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Perioperative Pain Management and Current Evidence

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American Pain Society
RESEARCH
EDUCATION
TREATMENT
ADVOCACY
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Guidelines on the Management of Postoperative Pain

Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council

Roger Chou,* Debra B. Gordon,† Oscar A. de Leon-Casasola,‡ Jack M. Rosenberg,§ Stephen Bickler,¶ Tim Brennan,‖ Todd Carter,** Carla L. Cassidy,†† Eva Hall Chittenden,‡‡ Ernest Degenhardt,§§ Scott Griffith,¶¶ Renee Manworren,‖‖ Bill McCarberg,*** Robert Montgomery,††† Jamie Murphy,‡‡‡ Melissa F. Perkal,§§§ Santhanam Suresh,¶¶¶ Kathleen Sluka,‖‖‖ Scott Strassels,**** Richard Thirlby,†††† Eugene Viscusi,‡‡‡‡ Gary A. Walco,§§§§ Lisa Warner,¶¶¶¶ Steven J. Weisman,‖‖‖‖ and Christopher L. Wu‡‡‡‡

Justification

- 80% patients experiment post operative pain
- 57% rate this pain as moderate, severe, or extreme

Apfelbaum JL, Chen C, Mehta SS, Gan TJ: Postoperative pain experience: Results from a national survey suggest postoperative pain continues to be undermanaged. Anesth
Gan TJ, Habib AS, Miller TE, White W, Apfelbaum JL: Incidence, patient satisfaction, and perceptions of postsurgical pain: Results from a US national survey. Curr Med Res Opin 30:149-160, 2014

Pain

- Impact
  - Life quality
  - Function
  - Functional recovery
  - Post surgical complications
  - Persistent post surgical pain

Guidelines

- American pain society (APS) Commissioned
- American Society of Anesthesiologist (ASA) Input
- American Society of Regional Anesthesia (ASRA) Reviewed

- Optimal management begins in the preoperative period

- 32 Recommendations

Methods

- Panel of 23 members of experts in different fields, directed by three co chairs
  - One selected by APS, One by ASA

Audience and Scope

- All clinicians who manage postoperative pain
- Provide evidence based recommendations on management of postoperative pain

Evidence Review

- Oregon Evidence-Based Practice Center
  - Key questions developed, scope, inclusion criteria to guide the review
    - Literature Review November 2012 with updated searches until December 2015
      - Multiple electronic databases
      - Reference list of relevant articles
      - Suggestions from expert reviewers
        - 6556 Abstracts reviewed
        - 107 Systematic reviews and 858 Primary studies (Not included before) were included in the evidence report

Pacific Northwest Evidence-based Practice Center

- 32 Recommendations
  - 4 High quality evidence
  - 11 Low quality evidence

Grading of the Evidence and Recommendations

- Grading of Recommendations Assessment, Development, and Evaluation Working Group [a]
  - Strength of recommendation
    - Strong
      - Benefit >> Risk
    - Weak:
      - Benefit > Risk
  - Quality of evidence
    - High, moderate or poor
      - Studies: Type, number, size, quality


CHEST Special Features

Grading Strength of Recommendations and Quality of Evidence in Clinical Guidelines*

Report From an American College of Chest Physicians Task Force

[a] Chest 129:174-181, 2006

Guidelines Development

- Panel meets
  - 2009 (Scope and questions)
  - 2011 (potential recommendations)
- Recommendations (Second meeting and additional)
  - Multistage delphi process
    - Each recommendation ranked and revised
      - 66% ranked: Became approved (Unanimous for most of them)
      - Lowest raked: Eliminated
    - People with conflict of interest did not vote.
  - Panel Subgroups
    - Recommendations written
    - Feedback from panel
  - External peer reviewers (>20)
  - Second review
- ASC approval April 2015
- ASRA approval August 2015
- ASA approval October 2015
- Guidelines update planning for 2021, or earlier if new evidence available

- 1 Individual tailored education, treatment options, plan and goals
- 2 Instruction on specific children's pain evaluation by caregiver
- 3 Thorough medical history: Medical, surgical, psychiatric, pain, medications
- 4 Pain treatment: Pain Control vs Side effects
- 5 Validated tool to assess pain
- 6 Multimodal analgesia, pharmacological and non pharmacological
- 7 Transcutaneous Nerve Stimulation (TENS)
- 8 Consider acupuncture, massage, Cold
- 9 Cognitive-Behavioral Therapy in adults
- 10 Opioids per mouth if patient is able to.
- 11 Avoid Intra muscular route for analgesics
- 12 Opioids PCA if oral route is not an alternative
- 13 If PCA, avoid basal Infusions in Opioid naïve adults
- 14 Opioids Post Operative: Monitor accordingly (Respiratory)
- 15 Acetaminophen and/or NSAIDS if not contraindication to all patients
- 16 Preoperative Celecoxib if not contraindicated
- 17 Consider Preoperative Gabapentin or Pregabalin
- 18 Consider IV Ketamine in adults
- 19 Consider IV Lidocaine infusion in adults for laparoscopic or open abdominal surgery
- 20 Surgical site-specific local anesthetic infiltration according to procedure
- 21 Topical Local anesthetics and blocks for circumcision
- 22 NO Local anesthetics applied directly in the pleural space
- 23 Peripheral regional anesthetic techniques in adults and children according to procedure
- 24 Continuous Local anesthetic peripheral regional infusions to extend duration
- 25 Clonidine as adjuvant, to extend single injection peripheral blocks
- 26 Neuraxial analgesia for major thoracic and abdominal procedures
- 27 NO Neuraxial magnesium, benzodiazepines, neostigmine, tramadol, and ketamine
- 28 Appropriate monitoring for patient receiving neuraxial interventions
- 29 Organizational structure with policies and processes for safe and effective post operative pain control
- 30 Surgical facilities should have access to pain specialist for patients with, or at risk of inadequate post operative pain
- 31 Qualified personal, as well as established polices and procedures when Neuraxial and Continuous peripheral nerve blocks are performed
- 32 Education to all patients and caregivers on pain treatment plan, including tapering after hospital discharge.

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Areas of Recommendation

- Preoperative Education and Perioperative Pain
- Methods of Assessment
- Organizational Structure, Policies, and Procedures
- Transitioning to Outpatient Care
- Physical Modalities
- General Principles Regarding the Use of Multimodal Therapies
- Systemic Pharmacological Therapies
- Local and/or Topical Pharmacological Therapies
- Peripheral Regional Anesthesia
- Neuraxial Therapies

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Preoperative education and perioperative pain management planning

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2 Instruction on specific children's pain evaluation by caregiver

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Preoperative education and perioperative pain management planning

- **Individual tailored education, treatment options, plan and goals**

STRONG RECOMMENDATION LOW QUALITY

Egbert LD, Battit GE, Welch CE, Bartlett MK: Reduction of postoperative pain by encouragement and instruction of patients. A study of doctor-patient rapport. N Engl J Med 270:825-827, 1964
Anderson EA: Preoperative preparation for cardiac surgery facilitates recovery, reduces psychological distress, and reduces the incidence of acute postoperative hypertension. J Consult Clin Psychol 55:513-520, 1987
Arthur HM, Daniels C, McKelvie R, Hirsh J, Rush B: Effect of a preoperative intervention on preoperative and postoperative outcomes in low-risk patients awaiting elective coronary artery bypass graft surgery. A randomized, controlled 2000

