Using Enhanced Recovery after Surgery (ERAS) to Improve Pediatric General Surgery Outcomes

Kurt Heiss MD
Professor of Surgery
Emory Healthcare
Medical Director of Quality
Children’s Healthcare of Atlanta
Faculty Disclosure

In compliance with ACCME Guidelines, I hereby declare:

• I do not have financial or other relationships with the manufacturer(s) of any commercial services(s) discussed in this educational activity.
Front Band for the Stones...
Objectives

ERAS Purpose

Adult Results

Components

ERAS and Safety

Change Management
Asking the right questions....

What did you notice?
What did you learn?
Let’s start with a pt presentation

- JG is 16 w Crohns
- Dense TI stricture
- Poor nutrition Alb 2.8
- Seen in clinic, overview
- Protein shakes
- ERAS/LEGO video and reading material
- Oral abx pre op day
Patient Presentation

- Fasted solids p MN, arrived drinking clears
- Operation started at 6 pm instead of 2!! 😞
- Clears while waiting
- Pre op Tylenol, Gaba load dose
Patient Presentation

• TAP block - IV abx
• Single site procedure
• < 4 cc/kg/hr IVF
• Closing protocol - new instruments, gloves
• MMA – Triple Drug Rx
• Drank that night
• POD 1 morning – Hep locked IV
Patient Presentation

• Ate solids
• Great pain control.
• Walked
• Got Dulcolax, had BM
• DC POD1 night

• So,... 24 hour colectomy
The “24 hour ileocelecectomy”

You may have noticed...
The “24 hour ileocecectomy”

“Optimization” with enteral protein shakes for albumin = 2.8
The “24 hour ileocecectomy”

“Optimization” w TPN for albumin = 2.8

Clinic visit.
Phone instruction.
Homework – written/videos
Pre Op Clinic
The “24 hour ileocecectomy”

“Optimization” w TPN for albumin = 2.8
Clinic visit. Phone instruction. Homework.

Oral abx. No fasting.
Pre op Gabapentin/Tylenol
The “24 hour ileocecectomy”

“Optimization” w TPN for albumin = 2.8
Clinic visit. Phone instruction. Homework.
Oral abx, limited fasting, pre op Gaba and Tylenol

TAP block
GD Fluids < 4 cc/kg/hr
No catheters
The “24 hour ileocecectomy”

“Optimization” w TPN for albumin = 2.8
Clinic visit. Phone instruction. Homework.
Oral abx, limited fasting, pre op Gaba and Tylenol
TAP block, GD Fluids < 4 cc/kg/hr  No catheters.

SS ileocecectomy

Scheduled oral meds post op
The “24 hour ileocecectomy”

“Optimization” w TPN for albumin = 2.8
Clinic visit. Phone instruction. Homework.
Oral abx, limited fasting, pre op Gaba and Tylenol
TAP block, GD Fluids < 4 cc/kg/hr No catheters.
SS ileocecectomy.
Scheduled oral meds post op

Drank, ate, ambulate POD 0.
Dulcolax -> BM.
Met Goals - POD 1
"Why is the patient still in the hospital?"

Poor mobility and function, no return of bowel function…

ERAS – A Paradigm shift

- Preadmission and preoperative instructions

  - Minimize surgical trauma
  - Individualized fluid therapy
  - Effective analgesia (with less side effects)

  - Early mobilization
  - Early gut function recovery
  - Stress response modulation

- Decrease of complications
  - Increase of healing
  - Decrease in length of stay

INCREASE: patient, therapist and healthcare system satisfaction
ERAS Paradigm shift
ERAS Paradigm shift

- Decrease of complications
- Increase of healing
- Decrease in length of stay

INCREASE: patient, therapist and healthcare system satisfaction
ERAS Paradigm Shift – Repeat....

