Acute Postoperative Pain Management: Why it matters more now than ever.

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Disclosures

• None.
Goals

• Typically this talk would cover
  – Advances in analgesic pharmacology
    • Tapendatol, Zohydro, Liposomal Bupivicaine (Exparel)
  – Specific regional techniques gaining in popularity
    • TAP block for abdominal surgery
    • Paravertebral and PECS blocks for breast surgery
    • Intra-articular analgesia and adductor canal blocks for knee replacement

• Instead will focus on
  – Fast-track initiatives are rapidly expanding and improving the perioperative episode.
  – These initiatives put a focus on Acute Postoperative Pain.
Outline

• Recent emphasis on fast-track programs for surgical episodes
  – Preoperative Surgical Home (PSH)
  – Enhanced Recovery After Surgery (ERAS)

• Pain pathways
  – Avoid opiates which cause nausea, ileus, sedation
  – Favor non-opiate analgesics, adjunct medications, and regional techniques.

• Review of recent efforts at BIDMC
Fast-Track protocols for Surgical Episodes

• Goal is to achieve the “Triple Aims”
  – Improving patient experience
  – Improving outcomes
  – Reducing costs

• Meet that goal via:
  – Evidence-based Protocols
  – Multi-departmental initiative
  – Shared decision-making
  – Continuity of care

• Two Current Models:
  – Perioperative Surgical Home (PSH)
  – Enhanced Recovery After Surgery (ERAS)

https://www.asahq.org/psh
Perioperative Surgical Home (PSH) Defined

• Patient-centered, physician-led, interdisciplinary and team-based system

• Coordinates care from pre-procedure assessment through the acute care episode, recovery, and post-acute care:
  – Cost effective pre-operative testing and consultation
  – “Prehabilitation”
  – Multimodal analgesia, goal-directed fluid management
  – Continuous measurement of outcomes with iterative improvements

• *Rather than a well-defined list of protocols and procedures, it is a concept that is organically materialized at each health entity.*

ASA, 2014.
## Common PSH Elements

<table>
<thead>
<tr>
<th>Preoperative Key Elements</th>
<th>Intraoperative Key Elements</th>
<th>Postoperative Key Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Admission through a centralized preoperative area/clinic</td>
<td>- Integrated pain management</td>
<td>- Integrated pain management</td>
</tr>
<tr>
<td>- Early preadmission assessments</td>
<td>- Fast-track surgery and discharge home</td>
<td>- Early postoperative mobilization by physical therapy and integrated acute-care and rehabilitation care</td>
</tr>
<tr>
<td>- Centralized systems to gather health and other information about patients before hospital admission</td>
<td>- Precise fluid management</td>
<td>- Improved coordination of care from postoperative to discharge home</td>
</tr>
<tr>
<td>- Preoperative innovations such as “prehabilitation” programs for targeted patients</td>
<td>- OR delay reduction techniques</td>
<td>- Improved discharge protocol</td>
</tr>
<tr>
<td>- A triage system to identify which patients need to attend a preadmission clinic or program</td>
<td>- Increased OR efficiency through improved OR flow</td>
<td>- Increased patient and caretaker education concerning post-discharge care</td>
</tr>
<tr>
<td>- Use of a multidisciplinary team based clinical care processed within the hospital to coordinate complex preparation of patients before surgery</td>
<td>- Scheduling initiatives to reduce cancellations and increase efficiency</td>
<td></td>
</tr>
</tbody>
</table>

