The New Standard for Surgical Recovery

Enhanced Recovery After Surgery (ERAS)

Melanie S. Morris MD and Daniel I. Chu MD
Division of Gastrointestinal Surgery
Department of Surgery
Disclosure

• We do not have any relevant financial relationships with any commercial interest that pertains to the content of our presentation.
1735
First Successful Appendectomy
October 16, 1846
Ether Dome
@ MGH
“Would rather have a resident with a nasogastric tube in his pocket than a stethoscope.” – William J. Mayo

Prevent post-operative nausea/vomiting
Prevent wound dehiscence
Prevent incisional hernia
Prevent anastomotic leakage

http://ccforum.com/content/11/1/201
NGT removed with bowel sounds and output < 1000cc
Ambulate by POD2
NPO/IVF until POD2
Bowel prep, pre-op ABX, VTE prophylaxis
Multimodal approach to control postoperative pathophysiology and rehabilitation

H. Kehlet

Figure 2  Multimodal interventions towards control of the postoperative period.
Enhanced recovery after surgery: A consensus review of clinical care for patients undergoing colonic resection

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\(^b\)Centre of Gastrointestinal Disease, Ersta Hospital, PO Box 4622, 116 91 Stockholm & Karolinska Institutet, Centre for Surgical Sciences, Karolinska University Hospital, Huddinge, 141 86 Stockholm, Sweden
\(^c\)Department of Surgery, University Hospital Maastricht, PO Box 5800, Maastricht 6202 AZ, The Netherlands
\(^d\)Department of Surgery, Tromso University Hospital, Tromso, Norway
\(^e\)Department of Surgical Gastroenterology, 435 Hvidovre University Hospital, Højdalsvej 2650, Denmark

\(^\*\)Section for Surgical Pathophysiology 4074, The Julianne Marie Centre, Rigshospitalet, Blegdamsvej 9, 2100 Copenhagen, Denmark

Figure 1 Main elements of the ERAS protocol.

Enhanced Recovery After Surgery (ERAS)

• Developed in Europe initially for open colorectal surgery
• Multimodal strategies designed to minimize stress and organ dysfunction
• Numerous studies\(^1\)\(^-\)\(^5\) have demonstrated effectiveness in:
  1. Reducing length-of-stay (by 2 days)
  2. Reducing post-operative complications (by 30%)
  3. Reducing in-hospital cost
  4. No increase in readmissions or mortality
• Adoption of ERAS in the United States increasing

Patients Bounce Back Faster From Surgery With Hospitals’ New Protocol
Clear liquids and pain meds before surgery, less IV fluid during and fewer narcotics afterward
Enhanced Recovery After Surgery
A Review

Olle Ljungqvist, MD, PhD; Michael Scott, MD; Kenneth C. Fearon, MD, PhD

Table 1. Member Sites and Leads of the Original Enhanced Recovery After Surgery Study Group Formed in 2001

<table>
<thead>
<tr>
<th>University and Hospital</th>
<th>Country</th>
<th>Lead(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Edinburgh</td>
<td>United Kingdom</td>
<td>Ken Fearon</td>
</tr>
<tr>
<td>Karolinska Institutet and Ersta Hospital Stockholm</td>
<td>Sweden</td>
<td>Olle Ljungqvist</td>
</tr>
<tr>
<td>University of Copenhagen and Hvidovre Hospital</td>
<td>Denmark</td>
<td>Henrik Kehlet</td>
</tr>
<tr>
<td>University of Northern Norway and Tromsø Hospital</td>
<td>Norway</td>
<td>Arthur Revhaug</td>
</tr>
<tr>
<td>University of Maastricht</td>
<td>The Netherlands</td>
<td>Martin von Meyenfeldt, Cornelius De Jong</td>
</tr>
</tbody>
</table>

Figure. Enhanced Recovery After Surgery (ERAS) Flowchart

A typical ERAS flowchart overview indicating different ERAS protocol items to be performed by different professions and disciplines in different parts of the hospital during the patient journey. The wedge-shaped arrows depicting each time period move into the period to follow to indicate that all treatments given affect later treatments. No NPO indicates fasting guidelines recommending intake of clear fluids and specific carbohydrate drinks until 2 hours before anesthesia; PONV, postoperative nausea and vomiting. Reprinted with permission from Olle Ljungqvist, MD, PhD.
PubMed Keyword Search: “ERAS” + “Surgery”