- Multidisciplinary efforts
- Maintaining homeostasis
- Minimizing metabolic stress
- Pre-, intra-, post-op guidelines
- Return to function
- Reduced LOS and complications

Enhanced Recovery After Surgery: The Future of Improving Surgical Care

Krishna K. Varadhan, MSc, MRCS; Dileep N. Lobo, DM, FRCS; Olle Ljungqvist, MD, PhD

Consensus Review of Optimal Perioperative Care in Colorectal Surgery

Enhanced Recovery After Surgery (ERAS) Group Recommendations

Kristoffer Lassen, MD, PhD; Mattias Soop, MD, PhD; Jonas Nygren, MD, PhD; P. Boris W. Cox, MD; Paul O. Hendry, MBChB, MRCS; Claudia Spies, MD, PhD; Maarten F. von Meyenfeldt, MD, PhD; Kenneth C. H. Fearon, MD, FRCS; Arthur Revhaug, MD, PhD; Stig Norderval, MD, PhD; Olle Ljungqvist, MD, PhD; Dileep N. Lobo, DM, FRCS; Cornelis H. C. Dejong, MD, PhD; for the Enhanced Recovery After Surgery (ERAS) Group

Children’s Healthcare of Atlanta | Emory University
Objectives

ERAS Purpose

Adult Results

Components

ERAS and Safety

Change Management
Why ERAS?? – Start w “why”

Decrease in nonsurgical complications

Total (95% CI)  972  974  100.0%  0.40 [0.27, 0.61]
Reduced LOS

### Fig. 6
Pooled estimates of length of hospital stay comparing enhanced recovery after surgery versus standard care. CI confidence interval, df degrees of freedom, RR risk ratio

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Experimental Mean</th>
<th>Control Mean</th>
<th>Mean Difference (IV, Random, 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson 2003 (30)</td>
<td>3.9</td>
<td>7</td>
<td>-3.10 [-4.61, -1.59]</td>
</tr>
<tr>
<td>Delaney 2003 (31)</td>
<td>5.2</td>
<td>9</td>
<td>-0.60 [-1.95, 0.75]</td>
</tr>
<tr>
<td>Garcia-Botelio 2011 (32)</td>
<td>4.15</td>
<td>5</td>
<td>-5.08 [-6.96, -3.20]</td>
</tr>
<tr>
<td>Gatt 2005 (33)</td>
<td>6.6</td>
<td>9</td>
<td>-2.40 [-5.22, 0.42]</td>
</tr>
<tr>
<td>Ionescu 2009 (34)</td>
<td>6.43</td>
<td>19</td>
<td>-2.73 [-3.96, -1.50]</td>
</tr>
<tr>
<td>Khoo 2007 (35)</td>
<td>5</td>
<td>7</td>
<td>-0.80 [-2.63, 0.35]</td>
</tr>
<tr>
<td>Muller 2009 (37)</td>
<td>6.7</td>
<td>7</td>
<td>-3.60 [-5.15, -2.05]</td>
</tr>
<tr>
<td>Ren 2012 (13)</td>
<td>5.7</td>
<td>14</td>
<td>-0.90 [-1.23, -0.57]</td>
</tr>
<tr>
<td>Serclova 2009 (38)</td>
<td>7.4</td>
<td>35</td>
<td>-3.00 [-3.92, -2.08]</td>
</tr>
<tr>
<td>Vlug 2011 LPS (12)</td>
<td>5.2</td>
<td>19</td>
<td>-1.00 [-1.79, -0.21]</td>
</tr>
<tr>
<td>Vlug 2011 LPT (12)</td>
<td>7</td>
<td>7</td>
<td>0.00 [-1.36, 1.36]</td>
</tr>
<tr>
<td>Wang 2012 LPS (41)</td>
<td>5.2</td>
<td>40</td>
<td>-1.10 [-2.99, 0.79]</td>
</tr>
<tr>
<td>Wang 2012 LPT (41)</td>
<td>6.5</td>
<td>42</td>
<td>-0.90 [-2.69, 0.89]</td>
</tr>
<tr>
<td>Wang G 2011 (14)</td>
<td>5.1</td>
<td>30</td>
<td>-2.50 [-3.60, -1.40]</td>
</tr>
<tr>
<td>Yang 2012 (40)</td>
<td>6</td>
<td>30</td>
<td>-5.70 [-7.10, -4.30]</td>
</tr>
</tbody>
</table>