Kash et al. PSH. ASA, 2014.
## PSH in Action: TKA @ UCI

<table>
<thead>
<tr>
<th>Phase</th>
<th>Element of Care</th>
<th>Perioperative Surgical Home</th>
<th>Standard Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>Patient education</td>
<td>Mandatory joint Replacement education classes, Written education material, Mind Body classes for optimal perioperative healing</td>
<td>Written education material and Joint Replacement education classes optional</td>
</tr>
<tr>
<td></td>
<td>Preoperative testing</td>
<td>Preoperative clinic visit with protocolized laboratory and ECG testing, MRSA swab, anemia management protocols</td>
<td>Lack of protocolized preoperative testing</td>
</tr>
<tr>
<td></td>
<td>NPO guidelines</td>
<td>NPO to solids after midnight and clear liquids up to 2 hour before arrival to hospital</td>
<td>NPO to solids and liquids after midnight</td>
</tr>
<tr>
<td></td>
<td>Standardized preoperative order sets</td>
<td>Standardized electronic order sets for VTE prophylaxis and initiation of multimodal pain regimen preoperatively</td>
<td>Generic order forms with lack of preop order sets</td>
</tr>
<tr>
<td></td>
<td>Discharge Planning</td>
<td>DME purchase and patient education, identification of post op care taker, engagement of home health agencies</td>
<td>Delayed discharge planning after patient admitted to the hospital</td>
</tr>
<tr>
<td>Intraoperative</td>
<td>Anesthesia care</td>
<td>Standardized anesthesia protocols with spinal as preferred anesthetic</td>
<td>Anesthetic choice and fluid management at the discretion of the anesthesia provider</td>
</tr>
<tr>
<td></td>
<td>Equipment/implants and prosthesis</td>
<td>Goal Directed therapy as standard for fluid management Standardized equipment per procedure cards, single vendor for most implants and prosthesis</td>
<td>Equipment per individual surgeon preference cards, multiple vendors for 1 implants and prosthesis</td>
</tr>
<tr>
<td></td>
<td>Pain regimen</td>
<td>Multimodal with intra articular analgesia</td>
<td>Intrathecal opioids, epidural analgesia</td>
</tr>
<tr>
<td>Post operative</td>
<td>Pain management</td>
<td>Standard postoperative multimodal pain management protocol, with emphasis on oral medication and avoidance of opiates by protocol</td>
<td>Use of opioids and PCA</td>
</tr>
<tr>
<td></td>
<td>Physical Therapy</td>
<td>Early mobilization with full weight bearing on POD 0</td>
<td>Usually mobilization on POD 1</td>
</tr>
<tr>
<td></td>
<td>Nutrition</td>
<td>Advance to normal diet on POD 0</td>
<td>Not standardized</td>
</tr>
<tr>
<td></td>
<td>Protocols for escalation of care</td>
<td>Decision tree for rapid escalation of care in case of medical deterioration</td>
<td>Same as other areas of the hospital</td>
</tr>
<tr>
<td>Post Discharge</td>
<td>Recovery Plan</td>
<td>Standardized personal recovery plan, including physical therapy, ambulation, anticoagulation management and wound care</td>
<td>Variable plan dependent on home health agency</td>
</tr>
<tr>
<td></td>
<td>Patient follow up protocols</td>
<td>Follow up includes telemedicine by surgeon, Nurse Navigator phone call and Orthopedic clinic visit</td>
<td>Follow up by Orthopedic clinic days to weeks postoperatively</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Audit plan</td>
<td>Aggressive audit schedule for quality measures and adherence to care path</td>
<td>Lack of regular audits</td>
</tr>
</tbody>
</table>

# UCI PSH Pain Management Protocol

<table>
<thead>
<tr>
<th>Table 1. UCI Medical Center Joint Surgical Home Pain Management Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preoperative holding area</strong></td>
</tr>
<tr>
<td>Acetaminophen 1000 mg orally, per os NOW</td>
</tr>
<tr>
<td>Oxycodone sustained released 10 or 20 mg orally, per os NOW</td>
</tr>
<tr>
<td>Gabapentin 300 or 600 mg orally, per os NOW</td>
</tr>
<tr>
<td>Celecoxib 200 or 400 mg orally, per os NOW (If history of serious allergy or intolerance to “sulfa drug,” use etodolac 500 mg orally, per os NOW instead of celecoxib 200 or 400 mg)</td>
</tr>
</tbody>
</table>

| **Intraoperative** |
| Anesthesia |
| Bair hugger |
| Blood warmer |
| Antibiotics |
| Spinal kit + meds |
| 1.4–1.6 mg 0.75% bupivacaine + 20 µg fentanyl |