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Preoperative education and perioperative pain management planning

- **Instruction on specific children's pain evaluation by caregiver**

STRONG recommendation LOW quality

Chambers CT, Reid GJ, McGrath PJ, Finley GA, Ellerton ML: A randomized trial of a pain education booklet: Effects on parents' attitudes and postoperative pain management. Child Health Care 26:1-13, 1997
Huth MM, Broome ME, Mussatto KA, Morgan SW: A study of the effectiveness of a pain management education booklet for parents of children having cardiac surgery. Pain Manag Nurs 4:31-39, 2003
Kankkunen P, Pietilä AM, Vehviläinen-Julkunen K: Families' and children's postoperative pain - literature review. J Pediatr Nurs 19:133-139, 2004
Finley GA, Chambers CT, McGrath PJ, Walsh TM: Construct validity of the parents' postoperative pain measure. Clin J Pain 19:329-334, 2003

Preoperative education and perioperative pain management planning

- **32 Education to all patients and caregivers on pain treatment plan, including tapering after hospital discharge.**

STRONG recommend LOW quality

- Medication
  - Doses, tapering, side effects, interactions

Reynolds MA: Postoperative pain management discharge teaching in a rural population. Pain Manag Nurs 10:76-84, 2009

Areas of Recommendation

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- **Methods of Assessment**
- General Principles Regarding the Use of Multimodal Therapies
- Physical Modalities

- Methods of Assessment
- Organizational Structure, Policies, and Procedures
- Transitioning to Outpatient Care

- Peripheral Regional Anesthesia
- Neuraxial Therapies
- **Organizational Structure, Policies, and Procedures**
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Preoperative Education and Perioperative Pain Management Planning

- **Thorough medical history: Medical, surgical, psychiatric, pain, medications, substance abuse, previous postoperative treatment.**

`STRONG Recommendation LOW quality

Donovan M, Evers K, Jacobs P, Mandleblatt S: When there is no benchmark: Designing a primary care-based chronic pain management program from the scientific basis up. J Pain Symptom Manage 18:38-48, 1999
Hibbard J: Engaging health care consumers to improve the quality of care. Med Care 41(Suppl):161-170, 2003 134.
Hinrichs-Rocker A, Schulz K, Jarvinen I, Lefering

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Preoperative Education and Perioperative Pain Management Planning

- **Pain treatment: Pain Control vs Side effects**

`STRONG Recommendation LOW quality

American Pain Society: Management of Acute Pain and Cancer Pain with Analgesics. In: American Pain Society. Principles of Analgesic Use. 8th ed. Glenview, IL, American Pain Society, 22-23, 2008
Gordon DB, Dahl J, Phillips P, Frandsen J, Cowley C, Foster RL, Fine PG, Miaskowski C, Fishman S, Finley RS: The use of "as-needed" range orders for opioid analgesics in the management of acute pain: A consensus statement of the American Society for Pain Management Nursing and the American Pain Society. Pain Manag Nurs 5:53-58, 2004

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Methods of Assessment

- **Validated tool to assess pain**
  STRONG Recommendation LOW quality

American Pain Society: Management of Acute Pain and Cancer Pain with Analgesics. In: American Pain Society. Principles of Analgesic Use. 8th ed. Glenview, IL, American Pain Society, 22-23, 2008

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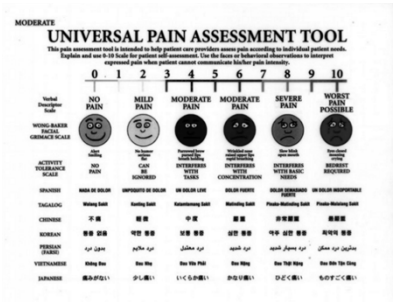
Methods of Assessment



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Methods of Assessment

Table 1. Examples of Validated Pain Intensity Assessment Scales

Name of Scale	*Rating System*
NRSs	Six-point NRS (NRS 0-5)[107] Eleven-point NRS (NRS 0-10)[24,25,53,95] Twenty-one point NRS (NRS 0-20)[50,131,281]
VRS	Four-point VRS[53] Seven-point Graphic Rating Scale[24,25] Six-point Present Pain Inventory (PPI)[34,95,157,201,223]
Visual Analogue Scales	Commonly rated 0 to 10 cm or 0 to 100 mm.
Pain Thermometer	Combines a visual thermometer with verbal descriptions of pain[130,131]
Faces Rating Scales	Faces Pain Scale-Revised[31,53,83,93,131,157,273,281] Wong-Baker FACES pain rating scale[309,314] Oucher scale[27,29]

Abbreviations: NRS, Numeric Rating Scale; VRS, Verbal Rating Scale.

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Methods of Assessment

Table 2. Suggested Elements of Postoperative Pain Assessment

Element	Questions Used for Assessment
1. Onset and pattern	When did the pain start? How often does it occur? Has its intensity changed?
2. Location	Where is the pain? Is it local to the incisional site, referred, or elsewhere?
3. Quality of pain	What does the pain feel like?
4. Intensity	How severe is the pain? (See Table 1)
5. Aggravating and relieving factors	What makes the pain better or worse?
6. Previous treatment	What types of treatment have been effective or ineffective in the past to relieve the pain?
7. Effect	How does the pain affect physical function, emotional distress, and sleep?
8. Barriers to pain assessment	What factors might affect accuracy or reliability of pain assessments[129] (eg, cultural or language barriers, cognitive barriers, misconceptions about interventions)?

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Organizational Structure, Policies, and Procedures

- **29 Organizational structure with policies and processes for safe and effective post operative pain control**
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Organizational Structure, Policies, and Procedures

- **Organizational structure with policies and processes for safe and effective post operative pain control**

  STRONG recommendation LOW quality
- **Multidisciplinary team**
- **Administrative and Physician leadership role**

Bradley EH, Herrin J, Mattera JA, Holmboe ES, Wang Y, Frederick P, Roumanis SA, Radford MJ, Krumholz HM: Quality improvement efforts and hospital performance: Rates of beta-blocker prescription after acute myocardial infarction. Med Care 43:282-292, 2005

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Organizational Structure, Policies, and Procedures

- **Surgical facilities should have access to pain specialist for patients with, or at risk of inadequate post operative pain**

STRONG recommendation LOW quality

- **Pain specialist: Diagnosis, Interventional treatment, comorbidities management**

Hadi I, Morely-Forster P, Dain S, Horrill K, Moulin D: Brief review: Perioperative management of the patient with chronic non-cancer pain. Can J Anaesth 53:1190-1199, 2006
Huxtable C, Roberts L, Somogyi A, Macintyre PE: Acute pain management in opioid-tolerant patients: A growing challenge. Anaesth Intensive Care 39:804-823, 2011
Rozen D, DeSaetano N: Perioperative management of opioid-tolerant chronic pain patients. J Opioid Manag 2: 353-363, 2006

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Organizational Structure, Policies, and Procedures

Table 4. Management of Postoperative Pain in Patients Receiving Long-Term Opioid Therapy

