

MULTIMODAL ANALGESIA

STRATEGIES FOR PERIOPERATIVE PAIN MANAGEMENT

JOSEPH KAY MD FRCPC
Department of Anesthesia
University of Toronto



Sunnybrook
HEALTH SCIENCES CENTRE



Outline

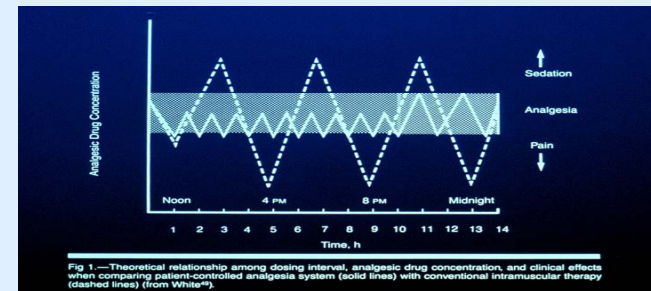
- Why treat pain aggressively?
- Pain pathways
- Components multimodal analgesia
- Clinical pathways

Why Treat Pain Aggressively

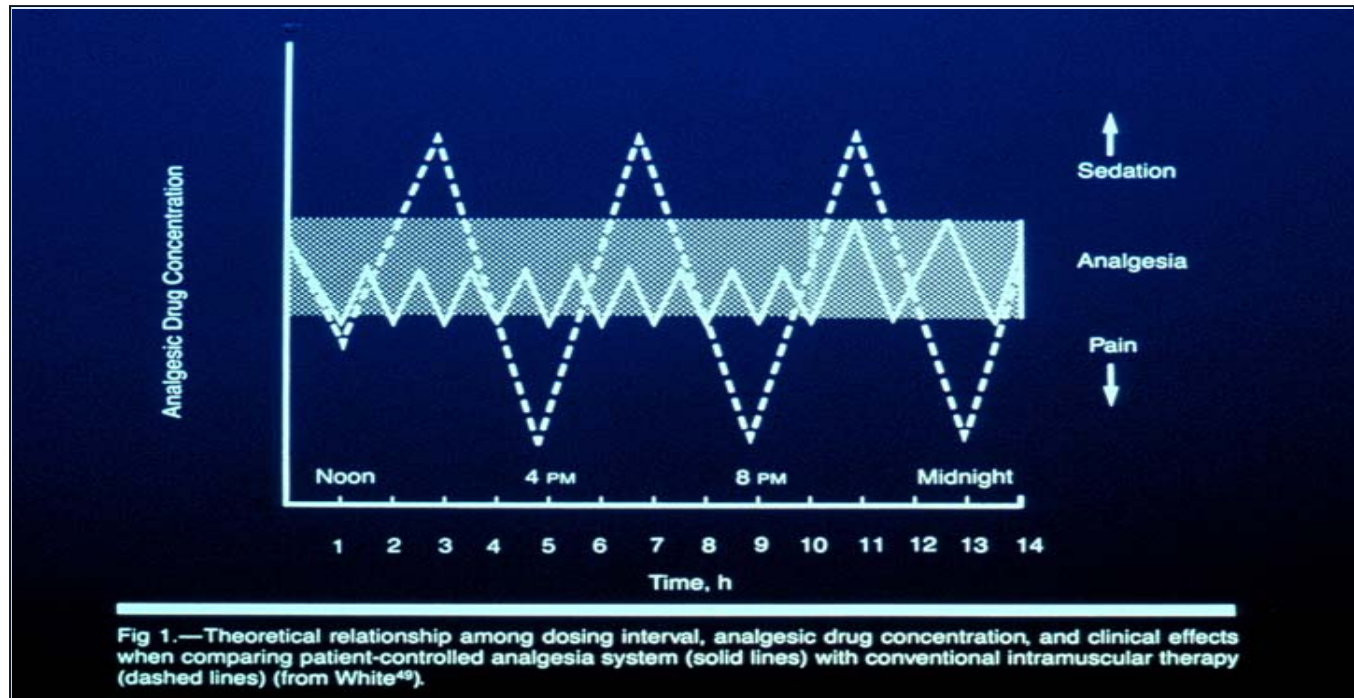
- Reduce complications
- Improve rehabilitation
- Improve outcome
- Prevent chronic pain

