A28/B28: Implementation of an Enhanced Recovery after Surgery Program for Colorectal Surgery at a Community Teaching Hospital

Mallory S. Bray, MD
Stephen B. Shapiro, MD, FACS

Gundersen Medical Foundation
Gundersen Health System
La Crosse, WI

Disclosures

• There are no conflicts of interest to disclose
Session Objectives

1. Implement a perioperative platform for a standardized evidence-based Enhanced Recovery After Surgery (ERAS) protocol for all patients undergoing elective colorectal resections.
2. To assess whether successful adaption of an ERAS protocol would reduce LOS and postoperative complications after elective surgery.
3. To compare our institutional outcomes with an ERAS protocol to those reported in the literature.

Background

• Enhanced Recovery After Surgery (ERAS) programs have been developed specifically for colorectal surgery aimed at:
  – Decreasing surgical stress
  – Decreasing morbidity & mortality
  – Improving the patient’s perception of the surgical experience
Gundersen Health System

- La Crosse, WI
- Integrated multispecialty health system
  - 325-bed teaching hospital at main campus
- 26 medical clinics across 19 counties in 3 states
- 6,722 total employees
  - 850 providers
- General surgery residency program
  - 3 chiefs per year (15 residents total)

Objective

- Our goal was to implement a standardized ERAS pathway for all patients undergoing elective colorectal resections at our community teaching hospital.
  - Measure the impact of ERAS on patient outcomes
Outline - PDSA

Identify and assess problem

Plan: Buy-in from different groups, identify nurse and resident champion

Do: trial period for 1 surgical team’s patients

Study: gather data, present preliminary findings to surgeons

Act: walk patient through the process from pre to postoperative, outpatient and inpatient

Outcome / Follow-up

Identify Problem

• 2011 National Surgical Quality Improvement (NSQIP) Report

Areas needing improvement
  • Colorectal Morbidity = 33%
  • Colorectal Surgical site infection (SSI) = 21%
    • Mortality = 3.8%
    • Urinary tract infection = 4.4%
    • Return to Operating room (unplanned) = 7.6%

Areas of exemplary performance
  • Length of stay
  • Most colorectal procedures performed laparoscopically
    — Low rate of conversion to open
Goal

• Improve outcomes by adhering to a standardized ERAS based initiative for our elective colorectal surgery patients

• Combination of pre, intra, and postoperative interventions aimed at reducing surgical stress response
  – Quicker return to baseline functional status
  – Decreased morbidity
    • Driven by SSI rates

Plan

• Literature Review

• Presentations
  – Cleveland Clinic International Colorectal Disease Symposium
  – SAGES ERAS Symposium

• www.ERAS.org
Plan

• Understand ideal steps at Gundersen Health System, La Crosse, WI
  — Staff, Resident, Nurse “Champions”
  — Documented Proposal
    • Open for all to view
  — Inter-departmental Buy-In
    • Surgeons
    • Anesthesia
    • Nurses
    • Pharmacy
  — Availability of staff, medications on formulary
  — Epic electronic health record programmers

Plan

• Predicting Challenges & Compromise
  1. Anesthesia
  2. Surgeons
    • Met one-on-one with predicted “objectors” and “adopters”
    • Gave time for feedback after introduction of protocol
  3. Nurse time constraints
  4. Residents
Plan

• Predicting Challenges & Compromise

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Do

• Walking through the Process
  – Preoperative
  – Intraoperative
  – Postoperative
  – Patient Education throughout

• Protocols, Order-sets
Before ERAS Implementation

- 15 surgeons
- 15 residents
- Postoperative protocols determined by surgeon and resident preference

GHS Consensus Interventions

**Pre-Operative**
- Preadmission patient education
- Preoperative bowel preparation
- Decreased preoperative fasting with preoperative carbohydrate loading
- Antimicrobial prophylaxis
- Prevention of ileus-Alvimopan

**Intra-Operative**
- Intra-operative fluid management
- Active prevention of hypothermia
- Prevention and treatment postoperative nausea and vomiting
- Laparoscopic assisted surgery
- Removal of NG tubes
- No peritoneal drain placement