**Total (95% CI)**

|                | 1046          | 1053 | 100.0% | -2.28 [-3.09, -1.47] |

Heterogeneity: $I^2 = 1.90$; $Chi^2 = 98.88$, df = 14 ($P < 0.00001$); $I^2 = 86$

Test for overall effect: $Z = 5.50$ ($P < 0.00001$)
No increase in readmissions

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Experimental Events</th>
<th>Total Weight</th>
<th>Control Events</th>
<th>Total Weight</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson 2003 (30)</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>11</td>
<td>Not estimable</td>
</tr>
<tr>
<td>Delaney 2003 (31)</td>
<td>3</td>
<td>31</td>
<td>6</td>
<td>33</td>
<td>0.53 [0.15, 1.95]</td>
</tr>
<tr>
<td>Gatt 2005 (33)</td>
<td>1</td>
<td>19</td>
<td>4</td>
<td>20</td>
<td>0.26 [0.03, 2.15]</td>
</tr>
<tr>
<td>Ionescu 2009 (34)</td>
<td>0</td>
<td>48</td>
<td>0</td>
<td>48</td>
<td>Not estimable</td>
</tr>
<tr>
<td>Khoo 2007 (35)</td>
<td>3</td>
<td>35</td>
<td>1</td>
<td>35</td>
<td>3.00 [0.33, 27.46]</td>
</tr>
<tr>
<td>Lee 2011 (36)</td>
<td>0</td>
<td>46</td>
<td>0</td>
<td>54</td>
<td>Not estimable</td>
</tr>
<tr>
<td>Muller 2009 (37)</td>
<td>3</td>
<td>76</td>
<td>2</td>
<td>75</td>
<td>1.48 [0.25, 8.61]</td>
</tr>
<tr>
<td>Serciova 2009 (38)</td>
<td>0</td>
<td>51</td>
<td>0</td>
<td>52</td>
<td>Not estimable</td>
</tr>
<tr>
<td>Vlug 2011 (12)</td>
<td>13</td>
<td>193</td>
<td>14</td>
<td>207</td>
<td>1.00 [0.48, 2.06]</td>
</tr>
<tr>
<td>Wang G 2011 (14)</td>
<td>4</td>
<td>106</td>
<td>9</td>
<td>104</td>
<td>0.44 [0.14, 1.37]</td>
</tr>
<tr>
<td>Wang G 2012 (39)</td>
<td>4</td>
<td>81</td>
<td>5</td>
<td>82</td>
<td>0.81 [0.23, 2.91]</td>
</tr>
<tr>
<td>Wang G 2012 (41)</td>
<td>2</td>
<td>49</td>
<td>3</td>
<td>50</td>
<td>0.68 [0.12, 3.90]</td>
</tr>
<tr>
<td>Wang Q 2012 (29)</td>
<td>0</td>
<td>40</td>
<td>0</td>
<td>38</td>
<td>Not estimable</td>
</tr>
<tr>
<td>Yang 2012 (40)</td>
<td>0</td>
<td>35</td>
<td>0</td>
<td>35</td>
<td>Not estimable</td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>824</strong></td>
<td><strong>844</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>0.78 [0.50, 1.20]</strong></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 7: Pooled estimates of hospital readmission comparing enhanced recovery after surgery versus standard care. CI confidence interval, df degrees of freedom, RR risk ratio.
Eras today

- 13 Randomized Controlled Trials
- Hundreds of publications

(www.erassociety.org)

Results in:
- 2-3 day reduction in hospital stay
- Decreased complications
Objectives

ERAS Purpose

Adult Results

Components

ERAS and Safety

Change Management
An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU

Peter Pronovost, M.D., Ph.D., Dale Needham, M.D., Ph.D., Sean Berenholtz, M.D., David Sinopoli, M.P.H., M.B.A., Haitao Chu, M.D., Ph.D., Sara Cosgrove, M.D., Bryan Sexton, Ph.D., Robert Hyzy, M.D., Robert Welsh, M.D., Gary Roth, M.D., Joseph Bander, M.D., John Kepros, M.D., and Christine Goeschel, R.N., M.P.A.

