Preventing Persistent Post-Surgical Pain & Opioid Use in At-Risk Veterans: Effect of ACT

Katie Hadlandsmyth, PhD
University of Iowa, Carver College of Medicine, Iowa City, IA

Barbara St. Marie, PhD, AGPCNP, FAANP
University of Iowa, College of Nursing, Iowa City, IA

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Conflicts of Interest/Disclosures

• Hadlandsmyth: Nothing to disclose.

• St. Marie: Receives funding from the National Institute on Drug Abuse (5K23DA043049-03); serves on the Faculty Advisory Panel for CO*RE REMS and is a paid consultant for CO*RE REMS.
Objectives

1. To appraise the value of an Acceptance and Commitment Therapy (ACT) workshop among patients undergoing orthopedic surgeries.

2. To differentiate the contribution of mixed methods to this study on ACT.

3. To understand barriers and facilitators of implementing ACT for patients preparing for surgery.

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- Personnel:
  - Katie Hadland-Smyth, Project Director
  - Jennie Embree, Data Manager
  - Katie Geasland, Blinded Research Assistant
  - Judy Allen, Qualitative Analyst
  - Edin Sabic/Roohina Wajid, Research Interns
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Background/Rationale

- Rates of persistent post-surgical pain:
  - 50-85% amputations
  - 50% Thoracotomy
  - 20% Total Knee Arthroplasty
  - 20-50% breast surgeries

- Distress-based conditions put patients at risk for persistent pain and prolonged opioid use following surgery (Correll, Linow, Kern et al., 2005; Kern, Citri, Rossetti et al., 2000).

- Preventing these problems for the thousands of patients who undergo surgery each year can have a dramatic impact on quality of life, productivity, and reduced risk of life-threatening issues, such as opioid misuse and suicidal ideation.
Logic Model

Conceptual Model

ACT Coping Skills →

↑ pain acceptance
↑ engagement in values-based behavior

At-Risk Veterans

• High pain level
• Anxiety symptoms
• Depressive symptoms

Surgery

• Orthopedic surgery

Improved Outcomes

• No pain
• No opioids

* Coping skills: acceptance-based coping of pain; committed actions towards values-based behaviors.

Study Aims

Primary Aim #1:
Determine the feasibility of providing a 1-day ACT workshop and individualized booster session with at-risk veterans before and after surgery.

Primary Aim #2:
Determine if an ACT workshop & booster reduces the length and/or amount of pain and opioid use following surgery when compared to TAU.

Design/Setting

• Mixed Methods
  • Guided open-ended interviews
  • Single-blinded, prospective, randomized, experimental design with random assignment to one of two groups:
    1. Treatment As Usual (TAU)
    2. Acceptance and Commitment Therapy (ACT) plus TAU (ACT + TAU)

• Iowa City VAMC – orthopedic surgery clinic
  • Serves over 184,000 veterans living in 50 counties in Eastern Iowa, Western Illinois and Northern Missouri.
  • Tri-level care system; primary, secondary, and tertiary care to patients requiring orthopedic surgery.
Participants

**Inclusion Criteria:**
- Veterans, ≥ 18 years old, scheduled for orthopedic surgery
- Identified to be "at-risk" at screening visit:
  - Preoperative Pain (movement) > 7 OR > 3 and
  - HAMA (anxiety) ≥ 15
  - HAMD (depression) ≥ 17

**Exclusion Criteria:**
- Mental incapacity or a language barrier
- History of brain injury
- Bipolar or psychotic disorder
- Complications following surgery requiring reoperation

**Sample Size:**
- 70% power at α = 0.05, a 50% reduction in median time to pain or opioid cessation OR hazard ratio for quitting of 2.0.

Methods

**Table 1: Timing of Data Collection**

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**CONSORT Diagram**

- Participants: Allocated to ACT (n=44)
  - Received Surgery and Attended Workshop (n=32)
  - Received Surgery and Did Not Attend Workshop (n=8)
  - Surgery Cancelled, Attended Workshop (n=2)
  - Surgery Cancelled, Did Not Attend Workshop (n=2)

- Allocated to TAU (n=44)
  - Received Surgery (n=36)
  - Surgery Cancelled (n=8)

- Allocation Lost to Follow-Up (n=0)

- Recruitment Analysis
  - Intent-to-treat analysis (n=35)
  - Protocol analysis (n=35)

- Analysis
  - Not interested (n=87)
  - Too busy (n=58)
  - Travel difficulties (n=36)
  - Other (n=6)
  - Workshop mentioned as a factor (n=28)

- Exclusion Analysis
  - AE (n=1)
  - Low pain at enrollment (n=1)
Aim 1: Feasibility

• Workshop – 34/44 (77%) attended a workshop
  • 1st scheduling attempt: 26 (76%)
  • 2nd attempt: 6 (18%)
  • 3rd attempt: 2 (6%)
  • Never attended: 10/44 (20%)

• Booster received – 29/32 (91%) following surgery


Aim 2: Potential Efficacy

• Pain > 3
• Opioid Use
Aim 2: Mediation by CPAQ and CPVI


Qualitative Research

- Qualitative purpose
  - Examined ACT skills reported used a 1 week following workshop and 3 months after surgery
  - Map the skills to the theoretical constructs of ACT
- Prospective, longitudinal data
- Data collection
  - Phone interviews at 1 week and 3 months lasting 20-40 minutes
  - Semi-structured interview guide
  - Two qualitative researchers and a research assistant
  - Content analysis – Nvivo®

Results: Feasibility

- Barriers
  - Description of ACT and what it does
  - Travel difficulties – Rural, Winter
  - Scheduling conflicts – other medical appointments, pre-operative timeframe
  - Workshop size – 2-3 participants
- Facilitators
  - Group format
  - Engaging content and trainers
  - Use of manual and booster session
Mapping skills to ACT theoretical constructs

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<th>Skills</th>
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<th>Construct</th>
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<th>Cognitive Defusion</th>
<th>Awareness</th>
<th>Mindfulness</th>
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One participant stated he was "... accepting maybe some of the pain, ... then still carrying on with my life" rather than focusing on things he could not do.