ERAS is here to stay.
<table>
<thead>
<tr>
<th>Year</th>
<th>Pub</th>
<th># Pts</th>
<th>Reference LOS</th>
<th>ERAS LOS</th>
<th>Morbidity</th>
<th>Readmit</th>
<th>Cost</th>
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<tr>
<td>2011-2013</td>
<td>NSQIP</td>
<td>6</td>
<td></td>
<td></td>
<td>31%</td>
<td>11%</td>
<td></td>
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<tr>
<td>Mayo¹</td>
<td>2009</td>
<td>2012 BJS</td>
<td>66 vs. 66</td>
<td>3 (3-5)</td>
<td>3* (2-3)</td>
<td>No difference</td>
<td></td>
</tr>
<tr>
<td>Oregon²</td>
<td>2010</td>
<td>2014 JAMA Surg</td>
<td>176 vs. 68</td>
<td>6.7</td>
<td>3.7*</td>
<td>Less ileus</td>
<td>No difference</td>
</tr>
<tr>
<td>Duke³</td>
<td>2010</td>
<td>2014 Anesth Analg</td>
<td>142 vs. 99</td>
<td>7</td>
<td>5*</td>
<td>46% less UTI*</td>
<td>9.8% (vs. 20.2%)*</td>
</tr>
<tr>
<td>UVa⁴</td>
<td>2013</td>
<td>2015 JACS</td>
<td>109 vs. 98</td>
<td>6.8</td>
<td>4.6*</td>
<td>50% less POC*</td>
<td>10% (vs. 17%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Pub</th>
<th># Pts</th>
<th>Reference LOS</th>
<th>ERAS LOS</th>
<th>Morbidity</th>
<th>Readmit</th>
<th>Cost</th>
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<tbody>
<tr>
<td>2011-2013</td>
<td></td>
<td>6</td>
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<td>21%</td>
<td>11%</td>
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<td></td>
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<tr>
<td>Mayo1</td>
<td>2009</td>
<td>2012</td>
<td>BJS</td>
<td>3 (3-5)</td>
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<tr>
<td>Oregon2</td>
<td>2010</td>
<td>2014</td>
<td>JAMA Surg</td>
<td>176 vs. 68</td>
<td>6.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duke3</td>
<td>2010</td>
<td>2014</td>
<td>Anesth Analg</td>
<td>142 vs. 99</td>
<td>7</td>
<td></td>
<td></td>
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<tr>
<td>UVa4</td>
<td>2013</td>
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<td>JACS</td>
<td>109 vs. 98</td>
<td>6.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

↓ LOS  
↓ Readmissions  
↓ Morbidities  
↓ Cost

1. ERAS links existing **pre/op/post** processes
2. Collaborative, multi-disciplinary effort to benefit patient
3. Simple, nothing fancy, nothing new
4. **It works**
ERAS Key Questions

1. Does ERAS work in other specialties?
2. How do you implement it?
3. Which components make it work?
4. Why is ERAS important?
5. What are ERAS outcomes at UAB?
1. Does ERAS work in other specialties?
2. How do you implement it?
3. Which components make it work?
4. Why is ERAS important?
5. What are ERAS outcomes at UAB?
1. Does ERAS work in other specialties?

Yes
### Table 3. ERAS Society Guidelines

<table>
<thead>
<tr>
<th>Procedure and Topic</th>
<th>Year of Publication</th>
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<tbody>
<tr>
<td>Colonic resection</td>
<td>2012</td>
</tr>
<tr>
<td>Rectal resection</td>
<td>2012</td>
</tr>
<tr>
<td>Pancreatoduodenectomy</td>
<td>2012</td>
</tr>
<tr>
<td>Cystectomy</td>
<td>2013</td>
</tr>
<tr>
<td>Gastric resection</td>
<td>2014</td>
</tr>
<tr>
<td>Anesthesia protocols</td>
<td>2015</td>
</tr>
<tr>
<td>Anesthesia pathophysiology</td>
<td>2015</td>
</tr>
<tr>
<td>Major gynecology (parts 1 and 2)</td>
<td>2015</td>
</tr>
<tr>
<td>Bariatric surgery</td>
<td>2016</td>
</tr>
<tr>
<td>Liver resection</td>
<td>2016</td>
</tr>
<tr>
<td>Head and neck cancer surgery</td>
<td>2016</td>
</tr>
<tr>
<td>Breast reconstruction</td>
<td>2017</td>
</tr>
<tr>
<td>Hip and knee replacement</td>
<td>Under production</td>
</tr>
<tr>
<td>Thoracic noncardiac surgery</td>
<td>Under production</td>
</tr>
<tr>
<td>Esophageal resection</td>
<td>Under production</td>
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*For updates and free download, go to [http://www.erassociety.org](http://www.erassociety.org).*

http://jamanetwork.com/journals/jamasurgery/fullarticle/2595921
PARTICIPATION OVERVIEW

- The ISCR program will contain five anticipated cohorts, each lasting **12 months**:

<table>
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<tr>
<th>Cohort</th>
<th>Service line</th>
<th>Start date</th>
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<tr>
<td>Cohort 1</td>
<td>Colorectal</td>
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</tr>
<tr>
<td>Cohort 2</td>
<td>Orthopedic</td>
<td>January 2018</td>
</tr>
<tr>
<td>Cohort 3 &amp; 4</td>
<td>Gynecology &amp; Emergency general surgery</td>
<td>January 2019</td>
</tr>
<tr>
<td>Cohort 5</td>
<td>Bariatrics</td>
<td>January 2020</td>
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</table>

- Participation is free and open to all hospitals in the United States, Puerto Rico, and the District of Columbia
- Participation is voluntary, and hospitals can pick which cohorts to participate in
- Participation is based on an individual hospital level, so not all hospitals within a hospital system need to participate

ERAS Key Questions

1. Does ERAS work in other specialties?
2. How do you implement it?
3. Which components make it work?
4. Why is ERAS important?
5. What are ERAS outcomes at UAB?
2. How do you implement?