Central Line Bundle Elements

1. Hand hygiene
2. Maximal barrier precautions
3. Chlorhexidine skin antisepsis
4. Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults
5. Daily review of line necessity with prompt removal of unnecessary lines
Table 3. Rates of Catheter-Related Bloodstream Infection from Baseline (before Implementation of the Study Intervention) to 18 Months of Follow-up.*

<table>
<thead>
<tr>
<th>Study Period</th>
<th>No. of ICUs</th>
<th>No. of Bloodstream Infections per 1000 Catheter-Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td>Baseline</td>
<td>55</td>
<td>2.7 (0.6–4.8)</td>
</tr>
<tr>
<td>During implementation</td>
<td>96</td>
<td>1.6 (0–4.4)†</td>
</tr>
<tr>
<td>After implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–3 mo</td>
<td>96</td>
<td>0 (0–3.0)‡</td>
</tr>
<tr>
<td>4–6 mo</td>
<td>96</td>
<td>0 (0–2.7)‡</td>
</tr>
<tr>
<td>7–9 mo</td>
<td>95</td>
<td>0 (0–2.1)‡</td>
</tr>
<tr>
<td>10–12 mo</td>
<td>90</td>
<td>0 (0–1.9)‡</td>
</tr>
<tr>
<td>13–15 mo</td>
<td>85</td>
<td>0 (0–1.6)‡</td>
</tr>
<tr>
<td>16–18 mo</td>
<td>70</td>
<td>0 (0–2.4)‡</td>
</tr>
</tbody>
</table>
Children’s Healthcare of Atlanta | Emory University


Maintenance of normothermia (body warmer/warm intravenous fluids)

Avoidance of salt and water overload

No drains

Mid-thoracic epidural analgesia/analgesia

Short-acting anesthetic agents

No premedication

Thromboprophylaxis

Antibiotic prophylaxis

No selective bowel preparation

No prolonged fasting

Fluid and carbohydrate loading

Premedication counseling

Audit of compliance

Stimulation of gut motility

Early mobilization

Non-opioid oral analgesia/NSAIDs

Early oral nutrition

Early removal of catheter

Avoidance of salt and water overload

Prevention of nausea and vomiting

No nasogastric tubes

Mid-thoracic epidural analgesia/analgesia

Postoperative

Intraperitoneal

ERAS

Preoperative

Postoperative
Fluid/ electrolytes/ nutritional status

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

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

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

Pain control
Less Pain – MIS and Regional Blocks
Scheduled Multi-Modal Analgesia (MMA)

Scheduled
Tylenol
10/kg/dose QID

Ibuprofen
5 mg/kg/dose TID

Gabapentin

Narcotic pain relievers now cause or contribute to nearly
3 OUT OF 4
Prescription Drug overdoses and about
15,500 DEATHS
- Centers for Disease Control and Prevention
Prevention of complications

Postoperative

Preoperative

Intraoperative

Mid-thoracic epidural anesthesia/analgesia
No nasogastric tubes
Prevention of nausea and vomiting
Avoidance of salt and water overload

Early removal of catheter

Antibiotic prophylaxis

Thromboprophylaxis

Early oral nutrition
Non-opioid oral analgesia/NSAIDs

Early mobilization
Stimulation of gut motility
Audit of compliance

Maintenance of normothermia (body warmer/warm intravenous fluids)

Preadmission counseling
Fluid and carbohydrate loading
No prolonged fasting
No/selective bowel preparation

No premedication
Short-acting anesthetic agents
Mid-thoracic epidural anesthesia/analgesia
No drains
Avoidance of salt and water overload

Closing Protocol
IOM 6 Domains of Quality

- Safe
- Timely
- Efficient
- Effective
- Equitable
- Patient Centered
Enhanced Recovery After Surgery (ERAS) Pathway

1. Outpatient Clinic
   - Multimodal patient education (paper booklet, web-based education and dedicated time with staff nurses)
   - Infection prevention strategies (materials given for pre-surgery bath and bowel preparation)

2. Pre-Anesthesia Clinic
   - Multimodal analgesia education
   - Regional anesthesia and analgesia education
   - Education about preoperative carbohydrate drink to prevent excessive fasting before surgery