"What I took home from that [workshop] ... is how to distance myself from – it helps out with my depression and everything 'cuz I get frustrated a lot, ... It's taking too long to heal... Instead of internalizing all of that into myself, and just thinking 'I'm no good,' and 'It's my fault that this isn't working... It helped me step outside of the box and look at it in a different direction."

"... if I live in the now, I’m not regurgitating all the pain from yesterday and I’m not stressing myself out on what might be tomorrow."

"[now he was] just trying to be aware of the pain, and that it’s gonna get better... Since then, I'm really getting' around great, don' a lot of walkin', and a lot of talkin' to people. Before [the workshop], I was at home and not doin' much and bein' angry."
...relate to your family and your kids, and what's important to you. You know what's important to you, but you just don't think about it in certain ways. That [ACT workshop] made you think about it a little different way.

Choices after this surgery compared to previous surgery:

"I don't need the tramadol so much."

Previously he thought pain was "boss" and now he chooses to not allow pain to stop the valued life, and to relax with the pain.

**Engagement**

- Committed action
- Setting goals
- Choice awareness

**Sustained goals**

- Understanding and clarifying about what's important
- Build goals around these important values
- One participant stated well:
  - First interview – set his goals to be more active, to engage in something, and to re-establish good health.
  - Three months later – still kept his goals, continued his rehabilitation on his own.
- Another participant stated before the workshop or the surgery, pain created a "... constant battle of whether I wanted to get up and move around, or not."
- Their goals helped to reduce impediment created by pain.

**Conclusion**

- Findings from this pilot feasibility study indicate:
  - Potential efficacy
  - Feasibility with some modifications

- Qualitative findings: Participants seemed to understand the ACT model of engaging in values-based living even in the presence of aversive internal content (such as pain).

- Next Steps: Larger multi-site RCT
References


Self-Assessment Questions

1. What outcome(s) did this intervention have a positive impact on?
   a) Reduction of opioids use following surgery
   b) Improvement of pain following surgery
   c) A and B
   d) None of the above

Self-Assessment Questions

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Self-Assessment Questions

2. Select outcome that was confirmed by both qualitative and quantitative data analysis.
   a) Improve ability to communicate feelings
   b) Improve function and return to activities
   c) Use of values-based activities
   d) All of the above

Self-Assessment Questions

3. Select one barrier to providing ACT in a perioperative time frame.
   a) Timing of surgery
   b) Patient readiness for surgery
   c) Location of ACT training
   d) All of the above
Self-Assessment Questions

3. Select one barrier to providing ACT in a perioperative time frame.
   a) Timing of surgery
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Self-Assessment Questions

4. What are indicators that a 1-day ACT workshop is feasible among Veterans
   a) Participants completed the workshop
   b) 1-day ACT workshops have been successful in other populations
   c) A and B
   d) None of the above
The Dynamics of Managing Acute Postoperative Pain in the Current Opioid Sparing Environment

Robert L. Barkin, MBA, Pharm D, DAAPM, DACFE, OFRSM

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Summary statements regarding postoperative pain Rx with a focus on the impact of scheduled analgesics versus no scheduled analgesics related to the management of in-hospital acute postoperative pain management

Robert L. Barkin, MBA, Pharm D, FCP, DAAPM, DACFE, OFRSM, Professor (Anesthesiology, Family Medicine, Pharmacology) Rush Medical College of Rush University (Chicago, IL); Clinical Pharmacologist, Department of Anesthesiology NorthShore University HealthSystem, Pain Centers The Orthopedic and Spinal Institute at Evanston & Skokie Hospitals Illinois

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Every effort has been made to ensure the accuracy of the data presented herein. This material may contain specific data such as drug doses and contraindications, etc., in standard sources prior to clinical application. This material might contain recommendations developed by other organizations. Please note that although these guidelines might be incorrect, this information is the best currently available from sources cited.
Objectives

1. Explain how to create a patient-specific, structured, time contingent postoperative hospital pain management plan
2. Discriminate established medical diagnosis vs. testimonial and catastrophizing
3. Explain how to integrate patient family collateral HCP in facilitating treatment initiation and pursuit of therapeutic benefit

- Initially: PMHx, PSHx, PΨHx, social Hx, Rx Hx (Rx, OTC, phytopharmaceuticals), "Allergies v. S/E's," PPMP, (multisource medications), OLD Rxs, friends, spouses, internet, external to USA travel, laboratory, EKG evaluation, (QTc)
- Pt (spouse, family), age, experiences, fears, education, expectations, post-op and pre-op opioid consumption and Pt unique needs.
- Multimodal pharmacotherapy, scheduled structure, overlapping intervals, PRN's for BTP to decrease higher doses of scheduled opioids, comorbid painful syndrome/DX (often patient amalgamated), neuroaxial opioids, ESI, IT routes.
Timely pre-surgical discussion in joint collaboration with patient, concerned others, collateral providers and the surgical team, structured decremental changes (opioid naïve v. tolerant). Create a patient-specific, patient focused, patient centered, personalized time contingent Rx plan accepted fully by patient and concerned others.

Pathways: transmission, transduction/conduction, perception, modulation

Scheduled analgesia v. anesthesia

Focus: diminish pain and suffering in quality and quantity through scheduled analgesic Rx plan with PRN for BTP and episodes. Diminish fear/anxiety of pain and improve postop functionality, ADL, PFT, performance, personal past experience and preferences; diminish pharmacotherapy iatrogenic effects, etc (constipation, GI, CNS, neuro, pulmonary, cardiac events). Address nociceptive, neuropathic, pain, controllable non-localized, non-surgical pain, facilitated by initiating a structured time contingent scheduled dosage regimen.

Negotiate catastrophizing cognitive distortion as an exaggeration, magnification or irrational thought pattern. A triad of rumination, magnification, helplessness. Addressing these focused events. “Predict and control.”