Implementation Science

“The scientific study of methods to promote the systematic uptake of research findings and other evidence-based practice into routine care...”
2. How do you implement?

Implementation Science
<table>
<thead>
<tr>
<th>Implementing ERAS = Changing Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture = Habits x Expectations</td>
</tr>
</tbody>
</table>
Implementing ERAS = Changing Culture

Culture = Habits x Expectations

ERAS = Δ Habits x Expectations
Implementation Frameworks: KTA Cycle and PDCA

Knowledge Creation:
- Identify problem
- Identify, review, select knowledge
- Adapt knowledge to local context
- Assess barriers to knowledge use
- Select, tailor, implement interventions

Knowledge Inquiry:
- Knowledge Synthesis

Knowledge Tools/Products:
- Monitor knowledge use

Evaluate Outcomes:
- Sustain knowledge use

Continual Improvement:
- PLAN
- DO
- CHECK
- ACT
1. Identify key champions in multidisciplinary team
2. Assemble ERAS Task Force
3. Construct ERAS protocol
4. Pilot study in controlled manner – gain preliminary data
5. Educate and trouble-shoot
6. Implement wide-spread adoption
When it all started...

Date: 8/19/2014
Case: APR for low rectal cancer
Location: OR 702

“Hey Anesthesia, can we do a spinal?” – Me
“Sure.” – Anesthesia (turns out to be Jeff Simmons MD)
1. Identify key champions in multidisciplinary team
2. Assemble ERAS Task Force
3. Construct ERAS protocol
4. Pilot study in controlled manner – gain preliminary data
5. Educate and trouble-shoot
6. Implement wide-spread adoption
Anesthesia:  Jeff Simmons, Jason McKeown
Surgery:  Dan Chu
Nursing:  Daran Brown
1. Identify key champions in multidisciplinary team
2. Assemble ERAS Task Force
3. Construct ERAS protocol
4. Pilot study in controlled manner – gain preliminary data
5. Educate and trouble-shoot
6. Implement wide-spread adoption
Anesthesia: Jeff Simmons, Jason McKeown, Tom Vetter, Juhan Paiste

Surgery: Dan Chu (GI Surgery), Warner Huh (Gyn), Marty Heslin (Surg Onc), Jeff Nix (Urology), Sushanth Reddy (Surg Onc), Ronald Alvarez (Gyn)

Nursing: Daran Brown (7N), Denise Oliver (pre-op/PACU), Angie Surles (CRNA Manager CVOR), Eric Evans (CRNA Manager Main OR), Sandra Daily (AVP), Amy Armstrong (WOCN)

Residents: Tyler Wahl (Surgery), Jacob Mills (Anesthesia)

Pharmacy: Lakeyra Palmer (7N lead pharmacist), Neil Parekh (OR), Jennifer Campbell (OR)

HSIS: Steve Croom (IMPACT), Marilyn Anderson (IMPACT), Krystal Scott (PowerPlan), Shea Polk (Pharmacy Informatics), Jimmy Stout (Nursing Informatics), John Marchant (PowerPlan)
1. Identify key champions in multidisciplinary team
2. Assemble ERAS Task Force
3. Construct ERAS protocol
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### ERAS Patient Checklist

1. **Clinic**
   - ERAS Patient face-sheet included in pre-op packet
   - ERAS education

2. **PACT**
   - Consent for intrathecal analgesia
   - ERAS education

3. **Pre-Operative Holding**
   - Multimodal analgesics: Examples: celecoxib, gabapentin, acetaminophen
   - Single-injection intrathecal analgesia (IPS)

4. **Operating Room**
   - IV Fluid recommendation**: (500ml/hl lap case, 800ml/hr open case)
   - PONV prophylaxis
   - Intraoperative fentanyl (at anesthesia discretion)
   - Non-opioid adjuncts: Examples: dexmedetomidine, lidocaine drip, ketamine
   - Ketorolac at end of case (age < 65 & normal renal function)

5. **PACU**
   - ERAS Order Set placed by Surgery Team
   - IPS Service to order any additional opioid medications for next 24 hrs
   - Admit to S/T Step-Down for 24-hr monitoring

