Enhanced Recovery after Surgery (ERAS) for Cesarean Delivery

UCSF OB/GYN Update
October, 2017

Mark Rollins, MD, PhD
Professor
University of Utah
Department of Anesthesia

Objectives
At the conclusion of this activity, participants should be able to:

1) Discuss the Concept of an ERAS Pathway & Areas of Impact to Patient Care
2) List ERAS Components Applicable to Cesarean Delivery
Why do ERAS?

- Decreased LOS by 2.3 days [95% CI: -3.09 to -1.47]
- Decreased Overall Morbidity (RR) = 0.60, [95% CI 0.46–0.76]
- Decreased Nonsurgical Complications (RR) = 0.40, [95% CI 0.27–0.61]
- Similar Readmission Rates
- Similar Surgical Complication Rates

Spine Surgery

- Decreased opioid consumption on POD 1 & 2
- Earlier ambulation
- Lower nausea dizziness and sedation POD 1 - 6
- Decreased PACU stay
- No infections either group

Spine Surgery

ERAS Results
- Significantly lower opioid consumption (oral morphine equivalent) on POD 1 (median [range]) 110 (75–105) mg vs 130 (120–150) mg and on POD 2 (100 (40–140) mg vs 50 (0–120) mg), but not on POD 3+.
- Pain score not analyzed
- Significantly earlier mobilization from bed (median [IQR]) of 1.5 (1.2–2) day vs 3.5 (3.2–3.5) days and ambulation, both with and without a walking frame (2.0 (1.5–2) days vs 7 (4–7) days and 5 (4–7) days vs 7 (5–7) days, respectively).
- Lower nausea, sedation and dicthnesis scores on POD 1.
- Significantly shorter LOS in the PACU (median [IQR]) 270 (175–350) min vs 545 (450–600 min), but no difference in hospital LOS.
- No postoperative infections in either group.

ERAS Disadvantages
- None.
Gynecologic Surgery

ERAS Benefits
- Significantly decreased PCA opioid use in intervention group (88.7% vs 11.3% at day 7) and decreased postpartum opioid use (89% decrease in the first 48 h with no change in pain scores
- Significantly shorter hospital stay for all surgery types (day 1 initiation)
- Efficacy based on length of hospital stay for complex cesarean deliveries (7.4 vs 6.1 days, p = 0.05) and vaginal cesarean sections (2.6 vs 2.1, p = 0.003)
- Significantly lower costs per patient for all surgery types (50% lower, p < 0.05)
- No difference in rate of surgery-related complications (fetoplacental, uterine, etc.) or mortality
- No difference in 30-day readmission rates or rate
- Hospital stay: Median cost savings of > $7,600 USD per patient (28.5% reduction)

ERAS Disadvantages
- None

Potential Benefits of ERAS for Cesarean Delivery

- Reduced hospital stay
- Improved patient satisfaction
- Reduced costs
- Faster return of bowel function
- Decreased pain
- Reduced opioid consumption
- Improved patient recovery

EDITORIAL
Enhanced recovery in obstetrics – a new frontier?

ORIGINAL ARTICLE
Introduction of enhanced recovery for elective cesarean section enabling next day discharge: a tertiary centre experience
## UCSF ERAS Pathway
### Cesarean Delivery

**Anesthesia:** Monica Harbell & Mark Rollins  
**OB:** Mari-Paule Thiet & Ben Li  
**Nursing:** Molly Killion  
**Pediatrics:** Seth Bokser & Valerie Flaherman

### ERAS

1) **PreOp Consultation “High Risk”**
2) **Education Materials**
3) **Discuss “What to Expect”**

### Day(s) Prior to surgery

- Anesthesia pre-op evaluation  
- Explanation of post-op pain regimen  
- “What to expect” handout  
- OB consents  
- Home Health assessment  
- Car Seat  
- Pediatrician Selection  
- Give Boost Breeze & Hibiclens to patients  
- Draw labs (CBC, RPR)  
- T&S if primary C/S  
- T&C if repeat C/S or other risks

<table>
<thead>
<tr>
<th>ASSESSMENTS</th>
<th>DR</th>
<th>NURSING</th>
<th>OB</th>
<th>ALL</th>
<th>PED</th>
<th>NOTES</th>
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</thead>
<tbody>
<tr>
<td>Day 1-3</td>
<td></td>
<td></td>
<td></td>
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</table>
**Practice Guidelines for Obstetric Anesthesia**