- Conduct preoperative evaluation to determine preoperative opioid use and doses
- Provide education regarding use of opioids before surgery
- Recognize that postoperative opioid requirements will typically be greater and that pain might be more difficult to control
- Consider pain specialty consultation (and in some cases behavioral and/or addiction consultation) for pain that is difficult to manage and complex cases
- Consider nonpharmacological interventions
  - Transcutaneous electrical nerve stimulation
  - Cognitive–behavioral therapies
- Consider nonopioid systemic medications
  - Gabapentin or pregabalin
  - Ketamine
- Consider local anesthetic-based peripheral regional and neuraxial local analgesic techniques
- Consider PCA with basal infusion of opioids for difficult to manage pain with appropriate monitoring
- Provide education and instructions on tapering opioids to target dose after discharge

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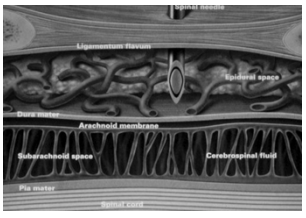
Organizational Structure, Policies, and Procedures

- **Qualified personal, as well as established polices and procedures when Neuraxial and Continuous peripheral nerve blocks are performed**

STRONG recommendation LOW quality



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- **6 Multimodal analgesia**, pharmacological and **non pharmacological**
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- **8 Consider acupuncture, massage, Cold**
- **9 Cognitive-Behavioral Therapy in adults**

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Physical Modalities

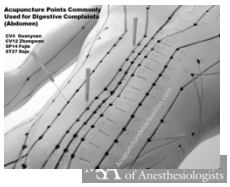
- 7 Transcutaneous Nerve Stimulation (TENS)

WEAK recommendation MODERATE evidence

- 8 Consider acupuncture, massage, Cold

NEITHER recommend NOR discourage

INSUFICIENT evidence



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Physical Modalities

- Transcutaneous TENS
- Acupuncture
- Massage
- Cold Therapy
- Localized heat
- Continuous passive motion
- Immovilization or Bracing

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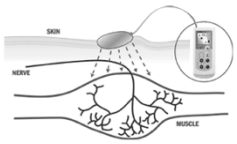
Physical Modalities

- Transcutaneous TENS
  - Activate endogenous descending inhibitory pathways activationg opioid receptors to produce reduced central excitability
  - 25% less post operative analgesic use compare to no TENS [∞]
  - Optimal regimen[§]



∞Bjordal JM et at, TENS can reduce post operative analgesic consumption. A meta-analysis with assessment of optimal treatment parameters for post operative pain. Eur J Pain 7:181-188, 2003
§Wang B et al, Effect of the intensity of transcutaneous acupoint electrical estimulation on the post Operative analgesic requirement. Anesth Analg 85: 406-413, 1997

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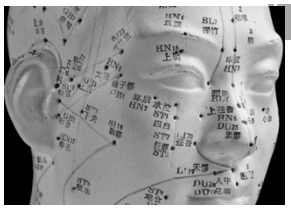
Physical Modalities

- Acupuncture



Deng G et al: Randomized controlled trial of a special acupuncture technique for pain after thoracotomy. J Thorac Cardiovasc Surg 136:1464-1469, 2008
Grabow L: Controlled study of the analgetic effectivity of acupuncture. Arzneimittelforschung 44:554-558, 1994
Gupta S, et al : The effect of pre-emptive acupuncture treatment on analgesic requirements after day-case knee arthroscopy. Anaesthesia 54:1204-1207, 1999
Kotani N, et al : Preoperative intradermal acupuncture reduces postoperative pain, nausea and vomiting, analgesic requirement and sympathoadrenal responses. Anesthesiology 95:349-356, 2001
Tsang RC, et al: Effects of acupuncture and sham acupuncture in addition to physiotherapy in patients undergoing bilateral total knee arthroplasty–a randomized controlled trial. Clin Rehabil 21:719-728, 2007
Wang R, Tronnier V: Effect of acupuncture on pain management in patients before and after lumbar disc protrusion surgery - a randomized control study. Am J Chin Med 28:25-33, 2000

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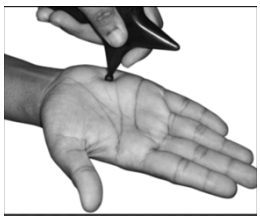
Physical Modalities

- Acupressure



Felhendler D, Lisander B: Pressure on acupoints decreases postoperative pain. Clin J Pain 12:326-329, 199

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Physical Modalities

- Auricular Acupuncture

Usichenko TI, et al: Auricular acupuncture for pain relief after total hip arthroplasty - a randomized controlled study.Pain 114:320-327, 2005
Usichenko TI, et al: Auricular acupuncture for pain relief after ambulatory knee surgery: A randomized trial. CMAJ 176:179-183, 2007
Wu HP, Bi LY, Xu CS, Zhu PT: Clinical observation of 50 cases of postoperative incisional pain treated by auricular acupoint pressure. J Tradit Chin Med 9:187-189, 1989

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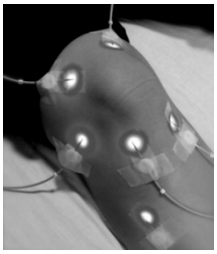
Physical Modalities

- Electroacupuncture



Lin JG, Lo MW, Wen YR, Hsieh CL, Tsai SK, Sun WZ: The effect of high and low frequency electroacupuncture in pain after lower abdominal surgery. Pain 99:509-514, 2002
Martelete M, Fiori AM: Comparative study of the analgesic effect of transcutaneous nerve stimulation (TNS); electroacupuncture (EA) and meperidine in the treatment of postoperative pain. Acupunct Electrother Res 10:183-193, 1985
Sim CK, Xu PC, Pua HL, Zhang G, Lee TL: Effects of electroacupuncture on intraoperative and postoperative analgesic requirements. Acupunct Med 20:56-65, 2002
Wong RH, LeeTW, Sihoe ADL, Wan IYP, Ng CS, Chan SK, Wong WW, Liang YM, Yim AP: Analgesic effect of electroacupuncture in postthoracotomy pain: A prospective randomized trial. Ann Thorac Surg 81:2031-2036, 2006

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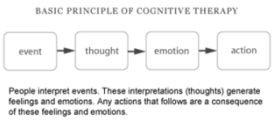
Use Of Cognitive-Behavioral Modalities

- Cognitive-Behavioral Therapy in adults
  - WEAK recommendation MODERATE quality
  - Guided Imagery
  - Relaxation Methods
  - Hypnosis
  - Intraoperative Suggestions
  - Music



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Use Of Cognitive-Behavioral Modalities

- Cognitive-Behavioral Therapy in adults
  - Some positive effect in postoperative pain, analgesic use and anxiety
  - Unclear effect on hospitalization stay
  - Some required patient engagement and preoperative training