Traditional Analgesia

- Parenteral opioid
- im/sc prn
- iv PCA



PCA



Opioid side-effects

- Nausea /vomiting
- Sedation
- Respiratory depression
- Pruritus
- Urinary retention
- Constipation
- Hyperalgesia / Tolerance
- Immunity

Multimodal Analgesia

ADD NON-OPIOID ANALGESICS

- To decrease opioid requirements
- Decrease opioid related s/e
- Improve dynamic analgesia
- Improve rehabilitation /outcome
- Reduce chronic pain

Improved Outcome

- Local infiltration / FNB: THA, TKA
↓ LOS, better flexion
- Thoracic Epidural: Colon resection
↓ ileus, ↓ LOS, improved QOL
- PVB/Thoracic Epidural: ↓ cancer recurrence

ANDERSEN ACTA ORTHOP 2007 78:180 CARLI ANESTHESIOLOGY 2002 97:540

CHELLY J ARTHROPLASTY 2001 16:436 WANG REG ANES PAIN MED 2002 27:139

WERNER ACUTE PAIN 2005 7:5 BIKI ANESTHESIOLOGY 2008 109: 180

EXADACTYLOS ANESTHESIOLOGY 2006 105:660

Improved Outcome

- Celecoxib ACL, TKA, laparoscopy
- Gabapentin TKA, ACL, Breast
- Dexamethasone LAP CHOLE, TL
- Oxycontin TKA

BUVANENDRAN JAMA 2003 MENIGAUX ANESTH ANALG 2005
FASSOULAKI ANESTH ANALG 2005 BISGAARD ANN SURG 2003
WHITE CAN J ANESTH 2007 PETERS J ARTHROPLASTY 2006 ANDERSEN
ACTA ORTHOPEDICA 2007 TOFTDAHL ACTA ORTHOP 2007 CHEVILLE J BONE JT
SURG 2001 WHITE CJA 2007

Chronic Pain

THE PREVALENCE OF CHRONIC POST SURGICAL PAIN IN CANADA

Elizabeth G VanDenKerkhof DrPH, David H Goldstein MSc FRCPC

Department of Anesthesiology, Queen's University, Kingston, ON K7L 2V7

- >30,000 new pts chronic pain 1999

Procedure	No. performed	Prevalence estimates	Estimated prevalence
Hysterectomy	55,404	16%-50%	8,865-27,702
Cholecystectomy	>50,000	21%-27%	>10,500->13,500
Hip Replace	19,853	3%-35%	596-6,949
Knee Replace	21,649	30%	6,495
Breast surgery	14,438 ⁺	13%-49%	1,877-7,219
Thoracotomy	16,305 ⁺⁺	7%-67%	1,141-10,924
Total	>177,649	3%-67%	29,474->72,789

Prevent Chronic Pain

RISK FACTORS

Anesthesiology 2000; 93:1123-33

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Chronic Pain as an Outcome of Surgery

A Review of Predictive Factors

Frederick M. Perkins, M.D.,* Henrik Kehlet, M.D., Ph.D.†

- Preoperative pain present >1 mo
- Operative nerve damage
- **Severe acute postoperative pain**

Prevent Chronic Pain

Multimodal Analgesia with Gabapentin and Local Anesthetics Prevents Acute and Chronic Pain After Breast Surgery for Cancer

Argyro Fassoulaki, MD, PhD, DEAA*, Argyro Triga, MD†, Aikaterini Melemini, MD*, and Constantine Sarantopoulos, MD, PhD, DEAA‡

Table 2. Patients with Chest, Axillary, Upper Arm, and Overall Chronic Pain, Absent or Decreased Sensation, and Patients who Required Analgesics at Home 3 and 6 mo After Surgery