3. Preoperative Area
   - Pre-emptive analgesia and nausea prevention
   - Coordinated plan for regional analgesia or anesthesia (epidural or transversus abdominis plane block)
   - Ensuring patients are kept warm while waiting for surgery

4. Recovery Room
   - Assistance with mobilizing to a chair within hours of surgery
   - Early resumption of oral intake

5. Inpatient Unit
   - Partnership with patients and their families to promote early mobility
   - Focus on early resumption of drinking, then eating, and minimal use of intravenous fluids
   - Early removal of urinary catheters, if applicable
   - State-of-the-art pain management in coordination with experts in acute pain

6. Discharge
   - Support for transition home
   - Focused teaching on what to expect at home
   - Dedicated number to call for questions in the first few weeks after discharge
## Recovery Goals

### Daily Recovery Goals Checklist

<table>
<thead>
<tr>
<th>Before Surgery</th>
<th>Surgery Day</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ I have asked all questions about surgery and/or recovery</td>
<td>□ I have made sure to tell my nurse if I am feeling sick or in pain</td>
<td>□ My epidural and/or urinary catheter have been removed</td>
<td>□ My pain is controlled with oral pain medications</td>
<td>□ I am walking around freely, showering and using the toilet unassisted</td>
</tr>
<tr>
<td>□ The day before surgery, I took all 3 doses of my neomycin and Flagyl</td>
<td>□ I have tolerated drinking liquids</td>
<td>□ I have walked around the nurses station at least 4 times today</td>
<td>□ Up and at 'em— continue to walk at least 4 times/day</td>
<td>□ I am eating a high protein diet, and staying hydrated without feeling sick</td>
</tr>
<tr>
<td>□ After midnight the night before surgery, I did not eat any solid food</td>
<td>□ I have tolerated solid food (if offered to me)</td>
<td>□ I am tolerating a diet and my intravenous fluids have been stopped</td>
<td>□ I understand the goals for discharge and a plan for discharge is in place</td>
<td>□ Any questions? Ask team about anything you are unsure about</td>
</tr>
<tr>
<td>□ I drank a high carbohydrate containing drink (apple juice/Gatorade) 2 hours before surgery</td>
<td>□ I have gotten out of bed and walked at least once around the nurse's station</td>
<td>□ If I have a stoma present, I am participating in my stoma care.</td>
<td>□ If I have a stoma present, I am participating in my stoma care.</td>
<td>□ If I have a stoma present, I am participating in my stoma care.</td>
</tr>
</tbody>
</table>

### Weight Check

<table>
<thead>
<tr>
<th>My weight today is ______ kg. Daily recovery goals met?</th>
<th>My weight today is ______ kg. Daily recovery goals met?</th>
<th>My weight today is ______ kg. Daily recovery goals met?</th>
<th>My weight today is ______ kg. Daily recovery goals met?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Yes □ No</td>
<td>□ Yes □ No</td>
<td>□ Yes □ No</td>
<td>□ Yes □ No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># of walks?</th>
<th># of walks?</th>
<th># of walks?</th>
<th># of walks?</th>
</tr>
</thead>
</table>
BEFORE SURGERY EDUCATION:

1. After midnight, you will not be able to eat anything. However, you can have clear liquids up until 3 hours before surgery. This will make you feel less thirsty, less hungry and less anxious. It will also help your body maintain its normal blood sugar levels after surgery.

2. Some examples of clear liquids you can drink include:
   - Gatorade
   - Apple Juice

3. You will be prescribed two oral antibiotics: Neomycin and Flagyl. Please take these three times a day as prescribed at home the day before surgery. These help to fight the risk of infection during surgery.

4. You will be prescribed a pain medication called Neurontin to take the morning of surgery before you leave your house. You should take this pill when you drink your sugar drink as described above. This will help control your pain after the operation.