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- 1 Individual tailored education, treatment options, plan and goals
- 2 Instruction on specific children's pain evaluation by caregiver
- 3 Thorough medical history: Medical, surgical, psychiatric, pain, medications
- 4 Pain treatment: Pain control vs side effects
- 5 Validated tool to assess pain
- **6 Multimodal analgesia, pharmacological** and non pharmacological
- 7 Transcutaneous Nerve Stimulation (TENS)
- 8 Consider acupuncture, massage, Cold
- 9 Cognitive-Behavioral Therapy in adults
- **10 Opioids per mouth if patient is able to**
- **11 Avoid Intra muscular route for analgesics**
- **12 Opioids PCA if oral route is not an alternative**
- **13 If PCA, avoid basal Infusions in Opioid naïve adults**
- 14 Opioids Post Operative: Monitor accordingly (Respiratory)
- **15 Acetaminophen and/or NSAIDS if not contraindication**
- **16 Preoperative Celecoxib if not contraindicated**
- **17 Consider Preoperative Gabapentin or Pregabalin**
- **18 Consider IV Ketamine in adults**
- **19 Consider IV Lidocaine infusion in adults for laparoscopic or open abdominal surgery**
- 20 Surgical site-specific local anesthetic infiltration according to procedure
- 21 Topical Local anesthetics and blocks for circumcision
- 22 NO Local anesthetics applied directly in the pleural space
- 23 Peripheral regional anesthetic techniques in adults and children according to procedure
- 24 Continuous Local anesthetic peripheral regional infusions to extend duration
- 25 Clonidine as adjuvant, to extend single injection peripheral blocks
- 26 Neuraxial analgesia for major thoracic and abdominal procedures
- 27 NO Neuraxial magnesium, benzodiazepines, neostigmine, tramadol, and ketamine
- 28 Appropriate monitoring for patient receiving neuraxial interventions
- 29 Organizational structure with policies and processes for safe and effective post operative pain control
- 30 Surgical facilities should have access to pain specialist for patients with, or at risk of inadequate post operative pain
- 31 Qualified personal, as well as established polices and procedures when Neuraxial and Continuous peripheral nerve blocks are performed
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Use Of Systemic Pharmacological Therapies

- 6 Multimodal analgesia, pharmacological
- 10 Opioids per mouth if patient is able to.
- 11 Avoid Intra muscular route for analgesics
- 12 Opioids PCA if oral route is not an alternative
- 13 If PCA, avoid basal infusions in Opioid naïve adults
- 15 Acetaminophen and/or NSAIDS if not contraindication to all patients
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General Principles Regarding the Use of Multimodal Therapies

- Multimodal analgesia, pharmacological and non pharmacological

STRONG Recommendation HIGH quality

- Around the clock non opioid analgesics and non pharmacological therapies
- Opioids not always needed ¶

¶Alarm A et al, Long term analgesic use after low-risk surgery: A retrospective cohort study. Arch Intern Med 172: 425-430, 2012

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General Principles Regarding the Use of Multimodal Therapies

- Several medications at different receptors
- One or more medications through different techniques
- Non Pharmacological techniques

¶Alarm A et al, Long term analgesic use after low-risk surgery: A retrospective cohort study. Arch Intern Med 172: 425-430, 2012

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General Principles Regarding the Use of

Table 3. Options for Components of Multimodal Therapy for Commonly Performed Surgeries

Type of Surgery	Systemic Pharmacologic Therapy	Local, Intra-articular or Topical Techniques*	Regional Anesthetic Techniques*	Neuraxial Anesthetic Techniques*	Nonpharmacologic Therapies‡
Thoracotomy	Opioids‖ NSAIDs‖ and/or acetaminophen Gabapentin or pregabalin‖ i.v. ketamine¶		Paravertebral block	Epidural with local anesthetic (with or without opioid), or intrathecal opioid	Cognitive modalities TENS
Open laparotomy	Opioids‖ NSAIDs‖ and/or acetaminophen Gabapentin or pregabalin‖ i.v. ketamine¶ i.v. lidocaine	Local anesthetic at incision i.v. lidocaine infusion	Transversus abdominis plane block	Epidural with local anesthetic (with or without opioid), or intrathecal opioid	Cognitive modalities TENS
Total hip replacement	Opioids‖ NSAIDs‖ and/or acetaminophen Gabapentin or pregabalin‖ i.v. ketamine¶	Intra-articular local anesthetic and/or opioid	Site-specific regional anesthetic technique with local anesthetic	Epidural with local anesthetic (with or without opioid), or intrathecal opioid	Cognitive modalities TENS
Total knee replacement	Opioids‖ NSAIDs‖ and/or acetaminophen Gabapentin or pregabalin‖ i.v. ketamine¶	Intra-articular local anesthetic and/or opioid	Site-specific regional anesthetic technique with local anesthetic	Epidural with local anesthetic (with or without opioid), or intrathecal opioid	Cognitive modalities TENS
Spinal fusion	Opioids‖ Acetaminophen‖ Gabapentin or pregabalin‖ i.v. ketamine¶	Local anesthetic at incision		Epidural with local anesthetic (with or without opioid), or intrathecal opioid	Cognitive modalities TENS
Cesarean section	Opioids‖ NSAIDs‖ and/or acetaminophen	Local anesthetic at incision	Transversus abdominal plane block	Epidural with local anesthetic (with or without opioid), or intrathecal opioid	Cognitive modalities TENS
CABG	Opioids‖ Acetaminophen Gabapentin or pregabalin‖ i.v. ketamine¶				Cognitive modalities TENS

Abbreviation: CABG, coronary artery bypass grafting.
NOTE. Blank cells indicate techniques generally not used for the procedure in question.
*Intra-articular, peripheral regional, and neuraxial techniques typically not used together.
‡Use as adjunctive treatments.
§Use i.v. PCA when parenteral route needed for more than a few hours and patients have adequate cognitive function to understand the device and safety limitations.
‖May be administered preoperatively.
¶On the basis of panel consensus, primarily consider for use in opioid-tolerant or otherwise complex patients.

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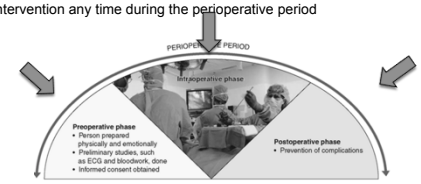
General Principles Regarding the Use of Multimodal Therapies

- Preemptive analgesia:
  - Interventions prior to surgical incision
  - Controversial
- Preventive analgesia:
  - Intervention any time during the perioperative period



Kelly DJ et al: Preemptive analgesia I: physiological pathways and pharmacological modalities. Can J Anaesth. 2001;48(10):1000.
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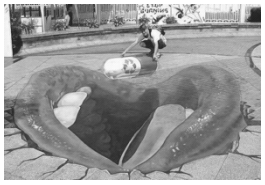
Use Of Systemic Pharmacological Therapies

- Opioids per mouth if patient is able to.

STRONG recommendation MODERATE quality evidence

- IV no superior
- Short acting
- No preoperative indication



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U.S. Food and Drug Administration: Extended Release - Long Acting Opioid Analgesics. Available at: http://www. fda.gov/Safety/MedWatch/SafetyInformation/ucm396503. htm. Accessed December 9, 2015
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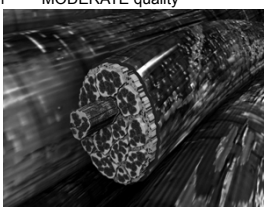
Use Of Systemic Pharmacological Therapies

- Avoid Intra muscular route for analgesics

  STRONG recommendation MODERATE quality

  - Painful
  - Variable absorption
  - No superior



Snell P, Hicks C: An exploratory study in the UK of the effectiveness of three different pain management regimens for post-caesarean section women. Midwifery 22:249-261, 2006
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Use Of Systemic Pharmacological Therapies

- Opioids PCA if oral route is not an alternative

  STRONG recommendation MODERATE quality

  - Required analgesia for several hours
  - Adequate cognitive function
  - Greater effectiveness and satisfaction over Health care provider-initiated intermittent bolus
  - By proxy administration
  - IV boluses