Pharmacotherapy: (time contingent structured Rx plan with an exit strategy for BTP)

APAP (IV, PO)
NSAIDS (ketorolac IV, PO NSAIDS), w/o anesthetics
AD – SNRI
SMR – Tizanidine, Orphenadrine, baclofen
AED – Gabapentinoids, (avoid for foot/ankles surgery), topiramate
NMDA: ketamine (IV), Subdiassociative-dose (0.25 to 0.5mg/kg) MG++, N20, DM.
Opioids: PO, Buccal, IV schedule doses, with limited short acting for BTP.
Anesthetics: Na+ channel blockers IV (short or long acting), topical
Tx plan exit strategy: 5 to 7 days up to 21 days (a function of extensiveness procedures, simulate home discharge environments routine ECF/NH)

Insurance/PBM coordination.

Stop all former historical opioid pain medications once at home or before Tx initiation in conjunction with pre-surgical evaluation plan.

Surgical team to maintain bilateral open dialogue with patient/family/care givers following hospital discharge with Pain Center staff as consultation.
Case 1

- 1) A 49 y/o male 73” H, 270#, BMI=33 presents for TKR due to sports trauma injury
- Vocation: MBA, JD, CPA, CEO of 180 person firm.
- Avocation: Runner, basketball, biking, gym, golf weekends
- Pain 4-10/10 a function of movement, comfortable with 4/10, achy, dull, neuropathic, nociceptive, if with pharmacotherapies present.
- PMHx: Migraine, hyperchol, GERD, OSA (CPAP – non-compliant)
- PSHx: Abd. hernia (repair - wt. lifting), clavicle repair from sports injury, ankle FX (repair, running)
- Allergies: NKDA, FA, EA, No RX side effects reported

Case 1 (Cont)

- SOC Hx: Married, 2 children, ETOH (states 1.5 oz whisky/ day “occasionally”), Spouse reveals an amount in excess of this. (must stop), nicotine Hx (cigars 1/day 7/week) (must stop), cannabis (weekend 1/d) (must stop), SRDU – denies; DIMS (sleep 11pm 3Aid).
- Test: QT 412, EKG = NSR
- INPT TX plan: PT/OT Pharmacotherapy to transfer to ECF for PT/OT in 2 days.

Case 1 (Cont)

- Pt “needs”: Expressed: “I do not want to ask for medications or “buzz” the nurses for it”, discussed structured time component to plan and rational.
- Plan: 1) schedule Rx plan in full
2) schedule the Tx plan with plans for BTP
3) use PRN to evaluate needs for outpatient ECF/N.H., P.T.
4) use PRNs and request pt. to F/u with one PCP for opioids if needed for functionality with whom he has a fiduciary relationship.
5) CPM of presurgery and add gabapentinoids and SMRs, opioids 5-7 days (consult w/ surgery team) a function of extent of surgery.
Case 2

- A 61 y/o female, 64" 192# BMI=33
- S/P (R) Hip Fx due to fall at home while doing housework
- Pain 8/10 dull, achy, throbbing, stabbing, 10/10 with movement
- PMHx: osteoporosis hypercholesterolemia, DM (type 2, diet) FMS, IBS
- PSHx: breast Bx(-), TAH, Appy
- Allergies/ S/E's 6-keto opioids = CNS, neuro, CV hypotension, GU, GI events
- PSHx: denies; aside DIMS, tearful about this fall, feels hopeless, helpless, loss of self esteem.
- SOCHx: Solitary living, EthOH (6 oz. wine/noc) nicotine: Ø, cannabis: Ø, SRDU: Ø, has one cat
- PPMP: reviewed=WNL

Case 2 (Cont)

- Routine: arise 6am, asleep 10pm, nocturie once
- RxHx: Stating (use every other day), oral hypoglycemic (less than compliant)
- OTC: D3, APAP, NSAIDS (not sure of doses or names of drugs)
- Herbas: garlic, ginger, ginseng (to stop), turmeric, melatonin
- Labs: CMP-WNL
- Tests: EKG=NSR, QTc=410
- Note: Resistance to medication "use reflects weakness" Has teenage grandchildren who visit

Case 2 (Cont)

- Plan: 1) Stop all home use OTC/Rx for pain
  2) Stop herbas-rationale given
  3) Opioids LA Q 8 to 12 hrs (abuse deterrent)
  4) APAP 500mg Q 8 hr PRN pain
  5) Small dose short acting opioids Q 8hr PRN for BTP
  6) Inpt small dose IV opioids for pain which is unresponsive to above Tx
  7) SNRI for pain, FMS, tearfulness (have social worker see pt)
  8) Low dose gabapentinoids, or topiramate
  10) scheduled NSAID IV of 6 hours when appropriate
Case 2 (Cont)

- Choices: 1) PRN doses only
  2) Timed doses of Rx plan, stop herbal/OTC at home
  3) Scheduled Tx plan with PRN (for BTP)
  4) Refer back to PCP within 15 days of outpatient post OP pain meds

Pharmacotherapeutic Rapid Evaluation (per RLB)

- Efficacy v. Efficiency
- 2. Iatrogenic Effects v. Toxic Effects
- 3. Compliance/Adherence v. Nonadherence
- 4. Economics (Payor, Self, Copay, PBM)
- 5. Monitoring: who, what, why, where
- 6. Outcomes
- 7. “Communicate before you medicate” (RLB)
- 8. Noncompliances or Noncomplainers (J. Clin Psychiatry 1988, Barkin, Stein)

Proposal for Opioid Free Anesthesia (Intraoperative Pain)