6. **Floor**
   - POD0 - Regular diet evening of surgery
   - POD0 - Ambulating/out of bed evening of surgery
   - POD0 - LR @ rate ordered by MD until POD1
   - POD0 - Non-opioid pain regimen
   - POD1 - Foley removed @ 08:00
   - POD1 - IVF saline-locked @ 08:00
   - POD1 - 1 set of AM labs

8. **Discharge Criteria**
   - Tolerating diet with GI/stoma function
   - Pain controlled
   - Ambulating
   - Special needs / follow-up arranged

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**ENHANCED RECOVERY AFTER SURGERY PATIENT EDUCATION**

Enhanced Recovery After Surgery (ERAS) is a clinically proven pathway that helps you recover quickly after major surgery. ERAS uses best medical and surgical practices to reduce post-
1. Identify key champions in multidisciplinary team
2. Assemble ERAS Task Force
3. Construct ERAS protocol
4. Pilot study in controlled manner – gain preliminary data
5. Educate and trouble-shoot
6. Implement wide-spread adoption
<table>
<thead>
<tr>
<th>Patient</th>
<th>Diagnosis</th>
<th>Procedure</th>
<th>Co-morbidities</th>
<th>BMI</th>
<th>ERAS</th>
<th>Bowel Function (d)</th>
<th>LOS (d)</th>
<th>POC</th>
<th>Readmission</th>
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<tbody>
<tr>
<td>61M</td>
<td>R colon mass</td>
<td>Open R hemicolecotomy</td>
<td>Myasthenia gravis, stroke (Plavix), PFO, obese</td>
<td>39</td>
<td>Yes</td>
<td>3</td>
<td>4</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>54F</td>
<td>Complicated diverticulitis</td>
<td>Hand-assist laparoscopic sigmoidectomy</td>
<td>Colovesical fistula w/ UTIs</td>
<td>18</td>
<td>Yes</td>
<td>3</td>
<td>4</td>
<td>None</td>
<td>None</td>
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<td>44F</td>
<td>Obstructing colon cancer</td>
<td>Lap extended R hemicolecotomy</td>
<td>Obese, OSA</td>
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<td>Yes</td>
<td>4</td>
<td>5</td>
<td>None</td>
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<tr>
<td>74M</td>
<td>Obstructing small bowel cancer</td>
<td>Lap SBR</td>
<td>HTN, malnutrition</td>
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<td>Yes</td>
<td>2</td>
<td>2</td>
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<td>None</td>
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<tr>
<td>37M</td>
<td>Chronic ulcerative colitis</td>
<td>Hand-assist laparoscopic subtotal</td>
<td>Infliximab, steroids</td>
<td>31</td>
<td>Yes</td>
<td>7</td>
<td>10</td>
<td>Ileus</td>
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Pilot study (5 patients)
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<tr>
<th>#</th>
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<tr>
<td>1</td>
<td>61</td>
<td>M</td>
<td>39.20</td>
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<td>R colon mass, HGD</td>
<td>4</td>
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<tr>
<td>2</td>
<td>54</td>
<td>F</td>
<td>17.89</td>
<td>HALS sigmoidectomy</td>
<td>Diverticulitis, colovesical fistula</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>44</td>
<td>F</td>
<td>40.00</td>
<td>Lap extended R hemicolectomy</td>
<td>Obstructing colon CA s/p stent</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>74</td>
<td>M</td>
<td>26.64</td>
<td>SBR</td>
<td>SBO, 7 Carcinoid</td>
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<td>5</td>
<td>37</td>
<td>M</td>
<td>30.80</td>
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<td>CUC</td>
<td>10</td>
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<tr>
<td>6</td>
<td>52</td>
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<td>27.24</td>
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<td>7</td>
<td>53</td>
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<td>8</td>
<td>43</td>
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<tr>
<td>9</td>
<td>52</td>
<td>F</td>
<td>26.44</td>
<td>Parastomal hernia repair w/ mesh, colostomy revision</td>
<td>Parastomal hernia</td>
<td>6</td>
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<td>10</td>