Ruggiero A, Barone G, Liotti L, Chiaretti A, Lazzareschi I, Riccardi R: Safety and efficacy of fentanyl administered by patient controlled analgesia in children with cancer pain. Support Care Cancer 15:569-573, 2007
Saudan S, Habre W, Cerroni D, Meyer PA, Greenberg RS, Kaelin A, Von Ungern-Sternberg BS: Safety and efficacy of patient controlled epidural analgesia following pediatric spinal surgery. Paediatr Anaesth 18:132-139, 2008
Hudcova J, McNicol ED, Quah CS, Lau J, Carr DB: Patient controlled opioid analgesia versus conventional opioid analgesia for postoperative pain. Cochrane Database Syst Rev CD003348, 2009
Anghelescu D, Faughnan L, Oakes L, Windsor K, Pei D: Parent-controlled PCA for pain management in pediatric oncology: Is it safe? J Pediatr Hematol Oncol 34:416-420,2013
Monitto CL, Greenberg RS, Kost-Byerly S, Wetzel R, Billett C, Lebet RM, Yaster M: The safety and efficacy of parent-/nurse-controlled analgesia in patients less than six years of age. Anesth Analg 91:573-579, 2000

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Use Of Systemic Pharmacological Therapies

- If PCA, avoid basal Infusions in Opioid naïve adults

STRONG recommendation MODERATE quality

- Quality of analgesia
- Increase risk of Nausea, Vomiting, and respiratory depression
- Opioid tolerant patients
- Children

Guler T, Unlugenc H, Gundogan Z, Ozalevli M, Balcioglu O, Topcuoglu MS: A background infusion of morphine enhances patient-controlled analgesia after cardiac surgery. Can J Anaesth 51:718-722, 2004
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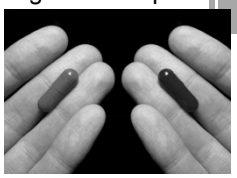
Use Of Systemic Pharmacological Therapies

- Acetaminophen and/or NSAIDS if not contraindication to all patients

STRONG recommendation HIGH quality

- Decrease pain and/or need for Opioids



Aubrun F, Langeron O, Heitz D, Coriat P, Riou B: Randomised, placebo-controlled study of the postoperative analgesic effects of ketoprofen after spinal fusion surgery. Acta Anaesthesiol Scand 44:934-939, 2000
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parecoxib, paracetamol and metamizol for postoperative pain relief after lumbar microdiscectomy. Anesth
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reduces morphine consumption after spinal fusion surgery. Anesth Analg 92:1473-1476, 2001
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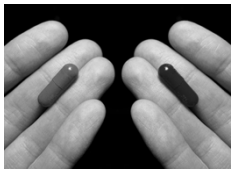
analgesia after orthopaedic surgery. Br J Anaesth 69: 19-22, 1992
McNicol ED, Tzortzoloulou A, Cepeda MS, Francia MB, Farhat T, Schumann R: Single-dose intravenous paracetamol or propacetamol for prevention or treatment of postoperative pain: A systematic review and meta-analysis. Br J Anaesth 106:764-775, 2011

Use Of Systemic Pharmacological Therapies

- NSAIDS and Acetaminophen: Different Mechanisms of action
- Combination more effective than either drug alone



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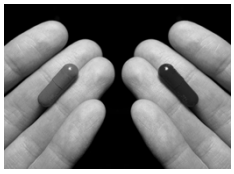
Use Of Systemic Pharmacological Therapies

- No clear difference between I.V versus Oral administration
- I.V Faster onset



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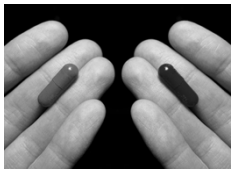
Use Of Systemic Pharmacological Therapies

- Side effects
  - NSAIDS
  - COX2
  - All NSAIDS:
    - Orthopedic surgery: Bone Non union: No high quality evidence
    - High NSAIDS doses and non union in spinal fusion: Not statistically significant nor seen in children.
    - Colorectal surgery: Anastomotic leak: Insufficient evidence
  - Acetaminophen



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Use Of Systemic Pharmacological Therapies

- Preoperative Celecoxib in adults if not contraindicated

STRONG recommendation MODERATE quality

- 200-400mg, 30 min -1 hour before surgery
  - Decrease pain, Opioid use

Ekman EF, Wahba M, Ancona F: Analgesic efficacy of perioperative celecoxib in ambulatory arthroscopic knee surgery: A double-blind, placebo-controlled study. Arthroscopy 22:635-642, 2006
Huang YM, Wang CM, Wang CT, Lin WP, Horng LC,Jiang CC: Perioperative celecoxib administration for painmanagement after total knee arthroplasty - a randomized,controlled study. BMC Musculoskelet Disord 9:77, 2008
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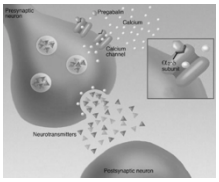
Use Of Systemic Pharmacological Therapies

- Consider Preoperative Gabapentin or Pregabalin

STRONG recommendation MODERATE quality

- Decrease opioid use.
- Decrease Post operative pain
  - 600-1200 mgs Gabapentin
  - 150-300 mgs Pregabalin



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Gonano C, Latzke D, Sabeti-Aschraf M, Ketner SC,Chiari A, Gustorff B: The anxiolytic effect of pregabalin in outpatients undergoing minor orthopedic surgery. J Psychopharmacol 25:249-253, 2011
Ittichaikulthol W, Virankabutra T, Kunopart M, KhamhomW, Putarawuthichai P, Rungghet S: Effects of pregabalin on post-operative morphine consumption after abdominal hysterectomy withwithout salphingoophorectomy: A randomized, double-blind trial. J Med Assoc Thai 92:1318-1323, 2009
Mathiesen O, Moiniche S, Dahl JB: Gabapentin and postoperative pain: A qualitative and quantitative systematic review, with focus on procedure. BMC Anesthesiol 7:6, 2007
Paech MJ, Goy R, Chua S, Scott K, Christmas T, Doherty DA: A randomized, placebo-controlled trial of preoperative oral pregabalin for postoperative pain relief after minor gynecological surgery. Anesth Analg 105:1449-1453, 2007
Straube S, Derry S, Moore RA, Wiffen PJ, McQuay HJ: Single dose oral gabapentin for established acute postoperative pain in adults. Cochrane Database Syst Rev CD008183, 2010
Zhang J, Ho KY, Wang Y: Efficacy of pregabalin in acute postoperative pain: A meta-analysis. Br J Anaesth 106:454-462, 2011

Use Of Systemic Pharmacological Therapies

- Consider Preoperative Gabapentin or Pregabalin
  - Sedation
  - Dizziness
  - Dose change in renal impairment
  - Children ?