| **Intraoperative periarthritic mixture total 100 mL volume ONCE in divided doses** |
| Epinephrine 1 mg/mL; 0.5 mL |
| Ketorolac 30 mg/mL; 1 mL |
| Clonidine 100 µg/mL; 0.8 mL |
| Ropivacaine 5 mg/mL; 49.25 mL |
| Sodium chloride 0.09%; 48.45 mL |

| **PACU** |
| Acetaminophen 1000 mg + oxycodone 10 mg orally, per os in PACU |
| PRN VAS pain score = 4 |

| **Opiates prn; dilaudid in divided doses** |

| **Patient care unit** |
| Acetaminophen 1000 mg orally, per os every 8 h. Around the clock. Start 8 h from NOW dose. Not to exceed 4 g per 24 h |
| Oxycodone sustained released 10 or 20 mg orally, per os every 12 h. Start 12 h from NOW dose |
| Gabapentin 300 mg orally, per os every night at bedtime. Adjust for renal impairment |
| Tramadol 50 mg orally, per os every 6 h PRN—mild pain. Use with caution in patient with seizure history |
| Oxycodone immediate release 10 mg orally, per os every 4 h PRN—moderate pain |
| Oxycodone immediate release 10 mg orally, per os every 4 h PRN—severe pain |
| Ketorolac 7.5 mg IV every 6 h ×2 doses. Start 6 h after surgery completed |
| Hydromorphone 0.2–0.4 mg IV push every 2 h PRN breakthrough pain |

Enhanced Recovery After Surgery (ERAS)

- A multimodal perioperative care pathway designed to achieve early recovery for patients undergoing major surgery
  - Well-defined protocol of ~20 specific clinical practices
  - Several practices pertain to acute pain management directly and indirectly
  - Started in 1990s in Denmark for colorectal surgery
    - Has spread across Europe, Canada, US
    - Now described in more surgical cohorts

- Focus on causes of prolonged hospitalization:
  - IV opiates, IVF 2/2 ileus, lack of mobility...

- Regional anesthetic block → minimize intravenous opiates → rapid awakening after surgery → early PO intake and mobilization, superior analgesia.*

ERAS for Open Colorectal Surgery

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

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)

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
Review Evidence of Individual Elements found in Pain Management Pathways

- Preoperative Elements
- Intraoperative Elements
- Postoperative Elements
Pre-operative Elements

- Gabapentin (Neurontin) or Pregabalin (Lyrica)
- Acetaminphen
- *Celecoxib (Celebrex)?*
Preoperative - Pregabalin (Lyrica)

Systematic review and meta-analysis of 55 studies

Significant positive effect at low medium and high doses:
- Improved pain scores
- Opioid-sparing
- Reduced nausea, vomiting, and pruritus

However, also increased sedation, dizziness, and visual disturbances.

Preoperative - Acetaminophen

Meta-analysis of 11 studies

Significant positive effects:
- Improved pain scores
- Opioid-sparing
- Reduced nausea and vomiting
Celecoxib (Celebrex) ?

Pain Medicine 2006. 103(6); 1271-7 Retracted.
Intraoperative Elements

- Esmolol infusion
- Dexamethasone
- Local infiltration at total joint arthroplasty
Esmolol during Hysterectomy

Esmolol infusion during surgery reduces opiate use through POD 3 (37.3 vs 54.7 mg mPCA)

BJA 2004; 93:799-805
Dexamethasone, meta-analysis

24 RCTs met inclusion criteria, 2751 patients

Combined effects favored dexamethasone >0.1mg/kg for:
- early and late pain at rest and movement
- opiate consumption

Analysis did not support delayed wound healing nor wound infection.

Anesthesiology 2011; 115(3): 575-88
Local Infiltration of Anesthesia for TJA

How is it done?