- Perioperative: APAP, NSAID (w/o C/I), scopolamine patch.
- Intraoperative: Multimodal Opioid sparing systemic analgesia, regional anesthesia evaluation, epidural anesthesia, intrathecal route.
  - Ketorolac, clidemine, lidocaine/bupivacaine, gabapentinoids, ketamine.
  - MgSO₄, methylprednisolone (Can J. Anesth 2003 50:336-41)
  - Dexmedetomidine (Br J Anesth 2014 112:306-11) or N₂O, propofol, SMR.
- Postoperative: Monitor for analgesic needs, medication side effects, medication therapeutic effects or a potential iatrogenic ADRs.
  - CPM above, anti-hyperalgesic if perceived prominent nociception persists.
  - Consider anesthesiologist fellowship trained pain specialist with a multidisciplinary pain management team inpatient and outpatient.
Self-Assessment Questions

1. In the process of designing a patient specific treatment for postoperative pain which process below is/are most important?
   a) Transmission
   b) Conduction
   c) Perception
   d) Modulation
   e) All of the above

2. During the process of synthesizing a comprehensive treatment which of the following is/are most important?
   a) Incorporating a patient specific treatment plan
   b) Encourage involvement of direct family care-givers facilitating therapeutic benefits
   c) Engage the collateral health care providers insights
   d) All of the above
Self-Assessment Questions

2. During the process of synthesizing a comprehensive treatment which of the following is/are most important?
   a) Incorporating a patient specific treatment plan
   b) Encourage involvement of direct family care-givers facilitating therapeutic benefits
   c) Engage the collateral health care providers insights
   d) All of the above

Self-Assessment Questions

3. During an evaluation of the following receiving phenomena, identify the most significant to utilize
   a) Medical diagnosis confirmed in the record
   b) Patient/family testimonials
   c) Catastrophizing
   d) Patient medication demands
   e) All of the above
Creating and Implementing Enhanced Recovery After Surgery (ERAS) Programs

Rebecca N. Blumenthal, MD
Vice Chair of Innovation
Department of Anesthesiology, Critical Care and Pain Medicine
NorthShore University HealthSystem
Clinical Assistant Professor
University of Chicago, Pritzker School of Medicine

Disclosures

• Describe the most common components of ERAS protocols, and discuss the history and evidence-based practice of enhanced recovery
• Demonstrate that ERAS protocols provide transformative plans for minimizing pain, reducing perioperative opioid usage, expediting patient recovery, and decreasing perioperative complications
• Outline the process for creation of ERAS programs for hospital systems, and identify some limitations and challenges for successful ERAS design and implementation

Learning Objectives
Creating and Implementing Enhanced Recovery Programs

Increase Awareness and “Buy-In”

Develop Plan

Assemble Multidisciplinary Team

Prepare and Execute Rollout

Ensure Sustainable Model

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ERAS: Definition

- Enhanced Recovery After Surgery
- Proven multidisciplinary, collaborative approach
- Scientific principles used to optimize pre-, intra-, and post-operative care
- ERAS protocols have been shown to:
  - Decrease length of stay (LOS)
  - Decrease perioperative complications
  - Improve outcomes
  - Lower cost
Average LOS for elective colorectal surgery was 6-12 days. Advances in laparoscopic surgery decreased LOS to 4-6 days.

- Kehlet et al (Denmark), 1990s: Multi-modal rehab, decreased LOS to 2 days.
- ERAS was born, 2000:
  - Intent: Develop evidence-based perioperative care pathways to facilitate patient recovery.

ERAS pathways proliferated nationally and internationally, initially for colorectal, but then developed for other surgical sub-specialties. Multiple conclusive studies proved the efficacy of each step of the protocols. Preponderance of clinical outcomes literature for ERAS versus conventional care supports:

- Reduced surgical stress
- Improved recovery of GI function
- Fewer complications
- Decreased LOS with no increase in readmissions

Goals of an ERAS Protocol:

- Deliver comprehensive perioperative care that is patient-centered and reduces variation in outcomes
- Optimize patients for surgery, minimize stress, and restore normal physiology expeditiously
- Encourage clinician teamwork and communication to achieve process measure compliance and success
Components of an Enhanced Recovery Program

**PREOPERATIVE**
- Preoperative Education and Optimization (Prehabilitation)
- Preoperative Fasting Guidelines and Carbohydrate Loading
- Elimination of Mechanical Bowel Preps
- Thromboembolism and Antimicrobial Prophylaxis

**INTRAOPERATIVE**
- Multimodal Non-Opioid Analgesics and Antiemetics
- Regional Anesthesia
- Normothermia and Euvolemia
- Minimize and Early Removal of Drains/Foleys/NGs

**POSTOPERATIVE**
- Early Mobilization/Ambulation
- Early Nutrition
- Multimodal Non-Opioid Analgesics

**Components of an Enhanced Recovery Program**
- Preoperative Period thru Post Discharge/Recovery
- Use Combinations of Non-Opioid Analgesics
- Improve Pain Scores
- Decrease Opioid Related Side Effects and LOS
  - Nausea/Vomiting and Pruritus
  - Sedation and Respiratory Depression
  - Ileus and Urinary Retention
  - Post-op Delirium and Addiction
- Greater Patient Satisfaction

**Multimodal Non-Opioid Analgesics**
- Decrease Opioid Use
- Decrease Pain
- Decrease PONV
- Other

<table>
<thead>
<tr>
<th>Drug</th>
<th>Decrease Opioid</th>
<th>Decrease Pain</th>
<th>Decrease PONV</th>
<th>Other</th>
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<tbody>
<tr>
<td>Tylenol</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Synergy with NSAIDS</td>
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<tr>
<td>NSAIDs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Side Effects - COX 2 can worsen COX 1</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Sedation</td>
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<tr>
<td>Dexomed</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Quick Return of GI Function</td>
</tr>
<tr>
<td>Ketamine</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Bolus vs. Infusion</td>
</tr>
</tbody>
</table>

**Common ERAS Multimodal Non-Opioid Analgesics**

“Stepwise” Positive Effects of Multimodals

1. Multimodal Analgesics
2. Multimodal Analgesics

> 2 Multimodal Analgesics

Stepwise Positive Effects of Multimodals

Additions of Non-Opioid Analgesics Associated with Additive Positive Effects in Total Joints.