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<td>29.80</td>
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<td>11</td>
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<td>Colon mass x 2</td>
<td>6</td>
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<tr>
<td>12</td>
<td>61</td>
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<td>CUC, refractory</td>
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<tr>
<td>13</td>
<td>66</td>
<td>F</td>
<td>27.29</td>
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<td>14</td>
<td>57</td>
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<td>15</td>
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</tr>
<tr>
<td>16</td>
<td>42</td>
<td>M</td>
<td>36.84</td>
<td>DLI SR</td>
<td>L colon mass</td>
<td>2</td>
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<tr>
<td>17</td>
<td>28</td>
<td>F</td>
<td>17.08</td>
<td>Lap --&gt; open end ileostomy reversal, ileocolic, DLI</td>
<td>Crohn's</td>
<td>7</td>
</tr>
<tr>
<td>18</td>
<td>61</td>
<td>F</td>
<td>24.54</td>
<td>Open Hartmann</td>
<td>Perforated diverticulitis</td>
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</tr>
<tr>
<td>19</td>
<td>74</td>
<td>M</td>
<td>22.66</td>
<td>Exlap, revision ileorectal, end-to-end IRA</td>
<td>Anastomotic stricture</td>
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<tr>
<td>20</td>
<td>74</td>
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<td>25.62</td>
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<tr>
<td>21</td>
<td>30</td>
<td>M</td>
<td>23.01</td>
<td>Diagnostic laparoscopy, debridement, drainage</td>
<td>Appendicolith</td>
<td>3</td>
</tr>
<tr>
<td>22</td>
<td>59</td>
<td>F</td>
<td>23.57</td>
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<tr>
<td>23</td>
<td>18</td>
<td>M</td>
<td>20.30</td>
<td>Lap R hemicolectomy</td>
<td>Crohn's, TI stricture</td>
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</tr>
<tr>
<td>24</td>
<td>52</td>
<td>F</td>
<td>25.90</td>
<td>Exlap, LOA x 4 hrs, resection ileocolic, ileocolonic anastomosis</td>
<td>Crohn's, redo, stricture</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>45</td>
<td>F</td>
<td>37.36</td>
<td>DLI SR, parastomal hernia repair</td>
<td>Diverticulitis</td>
<td>3</td>
</tr>
<tr>
<td>26</td>
<td>69</td>
<td>M</td>
<td>36.30</td>
<td>Lap --&gt; open R colectomy</td>
<td>Cecal mass</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>37</td>
<td>M</td>
<td>32.90</td>
<td>Stage 2/3 Proctectomy, IPAA, DU, VHR</td>
<td>CUC</td>
<td>9</td>
</tr>
<tr>
<td>28</td>
<td>53</td>
<td>M</td>
<td>29.44</td>
<td>DLI SR</td>
<td>Diverticulitis</td>
<td>2</td>
</tr>
<tr>
<td>29</td>
<td>36</td>
<td>F</td>
<td>40.44</td>
<td>End ileostomy reversal, ileocolic anastomosis, DLI</td>
<td>Crohn's</td>
<td>4</td>
</tr>
<tr>
<td>30</td>
<td>29</td>
<td>F</td>
<td>24.29</td>
<td>Exlap, subtotal colectomy, BI, partial gastrectomy, SBR w/ hand-sewn anastomosis</td>
<td>Crohn's, multiple fistulas</td>
<td>4</td>
</tr>
<tr>
<td>31</td>
<td>41</td>
<td>M</td>
<td>29.28</td>
<td>HALS sigmoidectomy, bladder repair, double-stapled end-to-end, flex sig</td>
<td>Kidney transplant, diverticulitis</td>
<td>8</td>
</tr>
<tr>
<td>32</td>
<td>58</td>
<td>F</td>
<td>43.98</td>
<td>HALS --&gt; open sigmoidectomy, TAH/BSO, double purse-string end-to-end, flex sig</td>
<td>Diverticular disease</td>
<td>5</td>
</tr>
<tr>
<td>33</td>
<td>49</td>
<td>M</td>
<td>35.56</td>
<td>HALS --&gt; open sigmoidectomy, double-stapled w/ Stealth, UHR, flex sig</td>
<td>Diverticular disease</td>
<td>13</td>
</tr>
<tr>
<td>34</td>
<td>28</td>
<td>F</td>
<td>22.54</td>
<td>HALS STC/BI (stage 1/3)</td>
<td>CUC</td>
<td>In-hospital</td>
</tr>
<tr>
<td>35</td>
<td>58</td>
<td>F</td>
<td>28.17</td>
<td>HALS sigmoidectomy, colorectal</td>
<td>Diverticular disease, heart transplant</td>
<td>In-hospital</td>
</tr>
</tbody>
</table>
N = 35 patients
Median age = 52 years
48.5% female, 51.5% male
Average BMI = 29.6
Median LOS = 4 days
Our Strategy @ UAB