No. of patients	3 mo			6 mo		
	Control n (%)	Treatment n (%)	P-value	Control n (%)	Treatment n (%)	P-value
Chest pain	7/22 (32)	7/22 (32)	1.00	5/21 (24)	3/20 (15)	0.697
Axilla pain	10/22 (45)	3/22 (14)	0.045	6/21 (29)	3/20 (15)	0.454
Arm pain	13/22 (59)	5/22 (23)	0.038	7/21 (33)	3/20 (15)	0.277
Chronic pain (total)	18/22 (82)	10/22 (45)	0.028	12/21 (57)	6/20 (30)	0.151
Absent or decreased sensation	17/22 (77)	16/22 (73)	1.00	17/21 (81)	13/20 (65)	0.424
No. of patients who needed analgesics	5/22 (23)	0/22 (0)	0.048	4/21 (19)	0/20 (0)	0.107

- EMLA cream x 3d, ropivacaine irrigation

Pain Pathways

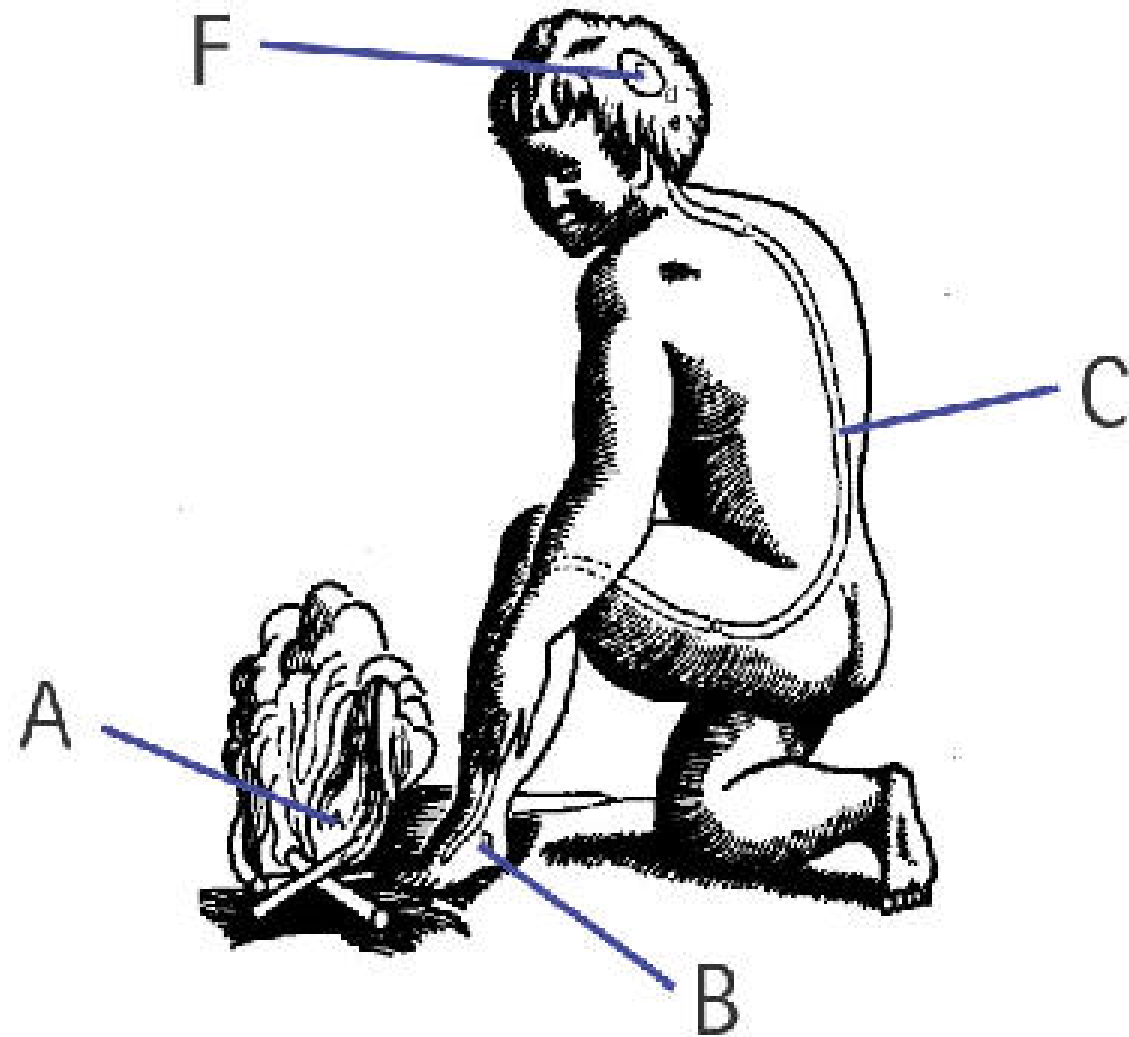
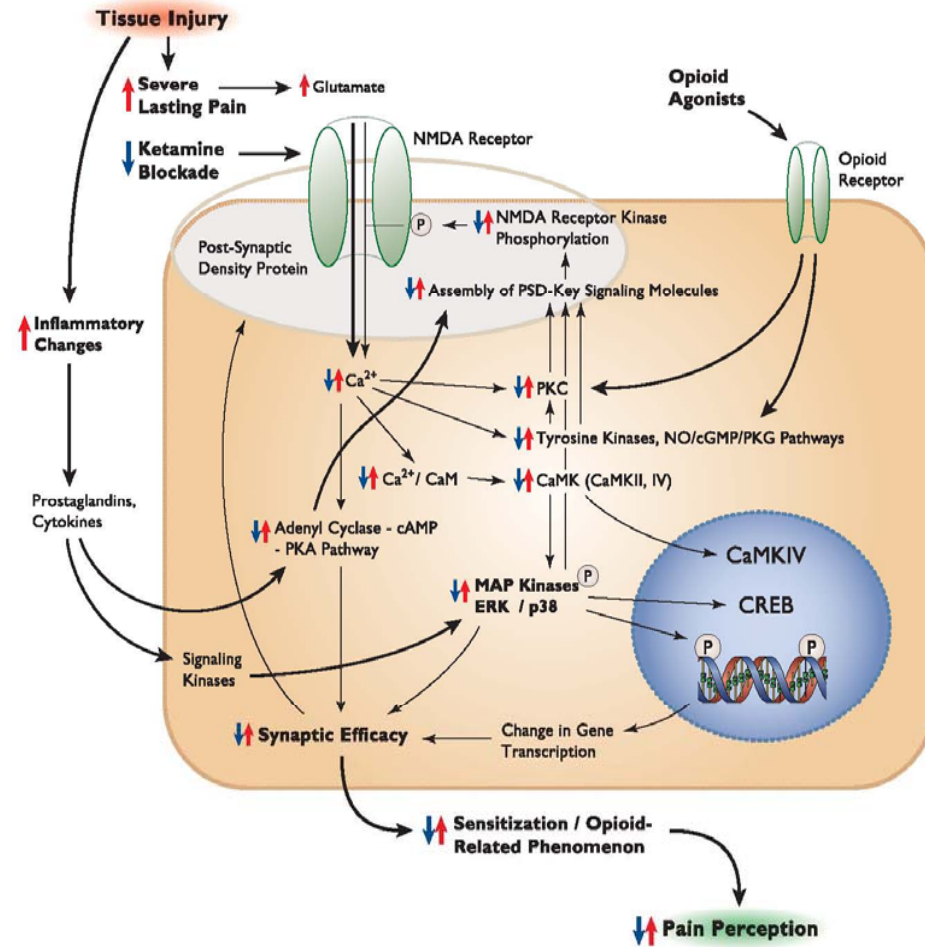
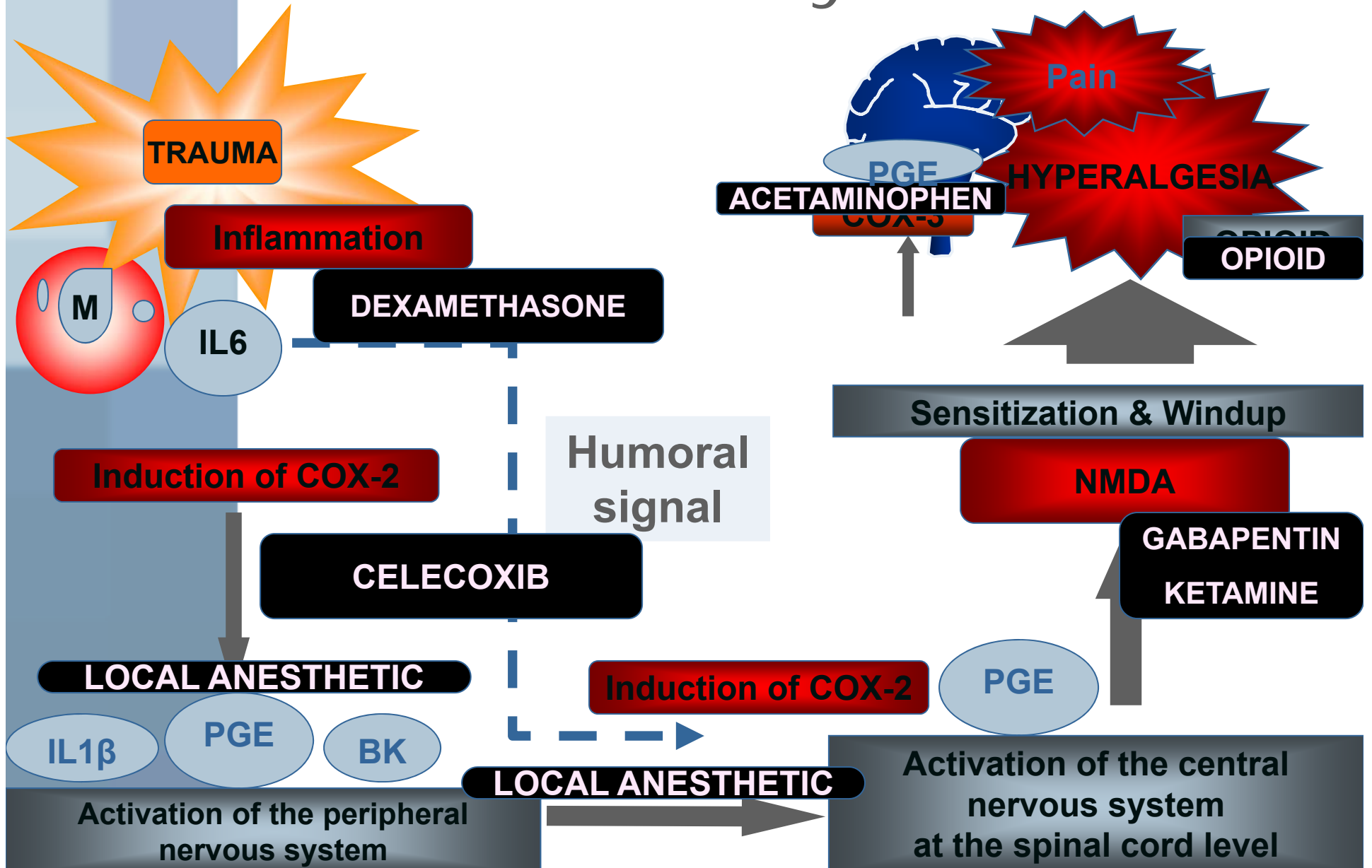