An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology*

Anesthesiology, 2016; 124(2): 1-31

- Recognition of significant anesthetic or obstetric risk factors should encourage consultation between the obstetrician and the anesthesiologist

- A communication system should be in place to encourage early and ongoing contact between obstetric providers, anesthesiologists, and other members of the multidisciplinary team

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**Early High Risk Consult:**

- Timely identification & investigation
- Prompt request for referrals
- Planned management for both scheduled and emergent delivery
- Involvement of a multi-disciplinary team

**Goal to minimize complications, morbidity & mortality**

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**Why in the antepartum period?**

- Timely input from senior specialists
- Further studies may be required
- Need for additional subspecialists
- Coordination of labor care
- Discussion of options / special needs
- Potential need for transfer

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**Other Potential Benefits?**

- Decrease complications
- Improve efficiency / limit delays
- Improve patient communication
- Improve patient satisfaction
- Useful teaching opportunity for patients
- Closer specialty working relationship
What is the Best Model?

- High Risk Clinic?
- Scheduled time in triage?
- Phone consult?
- Page anesthesiologist on call?
- While patient in labor?

PreOp

ERAS

1) Carbohydrate Drink
2) PreOp for Surgery (eg. NPO, Consent, etc)
3) Review patient Desires & Expectations
4) Bleeding Risk / Other Considerations
5) Incentive Spirometry Education
6) Acetaminophen
7) IV Fluids Standardized
Preoperative carbohydrate treatment was associated with a small reduction in length of hospital stay when compared with placebo or fasting in adult patients undergoing elective surgery.

Aspiration pneumonitis was not reported in any patients, regardless of treatment group allocation.

**Intra-op**

- Hypotension Prevention:
  - IV fluids during placement
  - Vasopressors
  - Standardized spinal cocktail: 25-40mL/kg (IBW) crystalloid
  - Ondansetron 4mg at start of case
  - Antibiotics prior to incision

- **LUD**
  - A set room temperature
  - Mother / Neonate Skin-to-skin
  - Leg compression Devices on
  - Foley after spinal placed
  - FHR if time from spinal to prep >10min
Intrathecal Morphine Doses
For Post-Cesarean Analgesia


- Nausea and Vomiting 10% to 50%
- Respiratory Depression < 0.25%

Intrathecal Morphine 100µg & 200µg
For Post-Cesarean Delivery Analgesia

Wong JY, et al. IJOA 22:36-40 2013

<table>
<thead>
<tr>
<th>Analgesia</th>
<th>IT Morphine 100µg</th>
<th>IT Morphine 200µg</th>
<th>Pvalue</th>
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</thead>
<tbody>
<tr>
<td>Opioid Use (0-24h)</td>
<td>54 ± 35mg</td>
<td>44 ± 35mg</td>
<td>.04</td>
</tr>
<tr>
<td>Opioid Use (24-48h)</td>
<td>54 ± 32mg</td>
<td>60 ± 31mg</td>
<td>.18</td>
</tr>
<tr>
<td>IV morphine required</td>
<td>30%</td>
<td>18%</td>
<td>.02</td>
</tr>
<tr>
<td>IV Morphine Use (0-24h)</td>
<td>2.5 ± 3.3mg</td>
<td>1.3 ± 3.5mg</td>
<td>.054</td>
</tr>
<tr>
<td>IV Morphine Use (24-48h)</td>
<td>0.02 ± 0.2mg</td>
<td>0 ± 0mg</td>
<td>.32</td>
</tr>
<tr>
<td>Mean VPS (0-24h)</td>
<td>2.0 ± 1.1</td>
<td>1.6 ± 1.1</td>
<td>.01</td>
</tr>
<tr>
<td>Mean VPS (24-48h)</td>
<td>2.5 ± 1.0</td>
<td>2.5 ± 1.0</td>
<td>.92</td>
</tr>
</tbody>
</table>