- 19% Decreased Resp. Compl.
- 26% Decreased GI Compl.
- 18.5% Decreased Opioid Usage
- 12.1% Decreased LOS

NSAIDS and Cox-2 Inhibitors were the MOST EFFECTIVE Multimodal Non-Opioid Analgesics

Source: Memtsoud is et al. (2018)

Peripheral Neural Blockade (e.g. TAP, Upper and Lower Extremity Blocks)
- Decrease Opioid Consumption
- Decrease LOS (about 1 day)
- Decrease PONV and Post-Op Ileus
- Excellent for Laparoscopic Abdominal and Ortho Procedures

Central Neural Blockade (e.g. Epidural and SAB)
- Decrease Time to Return of Gut Function (by 17 hours)
- Decrease Opioids and Post-op Morbidity (CV, Pulm, GI)
- Decrease LOS (about 1 day)
- Decrease Protein Catabolism and Endocrine Metabolic Response
- Excellent in Open Abdominal Procedures

Use Low Concentration of Local Anesthetic to Prevent Motor Block and Hypotension

Regional Anesthesia

Sources: Pirrera et al. (2018), Helander et al. (2017), Kim et al. (2017), Guay et al. (2016), Popping et al. (2014), Favuzza et al. (2013), Johns et al. (2012), Charlton et al. (2010), and Holte et al. (2002)

ERAS Elements with Greatest Impact on Recovery

Early Nutrition
Early Removal of Drains/Tubes
Preop Carbohydrate Drinks
Delete Mechanical Bowel Prep,

Rogers et al. (2018)
Braga et al. (2018)
Aarts et al. (2018)
Pecorelli et al. (2017)
Improve Patient Education and Participation
Optimize Perioperative Nutrition
Standardize Perioperative Anesthetic Regimens
Minimize Pain/Opioid Usage/Stress Response
Encourage Early Mobilization and Oral Intake

ERAS Protocols are Evidence-Based

- Nicholson et al., 2014, BJS
- Lau et al., 2017, World J Surg
- Visioni et al., 2017, Annals of Surg

# Randomized Controlled Studies
# Patients
# Surgical Sub-Specialties
Decreased LOS
Decreased Complications
Decreased Cost
No changes in…

Meta-Analysis of ERAS Programs in Surgical Patients

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td># Randomized Controlled Studies</td>
<td>18</td>
<td>42</td>
<td>99</td>
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<tr>
<td># Patients</td>
<td>5,099</td>
<td>5,241</td>
<td>6,500</td>
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<tr>
<td>Surgical Sub-Specialties</td>
<td>CR, GU, Upper GI, Thoracic</td>
<td>CR, GU, Upper GI, Thoracic</td>
<td>CR, GU, Upper GI, Thoracic</td>
</tr>
<tr>
<td>Decreased LOS</td>
<td>1.14 days</td>
<td>2.35 days</td>
<td>2.50 days</td>
</tr>
<tr>
<td>Decreased Complications</td>
<td>30%</td>
<td>8%</td>
<td>Odds Ratio=0.7</td>
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<tr>
<td>Decreased Cost</td>
<td>N/A</td>
<td>$830/day</td>
<td>$3109/day</td>
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<tr>
<td>No changes in…</td>
<td>Mortality, Readmissions, Major Complications</td>
<td>Mortality, Readmissions, Major Complications</td>
<td>No changes reported</td>
</tr>
</tbody>
</table>

Additional ERAS Benefits

- Reduced Cost
- Increased Revenue
- Reduced Post-Op Infections
- Decreased Inflammatory Mediators
- Reduced Opioid Usage
- Decreased Addiction Risk
- Rapid Recovery and Return to Oncologic Therapy
- Decreased Cancer Recurrence and Improved QOL
• Health Economics in ERAS Programs

- Stowers et al., Can J Anesth 2015
- 17 Studies
  - Colorectal, Bariatric, Gyno, Gastro, Pancreatic, Esophageal, Vascular
  - All Studies Report Cost Savings (Related to Quick Recovery, Decreased Mortality, and Complications)
  - All Costs are In-Hospital Costs
  - Few Studies Account for Readmissions and Follow-Up

- ERAS protocols need initial investments by institutions, but rapidly result in important gains financially and clinically
- Once implemented, financial gains continue to result in considerable savings proportional to the number of patients in the protocols

Cost Benefits

ERAS Protocols Reduce Post-op Infections

ERAS Protocols Combat the Opioid Crisis

- US Opioid Epidemic:
  - 2 million Americans dependent on opioids for chronic medical conditions
  - 4 million Americans use prescription opioids non-medically
  - 1/3 of people addicted to opioids took their first opioid post-operatively
  - 2018 DEA mandated a 20% decrease in opioid manufacturing
- ERAS Solution: Decrease Perioperative Opioid Usage
  - Patient Education and Expectation Management
  - Multimodal Non-Opioid Analgesia
  - Regional Anesthesia
- Challenge: Define Appropriate Quantity of Post-op Discharge Meds

Sources:
- Stowers et al. (2015)
- Grant et al. (2017)
- Brandal et al. (2017)
- Warren et al. (2017)
- Wick et al. (2017)
ERAS Impacts Cancer Survival

Sources: Askild et al. (2017), Kim et al. (2016), Juneja et al. (2014), Gustafsson et al. (2013)

Creating and Implementing Enhanced Recovery Programs

How Do We Implement ERAS Pathways???

- There is No Formula!
- ERAS Must be Tailored to an Institution and Practice.
- Coordination, Integration, and Standardization are Keys for Successful ERAS Programs.