Amin SM, Amr YM: Comparison between preemptive gabapentin and paracetamol for pain control after adenotonsillectomy in children. Anesth Essays Res 5: 167-170, 2011
Rusy LM, Hainsworth KR, Nelson TJ, Czarnecki ML, Tassone JC, Thometz JG, Lyon RM, Berens RJ, Weisman SJ: Gabapentin use in pediatric spinal fusion patients: A randomized, double-blind, controlled trial. Anesth Analg 110: 1393-1398, 2010

Use Of Systemic Pharmacological Therapies

- Consider IV Ketamine in adults

WEAK recommendation MODERATE quality

- Decrease in pain medication use
- Decrease in pain scores
- Decrease risk persistent surgical pain

Abu-Shahwan I: Ketamine does not reduce postoperative morphine consumption after tonsillectomy in children. Clin J Pain 24:395-398, 2008
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McNicol ED, Schumann R, Haroutounian S: A systematic review and meta-analysis of ketamine for the prevention of persistent post-surgical pain. Acta Anaesthesiol Scand 58: 1199-1213, 2014

Use Of Systemic Pharmacological Therapies

- Consider IV Ketamine in adults
- Administred Pre, Intra, and/or Postoperatively
- Doses
  - Boluses 0.15-2mg/kg before incision and at closure

    with or without
  - Infusion 0.12 mg/kg/hr (2 mcg/kg/min) to 2mg/kg/hr
- Recommendation
  - Bolus 0.5 mg/kg and
  - Infusion 10 mc/kg/min with or without
  - Post operative infusion at lower dose
- Side effects
- Hallucinations, Nightmares

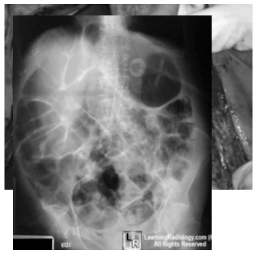
Loftus RW, Yeager MP, Clark JA, Brown JR, Abdu W, Sengupta DK, Beach ML: Intraoperative Ketamine reduces perioperative opiate consumption in opiate-dependent patients with chronic back pain undergoing back surgery.Anesthesiology 113:639-646, 2010

Use Of Systemic Pharmacological Therapies

- Consider IV Lidocaine infusion in adults for laparoscopic or open abdominal surgery

WEAK recommendation MODERATE quality

- Shorter duration of Ileus
- Better analgesia



Marret E, Rolin M, Beaussier M, Bonnet F: Meta-analysis of intravenous lidocaine and postoperative recovery after abdominal surgery. Br J Surg 95:1331-1338, 2008
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Use Of Systemic Pharmacological Therapies

- Consider IV Lidocaine infusion in adults for laparoscopic or open abdominal surgery
- Doses:
  - Bolus 100-150 mgs or 1.5-2.0 mg/kg and
  - Infusion 2-3 mg/kg/hr
- Recommendation
  - Bolus 1.5 mg/kg
  - Infusion 2 mg/kg/hr

De Oliveira GS, Duncan K, Fitzgerald P, Nader A, Gould RW, McCarthy RJ: Systemic lidocaine to improve quality of recovery after laparoscopic bariatric surgery: A randomized double-blinded placebo-controlled trial. Obes Surg 24:212-218, 2014
Farag Erial M, Sessle DI, Ghobrial M, Dalton JE, Liu J, Lee JH, Zaky S, Benzel E, Bingaman W, Kurz A: Effect of perioperative intravenous lidocaine administration on pain, opioid consumption, and quality of life after complex spine surgery. Anesthesiology 119:932-940, 2013

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- 1 Individual tailored education, treatment options, plan and goals
- 2 Instruction on specific children's pain evaluation by caregiver
- 3 Thorough medical history: Medical, surgical, psychiatric, pain, medications
- 4 Pain treatment: Pain Control vs Side effects
- 5 Validated tool to assess pain
- 6 Multimodal analgesia, pharmacological and non pharmacological
- 7 Transcutaneous Nerve Stimulation (TENS)
- 8 Consider acupuncture, massage, Cold
- 9 Cognitive-Behavioral Therapy in adults
- 10 Opioids per mouth if patient is able to.
- 11 Avoid Intra muscular route for analgesics
- 12 Opioids PCA if oral route is not an alternative
- 13 If PCA, avoid basal infusions in Opioid naive adults
- 14 Opioids Post Operative: Monitor accordingly (Respiratory)
- 15 Acetaminophen and/or NSAIDS if not contraindication to all patients
- 16 Preoperative Celecoxib if not contraindicated
- 17 Consider Preoperative Gabapentin or Pregabalin
- 18 Consider IV Ketamine in adults
- 19 Consider IV Lidocaine infusion in adults for laparoscopic or open abdominal surgery
- **20 Surgical site-specific local anesthetic infiltration according to procedure**
- **21 Topical Local anesthetics and blocks for circumcision**
- **22 NO Local anesthetics applied directly in the pleural space**
- **23 Peripheral regional anesthetic techniques in adults and children according to procedure**
- **24 Continuous Local anesthetic peripheral regional infusions to extend duration**
- **25 Clonidine as adjuvant, to extend single injection peripheral blocks**
- **26 Neuraxial analgesia for major thoracic and abdominal procedures**
- **27 NO Neuraxial magnesium, benzodiazepines, neostigmine, tramadol, and ketamine**
- 28 Appropriate monitoring for patient receiving neuraxial interventions
- 29 Organizational structure with policies and processes for safe and effective post operative pain control
- 30 Surgical facilities should have access to pain specialist for patients with, or at risk of inadequate post operative pain
- 31 Qualified personal, as well as established polices and procedures when Neuraxial and Continuous peripheral nerve blocks are performed
- 32 Education to all patients and caregivers on pain treatment plan, including tapering after hospital discharge.

- 20 Surgical site-specific local anesthetic infiltration according to procedure
- 21 Topical Local anesthetics and blocks for circumcision
- 22 NO Local anesthetics applied directly in the pleural space

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Use Of Local and/or Topical Pharmacological Therapies

- **Surgical site-specific local anesthetic infiltration according to procedure**
  WEAK recommendation MODERATE quality
- **Knee, C/S, Laparotomy, hemorrhoid**
- **Mixed evidence, Alternative methods**
- **Panel does NOT recommend routine local anesthetic infiltration, RATHER infiltration that show benefit for the specific procedure**
- **Avoid intra articular local anesthetic infusions**

Bamigboye AA, Hofmeyr GJ: Local anesthetic wound infiltration and abdominal nerves block during caesarean section for postoperative pain relief. Cochrane Database Syst Rev CD006954, 2009
Batra YK, Mahajan R, Kumar S, Rajeev S, Singh Dhillon M: A dose-ranging study of intraarticular midazolam for pain relief after knee arthroscopy. Anesth Analg 107:669-672, 2008
Bondok RS, Abd El-Hady AM: Intra-articular magnesium is effective for postoperative analgesia in arthroscopic knee surgery. Br J Anaesth 97:389-392, 2006
Brunat G, Pouzeratte Y, Mann C, Didelot JM, Rochon JC, Eledjam JJ: Posterior perineal block with ropivacaine 0.75% for pain control during and after hemorrhoidectomy. Reg Anesth Pain Med 28:228-232, 2003
Chan ST: Intra-articular morphine and bupivacaine for pain relief after therapeutic arthroscopic knee surgery. Singapore Med J 36:35-37, 1995
Elsharnouby NM, Eid HE, Abou Elezz NF, Moharram AN: Intraarticular injection of magnesium sulphate and/or bupivacaine for postoperative analgesia after arthroscopic knee surgery. Anesth Analg 106:1548-1552, 2008
Ersayli DT, Gurbet A, Bekar A, Uckunkaya N, Bilgin H: Effects of perioperatively administered bupivacaine and bupivacaine-methylprednisolone on pain after lumbar discectomy. Spine 31:2221-2226, 2006
Gurbet A, Bekar A, Bilgin H, Korfali G, Yilmaztar S, Tercan M: Pre-emptive infiltration of levobupivacaine is superior to at-closure administration in lumbar laminectomy patients. Eur Spine J 17:1237-1241, 2008
Kehlet H, Andersen LO: Local infiltration analgesia in joint replacement: The evidence and recommendations for clinical practice. Acta Anaesthesiol Scand 55:778-784, 2011