5. You will not have a bowel prep. If your surgery is going to be lower in your colon, you may need to have an enema before surgery. If so, you will be informed ahead of time.
Enhanced Recovery After Surgery Discharge Checklist:

☐ I have arranged transportation home.
☐ My pain is controlled on oral pain medication.
☐ I am able to walk independently.
☐ I am able to shower independently or as before surgery.
☐ I am able to dress independently or have help at home.
☐ I am comfortable with wound care and my dressing is dry.
☐ If stoma present, I have all the necessary equipment and feel confident taking care of it at home.
☐ My outpatient appointment is arranged and I have the clinic phone number.
☐ I have all my prescriptions including pain medication.
☐ All of my questions have been answered.
Objectives

ERAS Purpose

Adult Results

Components

Pediatric Result

Change Management
Colorectal/Cloaca

Implementation of an enhanced recovery protocol in pediatric colorectal surgery

Heather L. Short a, Kurt F. Heiss a, Katelyn Burch a, Curtis Travers b, John Edney c, Claudia Venable c, Mehul V. Raval a,∗

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™
ERAS Compliance ➔ Decreased LOS
Improvement in Secondary Outcomes

- Intraoperative Fluid Received
- Intraoperative Narcotics Received
- Postoperative Narcotics Received
- Time to Regular Diet
No Increase in Readmission or Complication Rates

<table>
<thead>
<tr>
<th></th>
<th>Pre-ERAS</th>
<th>Post-ERAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complication Rate</td>
<td>21%</td>
<td>17%</td>
</tr>
<tr>
<td>30-day Readmission Rate</td>
<td>23%</td>
<td>11%</td>
</tr>
</tbody>
</table>

- Blue bar represents Pre-ERAS data.
- Red bar represents Post-ERAS data.
Fast-track concepts in routine pediatric surgery: a prospective study in 436 infants and children

Marc Reismann · Jens Dingemann · Mathias Wolters · Birgit Laupichler · Robert Suempelmann · Benno M. Ure

• Tried in all pediatric surgery cases
• Worked for 30% of pediatric surgery cases
• Variable compliance
• Parents like it!!!

### PittCH ERAS - Same Day GB DC’s

<table>
<thead>
<tr>
<th>Metric</th>
<th>Before Implementation</th>
<th>Full Implementation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean surgery start time</td>
<td>12:22 PM (7:40 AM – 7:03 PM)</td>
<td>10:37 AM (7:45 AM – 6:19 PM)</td>
<td><strong>&lt;&lt;0.01</strong></td>
</tr>
<tr>
<td>Mean operative time (hours)</td>
<td>1.17 (0.43 - 2.97)</td>
<td>1.22 (0.33 - 2.90)</td>
<td>0.78</td>
</tr>
<tr>
<td>Mean length of stay (hours)</td>
<td>27.5 (10.5 - 48.6)</td>
<td>13.6 (0.4 - 52.9)</td>
<td><strong>&lt;&lt;0.01</strong></td>
</tr>
<tr>
<td>Same day discharge rate</td>
<td>2 (1.9%)</td>
<td>112 (77.2%)</td>
<td><strong>&lt;&lt;0.01</strong></td>
</tr>
<tr>
<td>ED 30-day return visit rate</td>
<td>Total visits</td>
<td>12 (11.4%)</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td>Surgery-related visits</td>
<td>8 (7.6%)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>30 day re-admission</td>
<td>6 (5.7%)</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Effectiveness of gabapentin as a postoperative analgesic in children undergoing appendectomy - BAPS

Figure. Post-appendectomy inpatient opioid consumption

- Overall
  - No gabapentin (n=58): 0.106
  - Gabapentin (n=25): 0.034
  - p-value = 0.004

- Simple appendicitis
  - No gabapentin (n=36): 0.000
  - Gabapentin (n=14): p-value = 0.002

- Complicated appendicitis
  - No gabapentin (n=6): 0.001
  - Gabapentin (n=11): p-value = 0.012

Children’s Healthcare of Atlanta | Emory University
Effectiveness of gabapentin as a postoperative analgesic in children undergoing appendectomy

Katherine J. Baxter\(^1\) · Jennifer Hafling\(^2\) · Jennifer Sterner\(^2\) · Adarsh U. Patel\(^1\) · Helen Giannopoulos\(^2\) · Kurt F. Heiss\(^1\) · Mehul V. Raval\(^1\)