Intrathecal Morphine 100µg & 200µg
For Post-Cesarean Delivery Analgesia

Wong JY, et al. UOA 22:36-40 2013

<table>
<thead>
<tr>
<th>Side Effects</th>
<th>IT Morphine 100µg</th>
<th>IT Morphine 200µg</th>
<th>Pvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiemetic Use</td>
<td>24%</td>
<td>52%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nausea Episodes (0-24h)</td>
<td>1.6 ± 1.3</td>
<td>1.9 ± 1.3</td>
<td>.04</td>
</tr>
<tr>
<td>Nausea Episodes (24-48h)</td>
<td>0.02 ± 0.13</td>
<td>0.04 ± 0.46</td>
<td>.56</td>
</tr>
<tr>
<td>Patients receiving NSAIDs</td>
<td>87%</td>
<td>87%</td>
<td>.98</td>
</tr>
<tr>
<td>Time of Surgery to Discharge</td>
<td>89 ± 20 hrs</td>
<td>89 ± 19 hrs</td>
<td>.76</td>
</tr>
</tbody>
</table>

Intrathecal Morphine 100µg & 200µg
For Post-Cesarean Delivery Analgesia

Wong JY, et al. UOA 22:36-40 2013

<p>| Patient Preferences for Outcomes Associated with Cesarean Delivery |
|---------------------------------------------------------------|------------------|------------------|--------|</p>
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Rank</th>
<th>Relative value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain during cesarean</td>
<td>8.4 ± 2.2</td>
<td>27 ± 18</td>
</tr>
<tr>
<td>Pain after cesarean</td>
<td>8.3 ± 1.8</td>
<td>18 ± 10</td>
</tr>
<tr>
<td>Vomiting</td>
<td>7.8 ± 1.5</td>
<td>12 ± 7</td>
</tr>
<tr>
<td>Nausea</td>
<td>6.8 ± 1.7</td>
<td>11 ± 7</td>
</tr>
<tr>
<td>Cramping</td>
<td>6.0 ± 1.9</td>
<td>10 ± 8</td>
</tr>
<tr>
<td>Itching</td>
<td>5.6 ± 2.1</td>
<td>9 ± 8</td>
</tr>
<tr>
<td>Shivering</td>
<td>4.6 ± 1.7</td>
<td>6 ± 6</td>
</tr>
<tr>
<td>Anxiety</td>
<td>4.1 ± 1.9</td>
<td>5 ± 4</td>
</tr>
<tr>
<td>Somnolence</td>
<td>2.9 ± 1.4</td>
<td>3 ± 3</td>
</tr>
<tr>
<td>Normal</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Data are mean ± s. Rank = 1 to 10 from the most desirable (1) to the least desirable (10) outcome, relative value = dollar value patients would pay to avoid an outcome; e.g., they would pay $57 of their $100 to avoid pain during cesarean delivery.

Intrathecal morphine dose:
50mcg vs. 100mcg vs. 150mcg

Less pruritus at 6 hours with 50 mcg IT morphine

Epidural Morphine Doses For Post-Cesarean Analgesia

- Nausea and Vomiting < 10%
- Respiratory Depression < 0.25%

Post-Cesarean Pain
(Efficacy of Two Epidural Morphine Doses)


ERAS
1) Early Mobilization
2) Foley Removal
3) DVT prophylaxis
4) Bowel Regimen
**POST-OP pain control**

- Maximizing non-opioid analgesics
  - Acetaminophen ATC
  - Ketorolac for 1st 24 hours, then ibuprofen ATC
- Oxycodone PRN
- Dilaudid IV PRN breakthrough pain

- If inadequate pain control,
  - During first 24 hours, call Anesthesia
  - Afterwards, call OB team

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**Post-Delivery Pain**
(Mean pain scores for first 24 hours after delivery)

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**Cesarean Delivery Pain**
(Impact on Daily Activities during first 24 hours)

<table>
<thead>
<tr>
<th>Activity Impacted</th>
<th>Vaginal Delivery</th>
<th>Cesarean Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>40%</td>
<td>72%</td>
</tr>
<tr>
<td>Mood</td>
<td>19%</td>
<td>40%</td>
</tr>
<tr>
<td>Sleep</td>
<td>36%</td>
<td>57%</td>
</tr>
<tr>
<td>Interactions with Others</td>
<td>8%</td>
<td>20%</td>
</tr>
<tr>
<td>Ability to Concentrate</td>
<td>13%</td>
<td>31%</td>
</tr>
<tr>
<td>Pain (8-weeks)</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>Depression (8-weeks)</td>
<td>11%</td>
<td>11%</td>
</tr>
</tbody>
</table>
Two months after childbirth:

“Women with severe acute postpartum pain had a 2.5-fold increased risk of persistent pain and a 3.0-fold increased risk of postpartum depression compared to those with mild postpartum pain.”