Some evidence supporting eight specific regions to infiltrate

AO&R 2014, 2(3).
Local Infiltration of Anesthesia for TJA

• What is typically given
  – LA (Ropivicaine or Liposomal Bupivicaine [Exparel])
  – Opiate (Morphine)
  – Epinephrine

• Unclear if LIA is better as in combination with or alternative to femoral nerve blocks/catheters

BJA 2012, 107(4), 487-9
Bone and Joint 2012, 94(9), 1154-9
Postoperative Elements

• *Epidurals in general surgery?*
• *Multimodal analgesia?*
Epidurals?

• Pain
  – Small statistical difference (6-17mm/100mm VAS)
  – Not clinically relevant (20-30mm/100mm VAS)

• Morbidity and mortality:
  – May minimally reduce cardiac complications in high-risk populations, but not in a general surgery population.
  – May reduce pulmonary complications in high-risk populations, but not in a general surgery population.

• Length of Stay
  – No demonstrable benefit

• Real benefits may be offset by placement failure
  – 13% to 47% in experienced hands

A&A 2014, 119(3), 740-4
Multimodal Analgesia?

• Defined
  – Use of non-opioid analgesics (NSAIDs/COX2i, APAP, ketamine)

• A Systematic Review’s Conclusions
  – Minimal theoretical and insufficient quantitative data to determine if addition of multimodal analgesics to systemic opioids results in improvement.
  – Some evidence that NSAIDs/COX2i may increase risk of severe bleeding, renal failure, and cardiovascular complications.

A&A 2007, 104(3), 689-702
Review Evidence of Pain Management Pathways

- Total Joint Arthroplasty
- Multilevel Spine Surgery
- Spine Surgery
- Meta-analysis of ERAS protocol for colorectal surgery
Total Joint Arthroplasty

- Retrospective analysis of patients undergoing THA or TKA before vs after implementation a multimodal perioperative anesthetic regimen for TJA

- Protocol
  - Spinal over General Anesthesia
  - Preoperative oral oxycontin and COX2i
  - Discouraged PCA
  - Standardized local anesthetic infiltration employed

- Outcomes
  - Improved pain at rest
  - Decreased narcotic consumption
  - Longer distance walked on early PODs
  - Decreased LOS

Table 2. Pain Scores (VAS)

<table>
<thead>
<tr>
<th></th>
<th>Rest RR</th>
<th>Rest DOS</th>
<th>Rest POD 1</th>
<th>Rest POD 2</th>
<th>Activity POD 1</th>
<th>Activity POD 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TKA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>1.5</td>
<td>4.4</td>
<td>5.6</td>
<td>5.9</td>
<td>4.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Group 2</td>
<td>2.2</td>
<td>4.8</td>
<td>4.2</td>
<td>3.5</td>
<td>3.8</td>
<td>3.9</td>
</tr>
<tr>
<td>P</td>
<td>.34</td>
<td>.54</td>
<td>.01*</td>
<td>.0004*</td>
<td>.28</td>
<td>.10</td>
</tr>
<tr>
<td>THA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>3.2</td>
<td>4.4</td>
<td>6.4</td>
<td>5</td>
<td>4.7</td>
<td>4.4</td>
</tr>
<tr>
<td>Group 2</td>
<td>3.6</td>
<td>5.8</td>
<td>5.2</td>
<td>2.8</td>
<td>4.3</td>
<td>3.3</td>
</tr>
<tr>
<td>P</td>
<td>.49</td>
<td>.02*</td>
<td>.005*</td>
<td>.000005*</td>
<td>.19</td>
<td>.004*</td>
</tr>
</tbody>
</table>

RR, recovery room; DOS, day of surgery. *Statistically significant.

*Arthroplasty 2006, 21(6), 132-8.*
Multilevel Spine Surgery

- Protocol
  - Preop: APAP, COX2i, gabapentin
  - Intraop: epidural and ketamine infusion
  - Postop: scheduled APAP, NSAID, gabapentin, ketamine, epidural

- Outcomes
  - less opioid use on POD 1 and 2
  - earlier mobilization and ambulation
  - low intensities of nausea, sedation and dizziness on POD 1–6.