Faster time to pain score \(<\ 3\)
ERAS and bariatric surgery in adolescent patients
Implementation of a Modified Enhanced Recovery Protocol in Cleft Palate Repairs

Stefanie E. Hush, MMSc, PA-C,* Jenny T. Chen, MD,* Colin M. Brady, MD,*
Magdalena Soldanska, MD,* David J. Nusz, MD,† Darren L. Rhinehart, MD,†
Kurt Heiss, MD,‡ Connor Crowley, BS,‡ and Joseph K. Williams, MD*

(J Craniofac Surg 2019;00: 00–00)
Total PO on POD 0

- Control Patients: 176 mL
- ERAS Patients: 305 mL
Average LOS decreased by 37.4% in the ERAS protocol
Average Perioperative Narcotic Use (mg)

- **Intraop**: 3.67 mg
- **PACU**: 0.53 mg
- **Postop**: 2.7 mg

**Control Patients**

**ERAS Patients**
Opioid doses Inpt per day (ME/kg/d)

CHOA ERAS
Thyroidectomies
Objectives

ERAS History

Adult Results

Components

Pediatric Results

Change Management
Hospital stay of 2 days after open sigmoidectomy with a multimodal rehabilitation programme

H. Kehlet and T. Mogensen

Department of Surgical Gastroenterology and Anaesthesiology, Hvidovre University Hospital, DK-2650 Hvidovre, Denmark

Correspondence to: Professor H. Kehlet
Horizontal – NPO, Opioid, Block work across all specialties
Vertical: Specialty-specific Protocols
Dealing with Resistance….

ERAS can be “Vertical” or “Horizontal”
Variation in utilization of narcotics

Percent umbilical hernia repair patients with opioid Rx

Deidentified Surgeons

Children’s Healthcare of Atlanta | Emory University
Educational Interventions

Figure 6. Number of high-utilization prescribers (surgeons who prescribed opioids to >50% of their patients), n=16
Note: Chi-squared test was not performed because test assumptions were not met.
A protocol is not enough to implement an enhanced recovery programme for colorectal resection

J. Maessen\textsuperscript{1}, C. H. C. Dejong\textsuperscript{1}, J. Hausel\textsuperscript{2}, J. Nygren\textsuperscript{2}, K. Lassen\textsuperscript{5}, J. Andersen\textsuperscript{3}, A. G. H. Kessels\textsuperscript{7}, A. Revhaug\textsuperscript{5}, H. Kehlet\textsuperscript{4}, O. Ljungqvist\textsuperscript{2}, K. C. H. Fearon\textsuperscript{6} and M. F. von Meyenfeldt\textsuperscript{1}
A protocol is not enough to implement an enhanced recovery programme for colorectal resection

J. Maessen\textsuperscript{1}, C. H. C. Dejong\textsuperscript{1}, J. Hausel\textsuperscript{2}, J. Nygren\textsuperscript{2}, K. Lassen\textsuperscript{5}, J. Andersen\textsuperscript{3}, A. G. H. Kessels\textsuperscript{7}, A. Revhaug\textsuperscript{5}, H. Kehlet\textsuperscript{4}, O. Ljungqvist\textsuperscript{2}, K. C. H. Fearon\textsuperscript{6} and M. F. von Meyenfeldt\textsuperscript{1}
Changing Practice...
Changing Behavior, Results

Diffusion Curve

- Innovators: 2.5%
- Early Adopters: 13.5%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%

Market Share

100%
90%
80%
75%
60%
50%
40%
30%
25%
20%
10%
0%

Diffusion of Innovations
Fourth Edition

Everett M. Rogers
Maloney’s 16% Rule:
Once you have reached 16% adoption of any innovation, you must change your messaging and media strategy from one based on scarcity, to one based on social proof, in order to accelerate through the chasm to the tipping point.
This is a Team Sport

Get Nursing on board
This is a Team Sport

Get **Anesthesia** on board
ERAS Protocol Adjustments
Dealing with Resistance to Change

- Build the team
- Collect some data
- Anticipate the Speed Bumps
- Focus on Purpose
- Deal with the “why”
- Work with Silos
- Develop protocols with other divisions
Pass baton to Dr George....