Figure 1 Descartes' model of pain

Pain Pathways



Pain Pathways



Multimodal Analgesia

Using more than one drug, acting at a different place or with a different mechanism,
each with a lower dose than if used alone,
thus providing better analgesia with less side effects.

Preventative Analgesia

PREVENT ACUTE PAIN

- Initiation
- Amplification
- Transmission

PREVENT ACUTE → CHRONIC PAIN

Preventative Analgesia

PERIOPERATIVE ANALGESIA

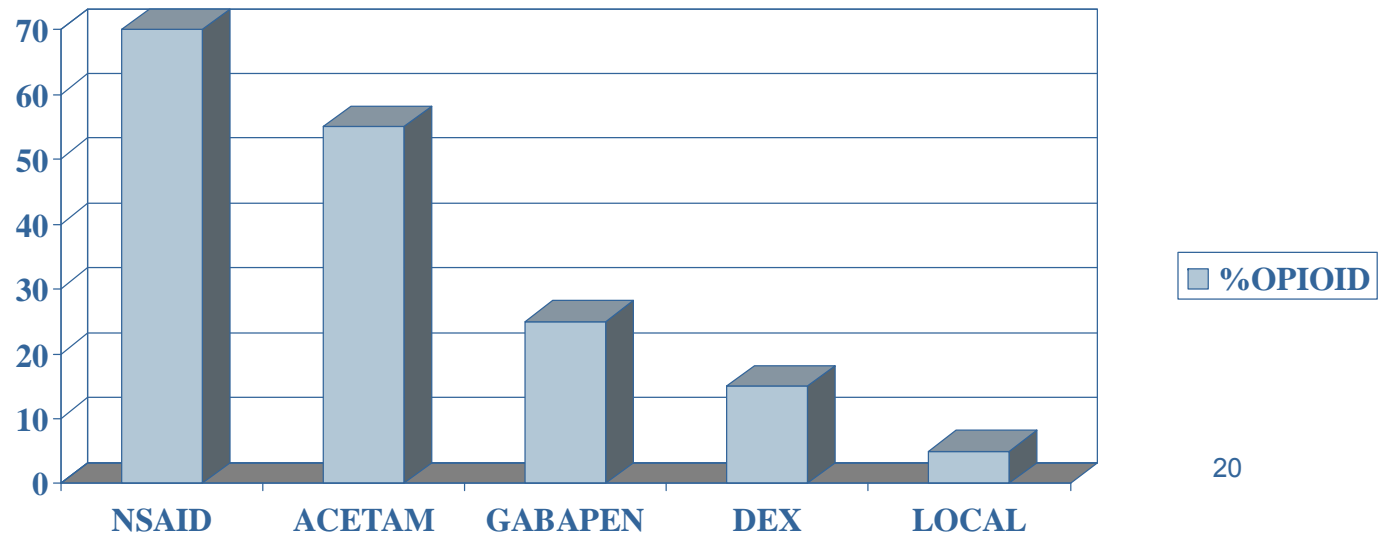
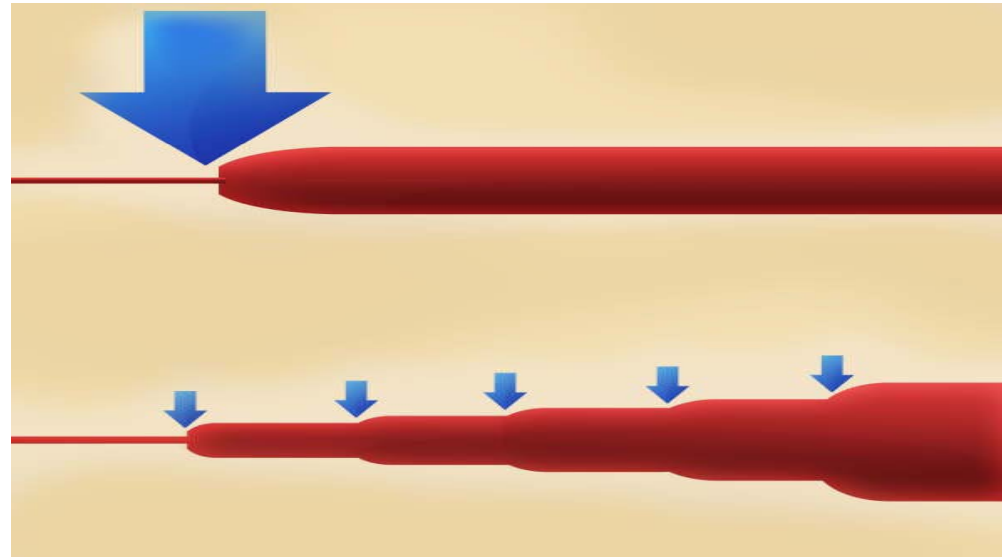
- Home
- Preoperative
- Intraoperative
- Postoperative
- Post discharge