ESJ 2013, 22(9), 2089–2096.
Cardiac Surgery

**Table 4 Pain scoring by 11-NRS**

<table>
<thead>
<tr>
<th>Evening scores</th>
<th>Day 0</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worst pain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multimodal</td>
<td>4.5±2.4</td>
<td>4.6±2.4</td>
<td>4.4±2.7</td>
<td>3.6±2.4</td>
</tr>
<tr>
<td>Morphine</td>
<td>5.0±2.4</td>
<td>5.5±2.4</td>
<td>5.3±2.1</td>
<td>3.9±2.3</td>
</tr>
<tr>
<td><strong>Least pain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multimodal</td>
<td>1.5±0.7</td>
<td>1.6±1.0</td>
<td>1.7±2.4</td>
<td>1.3±0.8</td>
</tr>
<tr>
<td>Morphine</td>
<td>1.7±0.9</td>
<td>2.1±1.2</td>
<td>2.5±1.7</td>
<td>1.8±0.8</td>
</tr>
<tr>
<td><strong>Average pain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multimodal</td>
<td>2.6±1.2</td>
<td>2.7±1.4</td>
<td>2.5±1.5</td>
<td>1.9±1.2</td>
</tr>
<tr>
<td>Morphine</td>
<td>3.5±2.0</td>
<td>3.6±1.6</td>
<td>3.9±1.7</td>
<td>2.7±1.5</td>
</tr>
</tbody>
</table>

**Protocol**
- Intraop: ketorolac and dexamethasone vs morphine
- Postop: ibuprofen and gabapentin vs morphine

**Outcomes**
- Lower pain scores POD 1-3
- Decreased PONV
- Fewer major in-hospital events (e.g. MI, CVA, GIB)

*JCS 2014, 9(1), 1–8.*
ERAS for Colorectal Surgery

- Meta-analysis of 7 RCTs, n = 852 undergoing colorectal surgery utilizing 4-12 ERAS elements
- Outcomes
  - Reduced LOS without difference in readmission
  - Fewer complications but no difference in mortality

*IJCD. 2012, 27(12), 1549–1554.*
Fast Tracking and Pain Pathways

• Avoid IV opiates

• Replace IV opiates with alternatives
  – Non-opiate analgesics (NSAIDs, APAP)
  – Analgesic adjuncts (gabapentin/pregabalin, ketamine)
  – Regional techniques

• Collaborative, comprehensive, forward-thinking acute pain management teams to enhance the surgical episode
Pain Pathways at BIDMC

• Ambulatory Gynecology

• Laparoscopic Colorectal Surgery

• Orthopedics
Ambulatory Gynecology

- Avoid scopolamine (r/o urinary retention, sedation)
- Encourage PO clear fluids until 2 hours before surgery
- APAP 1gm PO, Gabapentin 600mg PO, Decadrom 4-10mg IV
- End of case: Ketrolac 30mg IV vs colecoxib 400mg PO and Zofran 4mg IV
- Port site LA infiltration pre and post procedure
- TAP block for planned laparoscopy convert to open
Laparoscopic Colorectal Surgery

• First line: APAP, NSAID, TAP block
• Gabapentin Pre-operatively
• Opiates are final layer
Orthopedics

• Pre-op
  – APAP 1gm PO
  – Pregabalin 150mg PO if <70yo, 75mg if >70mg

• Intra-op
  – Emphasize spinal anesthesia (GA is the backup plan for TKA)
  – Emphasize regional/local analgesia

• Post-op
  – Start with PO oxycodone in the PACU
Summary

• Recent emphasis on fast-track programs for surgical episodes
  – Avoid opiates which cause nausea, ileus, sedation
  – Favor non-opiate analgesics, adjunct medications, and regional techniques.
  – Examples:
    • Preoperative Surgical Home (PSH)
    • Enhanced Recovery After Surgery (ERAS)

• Evidence
  – Individual elements used in pre/intra/post-operative phases
  – Comprehensive multimodal regimens

• Recent efforts at BIDMC
  – Ambulatory gynecology
  – Laparoscopic colorectal
  – Orthopedics