ERAS Impacts Cancer Survival
Enhanced Recovery
- Return to Baseline Oncologic Therapy
- Decrease Recurrence
- Improve Survival

Creating and Implementing Enhanced Recovery Programs
- Increase Awareness and "Buy-In"
- Develop Plan
- Assemble Multi-Disciplinary Team
- Prepare and Execute Rollout
- Ensure Sustainable Model
First Steps of ERAS Implementation

1. Review Quality Data
   - Identify best practices
   - Compare with current standards

2. Refine Metrics to Improve
   - Define specific goals
   - Implement changes

3. Identify ERAS “Champion”
   - Typically a Physician (Anesthesiologist or Surgeon) willing to lead

Appoint a Clinical “Champion”

Champion’s Initial Responsibilities

- Administrative Support
  - Recruit motivated leaders
  - Develop a plan

- Literature Review
  - Evidence-based practice
  - Current literature review

- Goals and Outline
  - Set goals and objectives
  - Outline implementation plan

- Recruiting Motivated Leaders
  -Recruit and retain leaders
  - Provide training
Creating and Implementing Enhanced Recovery Programs

Increase Awareness and "Buy-In"

Develop Plan

Assemble Multi-disciplinary Team

Prepare and Sustain Model

Ensure Sustainable Model

Multidisciplinary Team of Stakeholders

- Anesthesiology
- Surgery
- Quality Managers
- Nursing
- Physical Therapy
- Pain Clinic
- Nutrition
- Information Technology – EMR
- Home Care

Multidisciplinary Team of Stakeholders

ERAS Steering Group Meetings

- Start with Core Group
- Present Quality Data
- Build Consensus
- Identify Evidence-Based Best Practice
- Develop Timeline
- Identify Financial Barriers to Success
  - Cost Restraints
  - Resource Availability
- Time Constraints
- Identify Key/Champion Champions
- Administrative and Dept. Support
- "Buy-In" From All Providers
- IT and Quality Involvement
- Pharmaceutical Approval/Availability

Communication
Creating and Implementing Enhanced Recovery Programs

- Increase Awareness and "Buy-In"
- Develop Plan
- Assemble Multidisciplinary Team
- Prepare and Execute Rollout
- Ensure Sustainable Model

Getting to the Finish Line!

- Preparation
- Execution

Create a Preoperative Education Manual

- Helps Patients Understand and Prepare for Surgery
- Sets Expectations Management
- Delivers Enhanced Recovery and Describes the Goals of ERAS (Quieter Recovery, Fewer Complications, Less Pain)
- Helps the Patient Play an Active Role in Their Recovery Patient Participation
- Guides Patients Through the Entire Perioperative Journey (Prep through Discharge) and in Transition Sped FK
1. Develop Evidence-Based ERAS Protocol
   a) Define Pre-, Intra-, and Post-op Interventions
   b) Consider Resources, Patients, Local Experience etc.
   c) Obtain Input, Support, and Consensus of Multidisciplinary Team
   d) Pre-emptively Recognize Areas of Contention
2. Create New ERAS Pre-op and Post-op Order Sets and Eliminate Old
3. Define New Nursing Care Plans
4. Commitment that All Patients having Procedure, All Providers, Will Participate

Design ERAS Pathway and New ERAS Order Sets

Involvement of Multidisciplinary Team Members

- Pain Clinic
  - ERAS Spinal Fusion Patients (or any ERAS patient on chronic opioids)
  - Pre-op Consult for Patients on >50 MMEs of Opioids, Extended Release Opioids, with Substance Abuse History, Difficult to Control Pain Issues etc.
  - Help Adjust ERAS Spine Protocol and Meds to Assist with Perioperative Pain Management
- Acute Pain Consults Post-op
- Patients Return Post-op to Primary Pain MD
- Pharmacy
  - Review Order Sets
  - Approve, Order, Stock ERAS Meds
- Physical Therapy
  - Spinal Fusion ERAS
  - Total Joint/Ortho ERAS
- Home Care
  - Discharge Planning
- Informational Technology
  - Input New Order Sets
  - Design Program to Track Metrics

Education of All Personnel Involved in Care (Anesthesiologists, Surgeons, RNs, PAs)

Continuous Refinement of Protocol, Manual, Order Sets with Input by Team

IMPLEMENT!!!!

Final Steps Prior to Rollout
Creating and Implementing Enhanced Recovery Programs

Increase Awareness and "Buy-In"

Develop Plan

Assemble Multi-disciplinary Team

Prepare and Execute Rollout

Ensure Sustainable Model

---

Keys to Creating a Sustainable Model

Establish Governance

Track Metrics

Maintain Accountability

Ensure Compliance

---

Establish Successful Governance

- Clinical Leadership is Key
- Each Protocol should be Championed by Physicians and Nurses on the “Front Lines” and in the Quality Department
- ERAS Champions need to be Willing to Build ERAS Pathways with a Multidisciplinary Team and Support the Protocol Pre- and Post-Implementation
- Leaders need to Devote Significant Non-Clinical Time to the ERAS Effort
- If Few Protocols exist in the Literature, Champions Need to be Willing to Build, Evaluate, and Pioneer a New Pathway
- The Leadership Team must continue to meet Post Rollout to Evaluate Metrics and Outcomes and Revise the Pathway
Institution Specific
- Simplified with Help of EMR and Hospital IT Department
- Quality Managers Invaluable

Define and Track Metrics
- Reduced Loops
- Improved Length of Stay
- Lower Cost

Institution Specific
- Simplified with Help of EMR and Hospital IT Department
- Quality Managers Invaluable

Compliance and Accountability Will Ensure Future Continued Success of ERAS
- Maintain Accountability and Set Goals of Participation
- Ensure Maximum Compliance with Entire ERAS Protocol

ERAS Process Review- Criteria for Future ERAS Protocol Development
- Current Volume of Procedure
- Anticipated Growth of Procedure
- Procedure Risk for Adverse Events
- Clinical Leadership & Support; Desire to Collaborate Towards a Goal
Future ERAS Directions

Hospital Recovery: Metrics: LOS, Readmission Rate, Cost, etc

Clinical Recovery: Return to Baseline Physiologic Parameters: Ambulate, Void, etc