Preventative Analgesia

MULTIMODAL ANALGESIA

- Acetaminophen REMY BR J ANAES 2005
- NSAIDs /coxib REUBEN J BONE JT SURG 2005
- GBP/pregabalin TIIPPANA ANESTH ANALG 2007
- Ketamine HIMMELSEHER ANESTHESIOLOGY 2005
- Dexamethasone SALERNO J BONE JT SURG 2006
- Local Anesthetic LIU J AM COL SURG 2006
- Controlled release opioid -oxycontin

Multimodal Analgesia



Acetaminophen

- Reduce opioid consumption 20-30%
- Reduce opioid related side effects
- Additive effect with NSAIDs
- No adverse effects

NSAID / COXIB

- Reduce opioid consumption 30-50%
- Reduce opioid related side effects
- Improve pain scores up to 2/10
- CELECOXIB: among the most potent analgesics, no platelet dysfunction, no effect on bone fusion, no increase in thrombosis rates

Celecoxib

The Journal of Arthroplasty Vol. 20 No. 7 Suppl. 3 2005

Celecoxib Does Not Affect Osteointegration of Cementless Total Hip Stems

David R. Lionberger, MD, and Philip C. Noble, PhD

Effects of Celecoxib, a Novel Cyclooxygenase-2 Inhibitor, on Platelet Function in Healthy Adults: A Randomized, Controlled Trial

*Philip T. Leese, MD, Richard C. Hubbard, MD, Aziz Karim, PhD, FCP,
Peter C. Isakson, PhD, Shawn S. Yu, PhD, and G. Steven Geis, PhD, MD*

No effect on bone growth or bleeding

Celecoxib

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Reports of Original Investigations

Effect of short-term postoperative celecoxib administration on patient outcome after outpatient laparoscopic surgery

[Effet de l'administration postopératoire à court terme de célécoxib sur l'évolution des patients après une chirurgie par laparoscopie sans hospitalisation]

Paul F. White PhD MD FANZCA, Ozlem Sacan MD, Burcu Tufanogullari MD, Matthew Eng, Nina Nuangchamnonng, Babatunde Ogunnaike MD

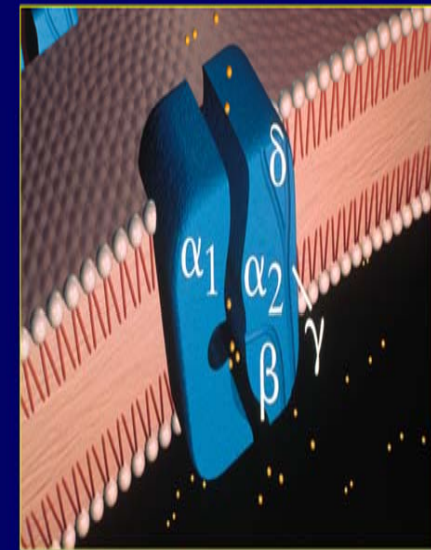
Celecoxib x 3 days postop:

- ↓ opioid use, pain, ileus
- ↑ satisfaction, recovery
- Resumed ADL 2 days earlier