1. Identify key champions in multidisciplinary team
2. Assemble ERAS Task Force
3. Construct ERAS protocol
4. Pilot study in controlled manner – gain preliminary data
5. Educate and trouble-shoot
6. Implement wide-spread adoption
Barriers to ERAS Implementation

Nursing education
“You have to have nurses on board”

Variability
“Resident’s kind of do their own thing”
“Surgeons often aren’t all in line with each other”

Resistance to change
“I don’t like changing anything”

Buy-in
“Without institutional buy-in it is doomed to failure”
Individual level

- Resistance to change (how do you change the culture?)
- Lack of collaboration
- Buy-in from multidisciplinary providers
- Just don’t believe the evidence

Institutional level

- Lack of nursing staff
- Lack of financial resources
- Difficulty in standardizing protocols
- Inability to audit
1. Identify key champions in multidisciplinary team
2. Assemble ERAS Task Force
3. Construct ERAS protocol
4. Pilot study in controlled manner – gain preliminary data
5. Educate and trouble-shoot
6. Implement wide-spread adoption
## Results in the United States + UAB

<table>
<thead>
<tr>
<th>Year</th>
<th>Pub</th>
<th># Patients</th>
<th>Reference LOS</th>
<th>ERAS LOS</th>
<th>Morbidity</th>
<th>Readmit</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2013 NSQIP</td>
<td>6</td>
<td>31%</td>
<td>11%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mayo¹</td>
<td>2009 2012 BJS</td>
<td>66 vs. 66</td>
<td>3 (3-5)</td>
<td>3* (2-3)</td>
<td>No difference</td>
<td>10% (vs. 5%)</td>
<td></td>
</tr>
<tr>
<td>Oregon²</td>
<td>2010 2014 JAMA Surg</td>
<td>176 vs. 68</td>
<td>6.7</td>
<td>3.7*</td>
<td>Less ileus</td>
<td>No difference</td>
<td>-$3202-4803 per pt</td>
</tr>
<tr>
<td>Duke³</td>
<td>2010 2014 Anesth Analg</td>
<td>142 vs. 99</td>
<td>7</td>
<td>5*</td>
<td>46% less UTI*</td>
<td>9.8% (vs. 20.2%)</td>
<td>10% cost-savings</td>
</tr>
<tr>
<td>UVa⁴</td>
<td>2013 2015 JACS</td>
<td>109 vs. 98</td>
<td>6.8</td>
<td>4.6*</td>
<td>50% less POC*</td>
<td>10% (vs. 17%)</td>
<td>-$6,567 per pt</td>
</tr>
<tr>
<td>UAB</td>
<td>2015</td>
<td>210 vs 210</td>
<td>6</td>
<td>3*</td>
<td>5-10% SSI</td>
<td>15% (no change)</td>
<td>TBD</td>
</tr>
</tbody>
</table>
ERAS Key Questions

1. Does ERAS work in other specialties?
2. How do you implement it?
3. Which components make it work?
4. Why is ERAS important?
5. What are ERAS outcomes at UAB?
3. Which component makes it work?

ERAS

Preoperative
- Preadmission counseling
  - Fluid and carbohydrate loading
  - No prolonged fasting
  - No/selective bowel preparation
  - Antibiotic prophylaxis
  - Thromboprophylaxis
  - No premedication

Postoperative
- Mid-thoracic epidural anesthesia/analgesia
- No nasogastric tubes
- Prevention of nausea and vomiting
- Avoidance of salt and water overload
- Early removal of catheter
- Early oral nutrition
- Non-opioid oral analgesia/NSAIDs
- Early mobilization
- Stimulation of gut motility
- Audit of compliance and outcomes

Intraoperative
- Short-acting anesthetic agents
- Mid-thoracic epidural anesthesia/analgesia
- No drains
- Avoidance of salt and water overload
- Maintenance of normothermia (body warmer/warm intravenous fluids)
Pre-Operative
- Patient Education
- Multimodal analgesics (non-opioid)

Operative
- Minimally-invasive techniques
- Avoid fluid overload
- PONV
- No drains

Post-Operative
- Non-opioid pain control
- Early diet
- Early mobilization
- Early catheter removal

The Impact of Enhanced Recovery Protocol Compliance on Elective Colorectal Cancer Resection

Results From an International Registry

On behalf of the ERAS Compliance Group*

Annals of Surgery | June 2015

- ERAS Interactive Audit System (www.erassociety.org)
- 140 variables – patient, procedure and 13 ERAS-specific variables

Overall: 2352 ERAS patients @ 13 centers

Median LOS = 6 days

9.2% readmission rate

40.3% complications (4.1% anastomotic leak rate)
### Predictors for LOS:

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Patient factors</th>
<th>Procedure factors</th>
<th>ERAS factors</th>
<th>Not significant factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA &gt; 2</td>
<td></td>
<td>Rectal cancer operations (1.30)</td>
<td>Pre-op carb drink (0.89)</td>
<td>Preadmission education (0.98)</td>
</tr>
<tr>
<td>ASAP &gt; 2 (1.18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-op WHO</td>
<td></td>
<td>Laparoscopy (0.83)</td>
<td>Epidural (1.07)</td>
<td>ABX prophylaxis (0.99)</td>
</tr>
<tr>
<td>Pre-op WHO (1.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total IVF</td>
<td></td>
<td></td>
<td></td>
<td>No NGT (0.99)</td>
</tr>
<tr>
<td>Total IVF (0.86)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laxative (0.97)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Predictors for Any Complication:

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Patient factors</th>
<th>Procedure factors</th>
<th>ERAS factors</th>
<th>Not significant factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA &gt; 2 (1.52)</td>
<td></td>
<td>Rectal cancer operations (1.50)</td>
<td>Restrictive IVF (0.35)</td>
<td>Preadmission education (0.95)</td>
</tr>
<tr>
<td>Pre-op WHO</td>
<td></td>
<td>Laparoscopy (0.68)</td>
<td></td>
<td>Preop carb drink (0.95)</td>
</tr>
<tr>
<td>Pre-op WHO (1.56)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male sex (1.27)</td>
<td></td>
<td>Total IVF (0.86)</td>
<td></td>
<td>Epidural (1.06)</td>
</tr>
</tbody>
</table>

Which fast track elements predict early recovery after colon cancer surgery?

