- Reporting

- **Alvimopan**
  - 12mg BID until diet and bowel movements
  - Reduces BM and LOS 1 day

- **Chewing Gum**
  - Sugar free gum 10 mins QID + PRN
  - Reduced time to BM, LOS
    - Short. Cochrane 2015
    - 81 studies >9000 patients
    - Mei. Gastroenterology Research 2017
    - 17 RCT >1800 patients
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination

• Postoperative Diet

- Audit compliance
- Reporting
Early Feeding

• But **when** can we feed postoperative patients?

• Bowel sounds
• Flatus
• Bowel movements
• Lack of abdominal distension
• Hunger
• Looks “good”
• Tolerating liquids, fulls, softs, low residue...
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition

- Multiple RCT, meta analyses demonstrating early feeding is safe, and decreases LOS, fewer complications
  - Andersen. Early enteral nutrition within 24h of colorectal surgery versus later commencement of feeding for postoperative complications. Cochrane 2006
- 7 RCT early feeding with reduced LOS, complications, same leak, SSI, NGT
- Diet within 24 hours

- Clears with supplements POD#0/1
- Low residue diet POD#2

- Cultural changes
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination

- Audit compliance
- Reporting

Narcotic Free Protocol?

- Minimize narcotics
- Epidural
- TAP (liposomal bupivacaine)
- Ketamine infusion
- IV Acetaminophen
- Gabapentin
- Ketorolac
- Tramadol
- Lidocaine patch
- PO opioids
- IV opioids
- PCA

- Reducing narcotics \(\rightarrow\) reduced LOS
- Schedule alternatives, **not** PRN
  - Khoo Ann Surg. 2007
Postoperative

- Immobility leads to skeletal muscle loss, atelectasis, insulin resistance, DVT

- Increased mobilization \(\rightarrow\) shorter LOS
  - Ahn Int J Colorectal Dis. 2013

- Loyola protocol
- Routine PTx consultation
  - Not OTx
- Up to chair evening of surgery
- Ambulate QID on POD 1 \(\rightarrow\) discharge
- Up to chair for meals

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination
- Audit compliance
- Reporting
- Care Coordination
- Audit compliance
- Reporting
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemenatal oxygen
- Care Coordination

- POD#0/1 Clears with Ensure Surgery
- POD#2 Low residue diet with Ensure Surgery (immunonutrition)
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination

- Heplock on POD#1
  - Contingent on tolerating clears
  - Recognizing that IVF have side effects
  - Bolus is common response to tachycardia, oliguria, hypotension, dizziness, poor PO intake, etc.
    - Reduce epidural
    - Review I/O
    - Assess patient

- Supplemental oxygen
- Care Coordination
- Audit compliance
- Reporting
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination

- Audit compliance
- Reporting

- Care coordination
  - Discharge coordination
  - WOCN
  - Hospitalist
  - Home services
  - SNF
Postoperative

- Active warming
- Glucose management
- PONV prophylaxis
- Ileus management
- DVT prophylaxis
- Pain management
- Rehabilitation
- WOCN
- Nutrition
- Immunonutrition
- IVF
- Urinary catheters
- Supplemental oxygen
- Care Coordination

- Audit compliance
- Reporting
Enhanced Recovery

• Implementation

• Updated order sets

• Enhanced Recovery is NOT an order set
  – Maessen. A protocol is not enough to implement an enhanced recovery programme for colorectal resection. BJS 2007
  – Achieved goals POD#3. Discharged POD#5
Enhanced Recovery

- NOT all or none
- Increasing elements improves outcomes
  - Gustafsson Arch Surg 2001
- NOT a research protocol with exclusion criteria
Enhanced Recovery Program in Colorectal Surgery: A Meta-analysis of Randomized Controlled Trials

Massimiliano Greco • Giovanni Capretti • Luigi Beretta • Marco Gemma • Nicolò Pecorelli • Marco Braga

- 16 RCT with 2376
- Reduced morbidity 40%
- LOS 2.28 days
- No increase readmissions
Future Initiatives at Loyola?

- Formal Prehabilitation protocol
- Ostim-i
- Goal directed fluid therapy protocol
- Phone Apps
- Wipes vs soap
- Smoking cessation program
- Evaluate TAP or epidural failure rates
- IV Lidocaine
- Compliance with Impact
- Nutrition assessment
- Hand hygiene for family, patients
Future Initiatives

• Implement protocol throughout Trinity?
Thank You!