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Use Of Local and/or Topical Pharmacological Therapies

- **Topical Local anesthetics and blocks for circumcision**
  STRONG recommendation MODERATE quality
- **Penile block**
- **EMLA**
  - **Risk of Methemoglobinemia**

Lehr VT, Cepeda E, Frattarelli DA, Thomas R, LaMothe J, Aranda JV: Lidocaine 4% cream compared with lidocaine 2.5% and prilocaine 2.5% or dorsal penile block for circumcision. Am J Perinatol 22:231-237, 2005
Taddio A, Ohlsson A, Einarson TR, Stevens B, Koren G: A systematic review of lidocaine-prilocaine cream (EMLA) in the treatment of acute pain in neonates. Pediatrics 101:E1, 1998
Taddio A, Stevens B, Craig K, Rastogi P, Ben-David S, Shennan A, Mulligan P, Koren G: Efficacy and safety of lidocaine– prilocaine cream for pain during circumcision. N Engl J Med 336:1197-1201, 1997
U.S. Food and Drug Administration: EMLA cream prescription insert. Available at: http://www.accessdata.fda. gov/drugsatfda_docs/label/2000/19941S11LBL.PDF. Accessed October 30 , 2014

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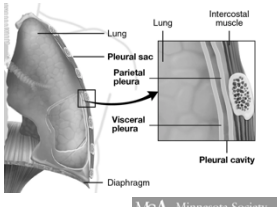
Use Of Local and/or Topical Pharmacological Therapies

- **NO Local anesthetics applied directly in the pleural space**
  STRONG recommendation MODERATE quality
- **No clear beneficial effects**
- **Potential risk of toxicity**
- **Last resource in the setting of multimodal approach**



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Demmy TL, Nwogu C, Solan P, Yendamuri S, Wilding G, DeLeon O: Chest tube-delivered bupivacaine improves pain and decreases opioid use after thoracoscopy. Ann Thorac Surg 87:1040-1046, 2009. discussion: 1046-1047

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- 12 Opioids PCA if oral route is not an alternative
- 13 [illegible] in Opioid naive adults
- 14 Opioids Post Operative: Monitor accordingly (Respiratory)
- 15 [illegible]
- 16 Preoperative Celecoxib if not contraindicated
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- 23 Peripheral regional anesthetic techniques in adults and children according to procedure
- 24 Continuous Local anesthetic peripheral regional infusions to extend duration
- 25 Clonidine as adjuvant, to extend single injection peripheral blocks

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Use Of Peripheral Regional Anesthesia

- **Peripheral regional anesthetic techniques in adults and children according to procedure**

STRONG recommendation HIGH quality

- **Knowledge of the technique, including ultrasound**
- **Side effects, precautions (Motor weakness)**
- **Elastomeric pumps**

Ganapathy S, Wasserman RA, Watson JT, Bennett J, Armstrong KP, Stockall CA, Chess DG, MacDonald C: Modified continuous femoral three-in-one block for postoperative pain after total knee arthroplasty. Anesth Analg 89: 1197-1202, 1999

Kaloul I, Guay J, Cote C, Fallaha M: The posterior lumbar plexus (psoas compartment) block and the threein-one femoral nerve block provide similar postoperative analgesia after total knee replacement. Can J Anaesth 51: 45-51, 2004 [erratum in: 52:119, 2005]

Kardash K, Hickey D, Tessler MJ, Payne S, Zukor D, Velly AM: Obturator versus femoral nerve block for analgesia after total knee arthroplasty. Anesth Analg 105: 853-858, 2007

Macalou D, Trueck S, Meuret P, Heck M, Vial F, Ouologuem S, Capdevila X, Virion JM, Bouaziz H: Postoperative analgesia after total knee replacement: The effect of an obturator nerve block added to the femoral 3-in-1 nerve block. Anesth Analg 99:251-254, 2004

Richman JM, Liu SS, Courpas G, Wong R,

Rowlingson AJ,McGready J, Cohen SR,Wu CL: Does continuous peripheral nerve block provide superior pain control to opioids? A meta-analysis. Anesth Analg 102:248-257, 2006

Naja Z, Ziade MF, Lonnqvist PA: Nerve stimulator guided pudendal nerve block decreases posthemorrhoidectomy pain. Can J Anaesth 52:62-68, 2005

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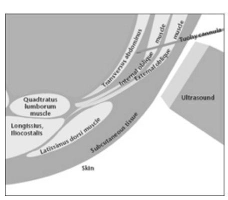
Use Of Peripheral Regional Anesthesia

TAP Block in ERAS

- **TAP block meta-analysis (10 RCTs, 633 subjects): TAP vs. control**
  - **TAP block: ↓ pain (4/24 h) and opioid consumption**
  - **Preoperative (vs. postoperative) TAP block ⇒ ↓ early pain, opioid consumption**
- **Concern with high serum levels of LA after TAP?**
  - **3 mg/kg Ropivacaine ⇒ plasma [ ] potentially neurotoxic**
  - **"…broadly consistent with plasma levels found after injection at other comparable sites.."**



Anesth Analg 2014;118:454-63
Br J Anaesth 2010;105:853-6
Eur J Anaesthesiol 2012;29:235-8

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Use Of Peripheral Regional Anesthesia

- **Continuous Local anesthetic peripheral regional infusions to extend duration of analgesia**

STRONG recommend MODERATE quality

Paul JE, Anya A, Hulrlburt L, Cheng JC, Thabane L, Tidy A, Murthy Y: Femoral nerve block improves analgesia outcomes after total knee arthroplasty. Anesthesiology 113:1144-1162, 2010
Richman JM, Liu SS, Courpas G, Wong R, Rowlingson AJ,McGready J, Cohen SR,Wu CL: Does continuous peripheral nerve block provide superior pain control to opioids? A meta-analysis. Anesth Analg 102:248-257, 2006

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Use Of Peripheral Regional Anesthesia

- **Clonidine as adjuvant, to extend single injection peripheral blocks**

WEAK recommendation MODERATE quality

- **Prolongs duration by average 2 hours**
- **Increased risk hypotension, syncope, sedation**

Engelman E, Marsala C: Efficacy of adding clonidine to intrathecal morphine in acute postoperative pain: Metaanalysis. Br J Anaesth 110:21-27, 2013
Popping D, Elia N, Marret E, Wenk M, Tramer MR: Clonidine as an adjuvant to local anesthetics for peripheral nerve and plexus blocks: A meta-analysis of randomized trials. Anesthesiology 111:4006-4415, 2009

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Use Of Neuraxial Therapies

- **26 Neuraxial analgesia for major thoracic and abdominal procedures**
- **27 NO Neuraxial magnesium, benzodiazepines, neostigmine, tramadol, and ketamine**

Ann Surg 2014;259:1056-67

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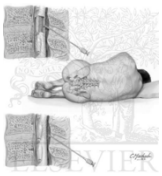
Use Of Neuraxial Therapies