Biological Recovery: Biomarkers: CRP, Neutrophil-Lymphocyte Ratio

Patient Reported Outcomes Tools: QoR-9,15,40, PQRS

• ERAS Protocols are Evidence-Based, Multidisciplinary, and Collaborative Approaches to Perioperative Care Based on Scientific Principles that Optimize Preoperative, Intraoperative, and Postoperative Care

• ERAS Care Maps and Standardization Result in Significant Decreases in Complications, Opioid Use, LOS, and Cost, and Improved Patient Rehabilitation and Recovery

• ERAS Strategies are Increasingly Being Utilized In the Era of Value-Based Care

Enhanced Recovery After Surgery (ERAS)-Summary

Creation and Implementing Enhanced Recovery Programs-Conclusion

• Development of Enhanced Recovery Programs Requires “Clinical Champions” and Broad Multidisciplinary Support and Participation

• A Number of Roadblocks for Successful ERAS Implementation may Need to be Overcome including Cost Restraints, Resource Availability, Time, Administrative and Departmental Support, “Buy-In” from All Providers, Reliable Ancillary Support Services, and Involved Quality Managers

• After Implementation of ERAS Pathways, it is Imperative that a Plan Exists to Ensure the Program Remains a Successful and Sustainable Model
1. **ERAS Protocols**
   a. Depend only on input from the anesthesia and surgery teams.
   b. Are evidence-based pathways that encompass all aspects of perioperative care.
   c. Consist of preoperative, intraoperative, and postoperative elements; in recent studies, the preoperative elements are associated with the greatest impact on recovery.
   d. Are proportionally successful based on the number of ERAS interventions in a protocol (increased numbers of interventions lead to increased success).

2. Several systematic review and meta-analysis reports of ERAS programs in multiple surgical subspecialties (colorectal, upper abdominal, genitourinary, orthopedic, and thoracic) have demonstrated that ERAS care is associated with all of the following except:
   a. Decreased hospital length of stay.
   b. Reduced perioperative complications.
   c. Increased readmission rate.
   d. Reduced pain score, opioid usage, and opioid-related side effects.

3. All of the following factors may limit successful implementation of ERAS programs in hospital systems except:
   a. Resource availability and cost.
   b. Administrative support.
   c. "Buy-in" from all providers.
   d. Private versus academic hospital systems.
   e. Committed ERAS champions.

---

**Self-Assessment Questions**

1. 1. b
2. 2. c
3. 3. d

**Appendix: References**


References (cont.)


References (cont.)


References (cont.)

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110

Disclaimer

111
Conflicts of Interest/Disclosures

I have nothing to disclose.

Objectives

- Appreciate the effect of physical therapy interventions on aberrant nociceptive processing.
- Understand the use of quantitative sensory testing in physical therapy management of chronic pain.
- Recognize the importance of a collaborative approach in health care for management of chronic pain.

Chronic Pain: An Epidemic

- Prevalence of chronic pain in US adults > 18 yo
  - estimated at 30.7 and 43%
- Similar statistics in UK
- Social and financial ramifications staggering
  - Disability, reduced quality of life
  - Increased risk of hospitalization, institutionalization, mortality

Johannes 2010 | Pain, Institute of Medicine 2010, Fayaz 2016 BMJ
Schafer 2014 BMC Public Health, Morales-Espinoza 2016 Pain
Another US Epidemic:
• Opioid-related abuse and addiction

Musculoskeletal pain
• May present with myriad of symptoms
• Confusing to clinician
• Leads to non-specific diagnoses (eg: Low Back Pain)

What is sensitization?

Neuroplasticity
Old view: pain was hard-wired
Stimulus  ➔  Response
The central nervous system can learn...
Peripheral Sensitization

“stimulus evoked plasticity of the nociceptor” Woolf 2007 Anesthesiology

Inflammatory mediators bind to receptor - cause:
↓ threshold
↑ excitability

Primary hyperalgesia

restricted to site of tissue injury
Requires ongoing stimulus for maintenance

Central nociplasticity

• occurs following repetitive or intense noxious stimulus

Characterized by:
• Increased excitability of nociceptive pathways
• Decrease in descending inhibition

Courtney 2010 J Pain, 2016 JOSPT

Adapted from Costigan 2009 Ann Rev Neurosci

How do we identify the patient with centrally mediated pain?

• Laboratory Methods

• Clinical Presentation
Found:
• Hyperexcitable FWR (nociceptive reflex) in knee OA vs. healthy age/gender matched control subjects
• ↓ threshold to elicit reflex

Facilitated nociceptive reflex as a biomarker for central sensitization

Other Musculoskeletal Conditions
• Whiplash, Fibromyalgia
  Banic 2004
• Cervical Spine Dysfunction
  Sterling 2010
• Lateral Epicondylalgia
  Lim 2012
• Anterior Cruciate Ligament Rupture
  Courtney 2011

Clinical Features of Central Nociplasticity
Clinical features of centrally-mediated pain

- Heightened intensity of pain
- Spreading of Pain (Altered pain threshold outside of injured area = Secondary hyperalgesia)
- Pain ramps up easily (temporal summation)
- Impaired ability to inhibit pain
- Latent pain
- Hypoesthesia

Greater Intensity and Distribution of Symptoms/Hyperalgesia

- Increased size of peripheral receptive field

Clinical Implication:
Input from a wider region can induce pain

In Knee OA:
Enlarged areas of pain associated with
- higher knee pain severity, stiffness and
- higher scores on Central Sensitivity Inventory

How? Heterosynaptic Facilitation

Figure 2: Mechanisms underlying allodynia and spreading of pain with central sensitization; heterosynaptic sensitisation
Regional vs Widespread Hyperalgesia

Dynamic Measures of Central Sensitization

• Conditioned Pain Modulation
  • Detects impaired descending inhibition

• Temporal Summation
  • Detects hyperexcitability of nociceptive pathways

Dynamic Measures of Central Nociplasticity

• Temporal summation of second pain is the perceptual correlate of wind-up
  Price 1977, Pain