M. S. Vlug*, S. A. L. Bartels*, J. Wind*, D. T. Ubbink†, M. W. Hollmann‡ and W. A. Bemelman* on behalf of the collaborative LAFA study group

*Department of Surgery, Academic Medical Center, Amsterdam, The Netherlands, †Department of Quality Assurance and Process Innovation, Academic Medical Center, Amsterdam, The Netherlands and ‡Department of Anesthesiology, Academic Medical Center, Amsterdam, The Netherlands

Colorectal Disease | Oct 2011

• LAFA trial (LAparoscopy + FAst-track multimodal)
• 4 groups: Lap + Fast-track, Open + Fast-track, Lap + Standard, Open + Standard
• 19 ERAS-specific variables

Predictors for shorter LOS: **Oral intake** and **early mobilization**

Female sex and laparoscopy
Fig. 5. Compliance with the protocol in subsequent patients.

Fig. 6. Correlation between compliance and LOS.

↑ ERAS Compliance = ↓ LOS
1. Does ERAS work in other specialties?
2. How do you implement it?
3. Which components make it work?
4. Why is ERAS important?
5. What are ERAS outcomes at UAB?
4. Why is ERAS important?

Quality argument:  ↓ LOS  ↓ post-op complications  ↓ readmissions

But it can’t be just post-op length-of-stay (LOS)
4. Why is ERAS important?

Quality argument:

↓ LOS

↓ post-op complications

↓ readmissions

\[
\text{Value} = \frac{\text{Quality} \times \text{Safety} \times \text{Patient Satisfaction}}{\text{Cost}}
\]
THE ONLY PATIENT SATISFACTION QUESTION THAT MATTERS...

DID YOU DIE??
Patient perceptions

**Outcomes**

#1 Freedom from nausea

#2 Freedom from pain at rest

#3 Achieving independent mobility

**Lowest scores:** Early discharge, early return of bowel movements

**Strategy**

#1 Pre-op counseling

#2 Avoiding infection
Provider perceptions

Outcomes

#1 Freedom from nausea
#2 Freedom from pain at rest
#3 Achieving independent mobility

Lowest scores: Early discharge, early return of bowel movements

Strategy

#1 Pre-op counseling
#2 Early mobilization
#3 Optimization of IVF
4. Why is ERAS important?

Quality argument:
- ↓ LOS
- ↓ post-op complications
- ↓ readmissions

\[
\text{Value} = \frac{\text{Quality} \times \text{Safety} \times \text{Patient Satisfaction}}{\text{Cost}}
\]
4. Why is ERAS important?

Quality argument:

- ↓ LOS
- ↓ post-op complications
- ↓ readmissions

\[
\text{Value} = \frac{\text{Quality} \times \text{Safety} \times \text{Patient Satisfaction}}{\text{Cost}}
\]
Reduction in disparities in surgery

**Value** = **Quality x Safety x Patient Satisfaction**

**Cost**

---

**NEWS RELEASES**

Monday, April 18, 2016

**NIH launches research program to reduce health disparities in surgical outcomes**

The National Institute on Minority Health and Health Disparities (NIMHD), part of the National Institutes of Health, has launched an initiative to support research to better understand and address disparities in surgical care and outcomes for disadvantaged populations. The new surgical disparities research program will involve collaborations among several NIH institutes and centers, along with the Agency for Healthcare Research and Quality. Full funding levels will be determined by the number of meritorious grant applications received.
Provides the **access** and **delivery** of best-evidence surgical care to all patients
ERAS Key Questions

1. Does ERAS work in other specialties?
2. How do you implement it?
3. Which components make it work?
4. Why is ERAS important?
5. What are ERAS outcomes at UAB?
### Surgical Length of Stay

**N=1064 patients**

**Median=3 days**

**Mean= 5 days**

<table>
<thead>
<tr>
<th>NUMBER OF INDIVIDUALS</th>
<th>DAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>1</td>
</tr>
<tr>
<td>278</td>
<td>2</td>
</tr>
<tr>
<td>272</td>
<td>3</td>
</tr>
<tr>
<td>148</td>
<td>4</td>
</tr>
<tr>
<td>85</td>
<td>5</td>
</tr>
<tr>
<td>49</td>
<td>6</td>
</tr>
<tr>
<td>33</td>
<td>7</td>
</tr>
<tr>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>55</td>
<td>10-14</td>
</tr>
<tr>
<td>58</td>
<td>14+</td>
</tr>
</tbody>
</table>
Racial Disparities in Length of Stay