- **Neuraxial analgesia for major thoracic and abdominal procedures**
  STRONG recommendation HIGH quality
- **Major thoracic and abdominal procedures**
- **Epidural Vs Spinal**
- **Local anesthetic and/or Opioids**
- **Decrease pain scores, less rescue analgesic use**
- **Risk vs General**
- **Clonidine??**



Joshi GP, Bonnet F, Shah R, Wilkinson RC, Camu F, F ischer B, Neugebauer EA, Rawal N, Schug S, Simanski C, Kehlet H: A systematic review of randomized trials evaluating regional techniques for posthoracotomy analgesia. Anesth Analg 107:1026-1040, 2008
Nishimori M, Ballantyne JC, Low JH: Epidural pain relief versus systemic opioid-based pain relief for abdominal aortic surgery. Cochrane Database Syst Rev CD005059, 2006
Ballantyne JC, Carr DB, deFerranti S, Suarez T, Lau J, Chalmers TC, Angelillo IF, Mosteller F: The comparative effects of postoperative analgesic therapies on pulmonary outcome: cumulative meta-analyses of randomized, controlled trials. Anesth Analg 86:598-612, 1998
Popping D, Elia N, Van Aken H, Marret E, Schug SA,
Kranke P,Wenk M, Tramer MR: Impact of epidural analgesia on mortality and morbidity after surgery: Systematic review and meta-analysis of randomized controlled trials. Ann Surg 259:1056-1067, 2014

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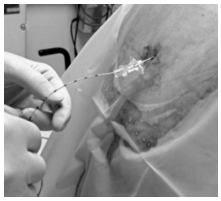
Use Of Neuraxial Therapies

Epidural in ERAS

- **Most Recent Meta-analysis**
- **Examined 125 trials (9044 patients, 4525 EA)**
- **↓ Death with EA (3.1% vs. 4.9%; OR=0.60; 95%CI, 0.39-0.93)**
- **EA significantly ↓ risk of A Fib, SVT, DVT, respiratory depression, pneumonia, ileus, PONV, ↑ GI recovery**
- **EA significantly ↑ risk of arterial hypotension, pruritus, urinary retention, and motor blockade**
- **Technical failures ⇒ 6.1% of patients.**



Ann Surg 2014:259:1056-67

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Use Of Neuraxial Therapies

- **NO Neuraxial magnesium, benzodiazepines, neostigmine, tramadol, and ketamine**

STRONG recommendation MODERATE quality

- **No clear evidence**
- **Undetermined safety**

Fogarty DJ, Carabine UA, Milligan KR: Comparison of the analgesic effects of intrathecal clonidine and intrathecal morphine after spinal anaesthesia in patients undergoing total hip replacement. Br J Anaesth 71: 661-664, 1993
Arcioni R, Palmisani S, Tigano S, Sartorsola C, Sauli V, Romano S, Mercieri M, Masciangelo R, De Blasi RA, Pinto G: Combined intrathecal and epidural magnesium sulfate supplementation of spinal anesthesia to reduce post-operative analgesic requirements: A prospective, randomized, double-blind, controlled trial in patients undergoing major orthopedic surgery. Acta Anaesthesiol Scand 51: 482-489, 2007
Chung CJ, Kim JS, Park HS, Chin YJ: The efficacy of intrathecal neostigmine, intrathecal morphine, and their combination for post-cesarean section analgesia. Anesth Analg 87: 341-346, 1998
Murali Krishna T, Panda NB, Batra YK, Rajeev S: Combination of low doses of intrathecal ketamine and midazolam with bupivacaine improves postoperative analgesia in orthopaedic surgery. Eur J Anaesthesiol 25:299-306, 2008

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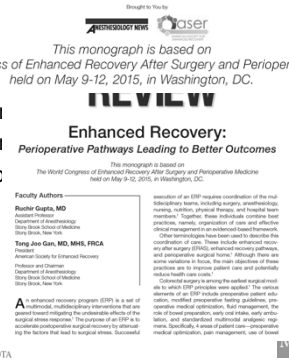
Enhanced Recovery Program

- Pain Mai
- Bowel Pı
- Choice o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ANESTHESIOLOGY NEWS

This monograph is based on
The World Congress of Enhanced Recovery After Surgery and Perioperative Medicine held on May 9-12, 2015, in Washington, DC.

REVIEW

Enhanced Recovery:
Perioperative Pathways Leading to Better Outcomes

This monograph is based on
The World Congress of Enhanced Recovery After Surgery and Perioperative Medicine held on May 9-12, 2015, in Washington, DC.

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An enhanced recovery program (ERP) is a set of multimodal, multidisciplinary interventions that are geared toward mitigating the undesirable effects of the surgical stress response.[1] The purpose of an ERP is to accelerate postoperative surgical recovery by attenuating the factors that lead to surgical stress. Successful execution of an ERP requires coordination of the multidisciplinary teams, including surgery, anesthesiology, nursing, nutrition, physical therapy, and hospital team members.[1] Together, these individuals combine best practices, namely, organization of care and effective clinical management in an evidenced-based framework.

Other terminologies have been used to describe this coordination of care. These include enhanced recovery after surgery (ERAS), enhanced recovery pathways, and multimodal rehabilitation or surgical home.[1] Although there are some variations in focus, the main objectives of these practices are to improve patient care and potentially reduce health care costs.[1]

Colorectal surgery is among the earliest surgical models to which ERP principles were applied.[2] The various elements of an ERP include preoperative patient education, modified preoperative fasting guidelines, preoperative medical optimization, fluid management, the role of bowel preparation, early oral intake, early ambulation, and standardized multimodal analgesic regimens. Specifically, 4 areas of patient care—preoperative medical optimization, pain management, use of bowel

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Enhanced Recovery Program

Pain Management

NSAIDS:
- Reduce opioid use 30%, no effect on Ileus

COX2:
- No increase of anastomosis leak risk, Less ileus

Acetaminophen:
- Serotoninergic pathways in the spinal cord through enhancement of the cannabinoid receptors
- IV vs PO 4 fold highest peak plasma concentration compare to PO, 15 min vs 1 hour.
- 1gr PO Before beginning opain: Less pain, decrease PONV (no opioid reduction)

B Blockers:
- Esmolol:
  - Decrease in opioid use.
  - Decrease Pain, PONV, LOS after Laparoscopic cholecystectomy

Tan M et al: Optimizing pain management to facilitate enhanced recovery after surgery pathways, Can J Anaesth, 2015; 62(2):203-218
Chen JY et al: Effect of adding Ketorolac to IV Morphine PCA on bowel function in colorectal surgery patients. Acta Anaesthesiol Scand. 2005; 49(4): 546-551
Gorissen et al, Risk of anastomotic leakage with NSAIDS in colorectal s. Br J Sur.2012;99(5):721-727

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Conclusions

- Optimal pain management begins in the preoperative period
- Plan tailored to patient, procedure
- Evidence support use of multimodal analgesia
- Most recommendations are currently based on expert input
- Further studies are necessary to establish the weight of the current recommendations. As a result some recommendations will be removed, while other change, and some new will appear in future guidelines

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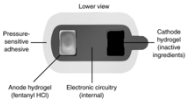
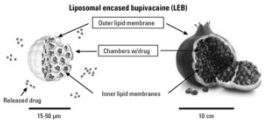
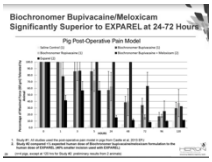
Future Guidelines







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