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Postoperative Analgesic Practice For Cesarean Delivery

Survey of Institutional Practice:

- Intrathecal Morphine (spinal) 77%
- Use of Epidural following C/D 21%
- Routine Use of PCA 12%
- NSAIDS 81%
  - “Round The Clock” 42%
  - PRN 51%
  - Other (often single dose) 7%
- Acetaminophen 45%


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Multimodal Analgesia

- Optimize additive effects of various agents
- Utilize different modes of analgesia
- Minimize maternal side effects
- Reduce transfer of medication to breast milk

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NSAIDs

- All NSAIDs have opioid sparing activity
  - Effective in reducing post-cesarean delivery pain
  - Enhance opioid analgesia
  - Decrease opioid-related side effects
- Non-selectively inhibit cyclooxygenase-1 & -2
  - Undesirable side effects include platelet dysfunction, renal impairment, and GI irritation
- American Academy of Pediatrics regards NSAIDs safe for use in breast feeding women
- Typical post-cesarean dosing in healthy women
  - Ibuprofen 600mg orally every 6 hours

Flood & Aleshi. Chapter 27, Chestnut’s Obstetric Anesthesia. 5th Ed. 2013
**NSAIDs**

**On-Demand vs. Fixed-Interval**

<table>
<thead>
<tr>
<th></th>
<th>Fixed-interval group</th>
<th>On-demand group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of analgesic doses met for 3h</td>
<td>1.0 ± 0.5 (5)</td>
<td>0.7 ± 0.4 (5)</td>
<td>0.044</td>
</tr>
<tr>
<td>Time from delivery to first analgesic dose (h)</td>
<td>8.2 ± 3.0 (9)</td>
<td>5.6 ± 2.6 (9)</td>
<td>0.041</td>
</tr>
<tr>
<td>Time from birth to second analgesic dose (h)</td>
<td>16.2 ± 5.3 (7)</td>
<td>15.7 ± 4.3 (7)</td>
<td>0.404</td>
</tr>
<tr>
<td>Pain scores at first analgesic dose</td>
<td>55.5 ± 15.1 (50)</td>
<td>57.9 ± 15.1 (50)</td>
<td>0.042</td>
</tr>
<tr>
<td>Pain scores at second analgesic dose</td>
<td>48.5 ± 21.0 (40)</td>
<td>52.9 ± 21.0 (40)</td>
<td>0.044</td>
</tr>
</tbody>
</table>

Fixed-interval NSAID dosing provides more effective post-operative cesarean analgesia and results in better patient satisfaction compared to on-demand dosing.


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**Acetaminophen**

- Less effective than NSAIDs in decreasing opioid consumption and post-op nausea & vomiting.
  - Effective in reducing post-cesarean delivery pain
  - Enhance opioid analgesia
  - Decrease opioid-related side effects

Typical Dosing 1000mg q8 hours
- In nursing mothers infant daily dose is 1% - 2% of maternal

Flood & Aleshi. Chapter 27, Chestnut's Obstetric Anesthesia. 5th Ed. 2013

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**CENSUS ON PATIENT SAFETY IN WOMEN’S HEALTH CARE**

[https://www.cmqcc.org](https://www.cmqcc.org)

[www.safehealthcareforeverywoman.org](http://www.safehealthcareforeverywoman.org)

**RECOGNITION & RESPONSE:**

**Cesarean Delivery**

Women undergoing cesarean delivery should receive:
- Sequential compression devices perioperatively and postpartum
- Pharmacologic prophylaxis (LMWH or UFH) based on risk factors

An "opt-out" strategy where all women undergoing cesarean delivery receive prophylaxis with LMWH or UFH unless there is a specific contraindication is also an acceptable approach
Discharge

- Goal “ready” for discharge by POD#3
- Home Health visit assessed at Preop
- Lactation Consult – POD#1
- Circumcision – POD#2
- Car seat & Tdap/Flu shot – POD#2
- Appointments for OB and Peds
- Discharge meds – Meds to Beds

UCSF Results

**ERAS**

1) Minimal Reduction in Length of Stay
2) Significant Reduction in Post-Op Opioid Requirements
3) Consequent Reduction in Number of Opioid Tablets Prescribed at Discharge