(A) Expected Length-of-Stay

(B) Observed Length-of-Stay
ERAS reduces disparities in LOS

- **Observed-to-Expected Difference (OED)**
  - Disparity: +2.72 days*

- **REFERENCE**
  - ACS Risk Calculator
  - Expected Length-of-Stay

- **More Days in Hospital**
  - Black: 3.5
  - White: +2.72 days*

- **Less Days**
  - Pre-ERAS
  - ERAS
  - Black: -0.25 days
  - White: -0.25 days

*p<0.05
Note: ERAS patients were not recorded in McKesson until January 2016.
% of Elective Colorectal Surgery Patients that Underwent ERAS Process

Source of Numerator: Surginet > “ERAS + General” under Anesthesia Type

Source of Denominator: Denominator is # of ICD-9 and ICD-10 codes by month from McKesson. (attached is the full list)
Elective Colorectal Surgery LOS Index O/E

- Redesign
- Go-live
- Sustainment

LOS O/E:
- Non-ERAS
- ERAS

Timeline:
- F2015_04_January
- F2015_05_February
- F2015_06_March
- F2015_07_April
- F2015_08_May
- F2015_09_June
- F2015_10_July
- F2015_11_August
- F2015_12_September
- F2016_01_October
- F2016_02_November
- F2016_03_December
- F2016_04_January
- F2016_05_February
- F2016_06_March
- F2016_07_April
- F2016_08_May
- F2016_09_June
- F2016_10_July
- F2016_11_August

LOS O/E:
- Non-ERAS
- ERAS

Values:
- 0.7 0.9 1.1 0.9 1.0 1.0 0.7 0.8 0.7 0.9 0.9 0.7 1.0 1.1 1.4 1.2 1.4 2.2 0.9
Avg. Variable Cost/Case- Elective Colorectal Surgery Patients

- Redesign
- Go-live
- Sustainment

$0
$5,000
$10,000
$15,000
$20,000
$25,000

$6,254 $7,659 $8,514 $8,028 $7,932 $7,156
$5,650 $9,018 $7,723 $8,513 $7,902 $6,618
$12,259 $10,860 $19,694 $16,401

Non-ERAS
ERAS
1121 patients
718 pre-ERAS, 403 ERAS

Top Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Pre ERAS</th>
<th>ERAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Complication</td>
<td>28.0%</td>
<td>26.3%</td>
</tr>
<tr>
<td>Organ Space SSI</td>
<td>4.0%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Superficial Incisional SSI</td>
<td>5.6%</td>
<td>3.4%</td>
</tr>
<tr>
<td>UTI</td>
<td>1.3%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Deep Incisional</td>
<td>2.4%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Sepsis</td>
<td>4.3%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
Post-operative Outcomes in UAB Colorectal Surgery Patients

**Readmission Rates**

<table>
<thead>
<tr>
<th></th>
<th>Pre ERAS</th>
<th>ERAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.2%</td>
<td>16.2%</td>
<td></td>
</tr>
</tbody>
</table>

**AKI**

<table>
<thead>
<tr>
<th></th>
<th>Pre ERAS</th>
<th>ERAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>*p&lt;0.05</td>
<td>5.8%</td>
<td>9.7%</td>
</tr>
</tbody>
</table>

395 matched patients
ERAS Decreases Opioid Use

395 matched patients
Summary

1. ERAS **works** across surgical disciplines
   
   * Expect more to come!

2. ERAS implementation requires framework but **doable**
   
   * Requires tailoring to each institution/environment

3. ↑ ERAS compliance = ↑ effectiveness
   
   * Specific mechanism(s) remains to be determined

4. ERAS is **valuable** and benefits patients, providers and system
   
   * There may be additional value in ERAS besides LOS
WHAT ARE THE OUTCOMES OF USING THE ENHANCED RECOVERY PATHWAY?

Hospitals that utilize the enhanced recovery pathway can see—

- Improved uptake of multimodal analgesia and reduced opioid use
- Reductions in surgical site infections (SSI)
- Reductions in catheter-associated urinary tract infections (CAUTI)
- Reductions in venous thromboembolic events (VTE)
- Improvement in patient experience
- Improvement in teamwork and safety culture
- Improvement in length of stay and readmissions

WHAT ARE THE BENEFITS OF PARTICIPATING IN THE ISCR PROGRAM?
Participating hospitals will have access to—

- U.S. leaders in perioperative quality
- Evidence-based enhanced recovery pathways and order sets ready for local adaptation
- Tools and materials to facilitate implementation of enhanced recovery pathways
- Monthly coaching calls and in-person training to support hospital work
- Quality improvement implementation support from a nurse consultant
- ACS data collection platform and access to clinical support team

HOW DOES A HOSPITAL ENROLL?
Please contact Stacey McSwine, ACS Enrollment Project Manager, at smcswine@facs.org to enroll.
Questions?

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dchu@uab.edu

@MelanieMorrisMD
@DChu80