• Homosynaptic facilitation
  • Repetitive stimuli applied (1 Hz)
  With central nociplasticity:
    • Steeper response curve

Temporal Summation

127
128
129
Dynamic Measures of Central Sensitization

- Found in many chronic pain populations
  - Knee OA: Arendt-Nielsen 2003 Pain, Courtney 2016 JOSPT
  - Hip OA: Kosek and Ordeberg 2000 Pain
  - Chronic patellofemoral pain: Rathleff 2016 Pain Med

Impaired Pain Inhibition

- Found in many chronic pain populations

Management
TENS
Transcutaneous electrical nerve stimulation

**How does it work? (both central and peripheral effects)**

- "Re-boots" descending inhibition
- Repetitive use results in a cumulative and longer-lasting TENS effect

**Local Effects:**

- In animal model, reduces Substance P

*Vance 2014
*Rokugo 2002

**Dosing:**

- Stimulation amplitude must be of sufficient strength to produce an analgesic effect
- Repeated use dampens central excitability and enhances descending inhibition
- Use mixed-frequency. Modulating between low and high frequencies delays opioid tolerance

**Interpretation:**

1. Turn it up
2. Use it often
3. Use Modulating Frequencies

*Use high frequency TENS in patients using opoid medications

*Slake 2013

**Why does it work?**

*Slake 2013
Manual therapy

- RCT demonstrated independent contribution of manual therapy for knee OA treatment outcomes
  
  Abbott 2015 JOSPT

Applied Grade III oscillatory mobilization at the tibiofemoral joint 2 x 3 minutes

Result:
- ↓ flexor withdrawal response
  - Decreased Central Sensitization

Courtney 2016 JOSPT

Joint Mobilization Enhances Mechanisms of Conditioned Pain Modulation in Individuals With Osteoarthritis of the Knee

Courtney 2016 JOSPT
Physical Activity Guidelines

• For Overall Cardiovascular Health:
  • At least 30 minutes of moderate-intensity aerobic activity at least 5 days per week for a total of 150 minutes.
  OR
  • At least 25 minutes of vigorous exercise 3 days per week
  AND
  • Moderate- to high-intensity muscle-strengthening activity 2 days per week

Exercise in Physical Therapy

• Strength
• Endurance
• Motor Control
• Function
• Power

But, what about for pain?
Inoculation for chronic pain?

- Regular physical activity prevents development of chronic muscle pain and exercise-induced muscle pain. 
- How?
- Reducing phosphorylation of NRE subunit of NMDA receptor in CNS (a component of central sensitization)
- Regular physical activity = no effect on development of acute pain
- But prevents development of central sensitization
- **Physical inactivity is a risk factor for development of chronic pain**

Exercise induced Analgesia:

- **Peripheral Effects**
  - Muscle contraction disperses inflammation
  - Restores joint normal movement
  - Removes mechanical driver of pain
  - Also increases expression of endogenous analgesic substances in exercising muscle

- **Central Effects**
  - Opioid Mechanisms
    - β-endorphin release activates descending inhibitory pathways
  - Non-Opioid Mechanisms
    - Serotonergic Inhibition
    - Exercise increases serum concentrations of endocannabinoids

Aerobic Exercise: Dose Response

- Recommend intensity >50% VO2 max and duration >10 min to elicit exercise analgesia
ISOMETRIC CONTRACTION: Dose Response

**Low level contraction (elbow flexion) for long duration = greatest decrease in pain**

Hoeger-Bement 2008

“Hypalgesic effect larger for contractions at a low to moderate intensity held for longer durations.”
Hoeger-Bement 2008

Confrontational therapy (Graded Exposure)

- exposure of patient to the feared stimuli (activity) without any danger
- graded or hierarchical approach
- the most mildly feared activities are targeted first
- gradual exposure to more intense anxiety provoking stimuli
- therapist and client collaboratively develop an exposure hierarchy in which feared stimuli are ranked accordingly

López-de-Uralde-Villanueva 2016 Pain Med

Conclusion

- increasing evidence that various therapies can down modulate pain processing such as:
  - TENS
  - Manual therapy
  - Exercise
Questions

1. Your patient is a 27 year old female with chronic low back pain, with intermittent radiation into the left gluteal region and lower extremity. On the PainDetect Questionnaire, she answers that “light touching (i.e. clothing) is moderately painful” in the lumbar region. Regarding her response to light touch, you hypothesize that the patient:
   a. is catastrophizing her symptoms
   b. is reporting allodynia to light touch
   c. may have neuropathic pain
   d. B and C

Questions

1. Your patient is a 27 year old female with chronic low back pain, with intermittent radiation into the lumbar region and lower extremity. On the PainDetect Questionnaire, she answers that “light touching (i.e. clothing) is moderately painful” in the lumbar region. Regarding her response to light touch, you hypothesize that the patient:
   a. is catastrophizing her symptoms
   b. is reporting allodynia to light touch
   c. may have neuropathic pain
   d. B and C

References
Question 2. Which of the following regarding descending pain inhibition is true?
   a. Physical therapy interventions such as exercise, manual therapy and TENS facilitate pain inhibition
   b. The amygdala is a key relay for pain modulation
   c. Because the effect of TENS is long lasting, recommended dosage is once/week
   d. Opioid and serotonergic mechanisms may interact to promote analgesia with exercise
   e. A and D

Question 3. Regarding graded exposure for management of the client with chronic musculoskeletal pain:
   a. involves gradual exposure in terms of time or intensity to a painful activity
   b. pain is always disregarded during these therapies
   c. it is best to start with the most irritating activity
   d. all of the above
Question

3. Regarding graded exposure for management of the client with chronic musculoskeletal pain:
   a. involves gradual exposure in terms of time or intensity to a painful activity
   b. pain is always disregarded during these therapies
   c. it is best to start with the most irritating activity
   d. all of the above

Thank you!