**Post-Operative**
- Minimize narcotic pain management
- Early mobilization
- Early initiation of diet
- Prevention of ileus-Alvimopan
- Early urinary catheter removal
- Prophylaxis against thromboembolism
- Post-operative fluid management

*Bold* denotes ERAS implementations
Order sets

- Worked directly with EPIC programmer face-to-face

Patient Education

- Hand-outs, Videos, One-on-one instruction
  - 8th Grade Reading Level
  - Large font

- Worked with patient educator team

- Reinforced throughout process
Patient Education

• Industry instruction for IMPACT
Patient Education

• Nurse Documentation

Preoperative

• Patient Education
• Preoperative Order set
  – Bowel prep
  – IMPACT carbohydrate drink and decreased preoperative fasting
  – Alvimopan
  – Preoperative antibiotics
Intraoperative

- Fluid Restriction
  - Avoid fluid overload
  - Weight based, to maintain normovolemia
  - Hypotension treated with pressors
- Prevention of Hypothermia
  - Forced air, Bair hugger
  - Warmed IV fluids
- Prevent hyperoxia
- Minimize narcotic – epidural
- Prevent and treat PONV
- Remove NG tube
- Avoid drain

Postoperative

- Patient Education
- Alvimopan
- Minimize narcotic
  - PO Pain meds POD#1
  - Pain Score Sheets
- Strict fluid management
- Early Foley removal
- Early ambulation
- Early initiation of diet
- VTE prophylaxis
Study

- Started with pilot roll-out using surgeon champion patients for one month
  - Too infrequent to become the “norm”

- Increase to 50% of general surgery group for 2 months

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Study

- Findings after initial 2 months
  - Subjective positive change in patient care
    - Jealousy from some non-pilot surgeons
  - Early feeding actually done and tolerated
  - Better understanding of program by all involved
  - Problems:
    - Continued use of PCA
    - IVF by “break” anesthesia team
  - Initial objective findings without increase in complications
Act

- Expanded to all elective adult colorectal surgery patients
  - Monitored compliance with residents and CNLs
  - Continued problems:
    - PCA
    - Midline incisions
    - Liberal postoperative fluids
      ➔ Improved at 3 months post-rollout

Act

- Nurse, Intern, and Resident easily identify when someone off of expected course
- POD#2 discharge...
  even in elderly
Results of our Project

- Presentations locally and regionally
  - Gundersen Health System, La Crosse, WI
  - Wisconsin Surgical Society
  - Southwest Surgical Congress

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-ERAS</th>
<th>ERAS</th>
<th>P</th>
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<tr>
<td>N</td>
<td>92</td>
<td>99</td>
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<tr>
<td>Sex, n (%)</td>
<td>0.980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>50 (54)</td>
<td>54 (55)</td>
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</tr>
<tr>
<td>Male</td>
<td>42 (46)</td>
<td>45 (45)</td>
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<tr>
<td>Mean Age, years</td>
<td>65.4 ± 12.6</td>
<td>63.1 ± 14.4</td>
<td>0.240</td>
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<tr>
<td>ASA Class, n (%)</td>
<td></td>
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</tr>
<tr>
<td>I</td>
<td>6 (7)</td>
<td>7 (7)</td>
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</tr>
<tr>
<td>II</td>
<td>37 (40)</td>
<td>57 (58)</td>
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</tr>
<tr>
<td>III</td>
<td>48 (52)</td>
<td>33 (33)</td>
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<td>IV</td>
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### Results: Operative Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-ERAS</th>
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<tbody>
<tr>
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<tr>
<td>Laparoscopic approach, n (%)</td>
<td>59 (60)</td>
<td>65 (71)</td>
<td>0.110</td>
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<tr>
<td>Mean Operative time, (min)</td>
<td>208 ± 76</td>
<td>206 ± 77</td>
<td>0.64</td>
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<tr>
<td>Pathology, n (%)</td>
<td></td>
<td></td>
<td>0.67</td>
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<tr>
<td>Benign</td>
<td>62 (67)</td>
<td>64 (65)</td>
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<tr>
<td>Malignant</td>
<td>30 (33)</td>
<td>35 (35)</td>
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### Results: Intraoperative fluids

<table>
<thead>
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<th>Mean fluid volume, mL</th>
<th>Pre-ERAS</th>
<th>ERAS</th>
<th>P</th>
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<tr>
<td>0</td>
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<td>500</td>
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<td>3000</td>
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<td>0.009</td>
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</table>

*P = 0.009*
Results: Alvimopan

Results: Pain Control
Results: Advancement of Diet

<table>
<thead>
<tr>
<th>Patients, %</th>
<th>POD 0</th>
<th>POD 0</th>
<th>POD 1</th>
<th>POD 1</th>
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<tbody>
<tr>
<td>Pre-ERAS</td>
<td>NPO</td>
<td>Liquid</td>
<td>General</td>
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<tr>
<td>ERAS</td>
<td></td>
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</tbody>
</table>

- POD 0: Pre-ERAS $P < 0.001$, ERAS
- POD 1: Pre-ERAS $P < 0.001$, ERAS

Results: Perioperative Data

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<thead>
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<th>Variable</th>
<th>Pre-ERAS</th>
<th>ERAS</th>
<th>$P$</th>
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<tbody>
<tr>
<td>N</td>
<td>92</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Mean PODs to return of bowel function</td>
<td>2.8 ± 1.1</td>
<td>2.3 ± 1.8</td>
<td>&lt;0.001</td>
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<tr>
<td>NG tube required, n (%)</td>
<td>15 (16)</td>
<td>8 (8)</td>
<td>0.080</td>
</tr>
<tr>
<td>Postoperative days</td>
<td>6.5 ± 4.0</td>
<td>5.2 ± 2.7</td>
<td>&lt;0.001</td>
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### 30-day Complications

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gundersen ERAS</th>
<th>Cochrane ERAS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Overall morbidity</td>
<td>19.4</td>
<td>28.5</td>
</tr>
<tr>
<td>Minor complications</td>
<td>6.1</td>
<td>25</td>
</tr>
<tr>
<td>Major complications</td>
<td>14.3</td>
<td>8.8</td>
</tr>
<tr>
<td>Readmission</td>
<td>11.1</td>
<td>3.3</td>
</tr>
<tr>
<td>Mortality</td>
<td>2.0</td>
<td>0.4</td>
</tr>
<tr>
<td>Length of stay, days</td>
<td>5.2</td>
<td>4 – 7.4</td>
</tr>
</tbody>
</table>


### Results: 30-day Complications

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-ERAS N (%)</th>
<th>ERAS N (%)</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Anastomotic dehiscence/leak</td>
<td>0 (0)</td>
<td>4 (4)</td>
<td>0.120</td>
</tr>
<tr>
<td>Abscess</td>
<td>3 (3)</td>
<td>3 (3)</td>
<td>0.990</td>
</tr>
<tr>
<td>Surgical site infection</td>
<td>7 (8)</td>
<td>4 (4)</td>
<td>0.290</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>5 (5)</td>
<td>2 (2)</td>
<td>0.260</td>
</tr>
<tr>
<td>Bowel obstruction</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>0.999</td>
</tr>
<tr>
<td>C. Difficile infection</td>
<td>2 (2)</td>
<td>3 (3)</td>
<td>0.999</td>
</tr>
<tr>
<td>Readmission</td>
<td>7 (8)</td>
<td>11 (11)</td>
<td>0.410</td>
</tr>
<tr>
<td>Mortality</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>0.190</td>
</tr>
</tbody>
</table>
Discussion

• Overall favorable results
• Additional study into anastomotic leaks and readmission
• Gundersen historical leak rate 0.4 - 3.2%
• Lower ASA class in ERAS group

Pitfalls of Implementation

• Maintenance of surveillance and accountability
• Follow-up with anesthesia group
• Nurse turnover and teaching → excluded era of individual physician orders
• Single surgeon pilot was too small
• Study did not look at patient-centered outcome (i.e. patient satisfaction)
• Team is needed
Conclusion

- Successful integration of an ERAS program into our institution using PDSA model
- Decreased length of stay
- Overall no statistically significant increase in surgical morbidity
- Multidisciplinary pre and postoperative care impacts outcomes
- www.ERAS.org