Gabapentinoids

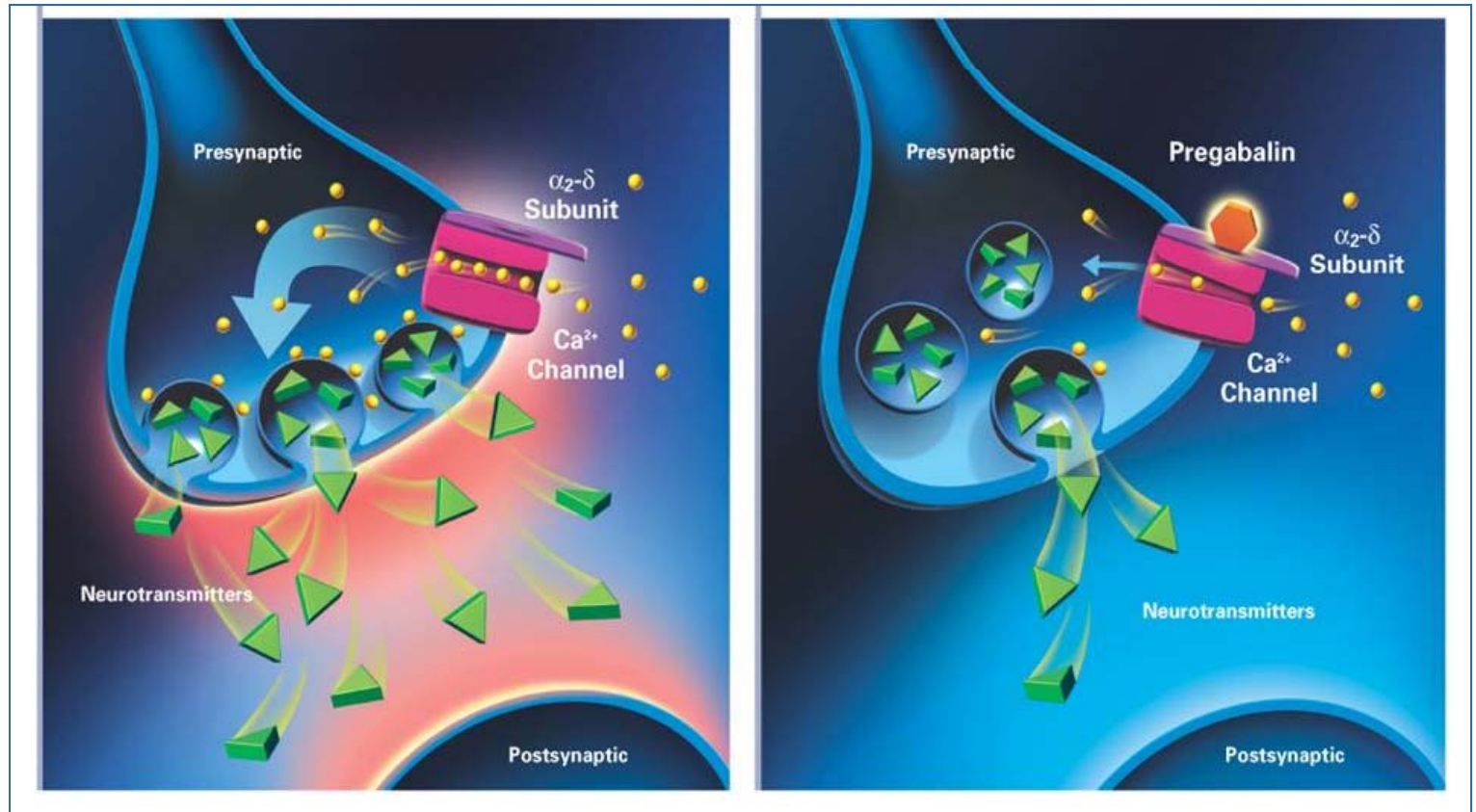
- Gabapentin
- Pregabalin
- 24 RCTs acute pain
- 600 mg optimal initial dose for gabapentin

The Calcium Channel



Adapted from Schwartz!

Gabapentinoids



PANDEY J NEUROSURG ANESTHESIOLOG 2005 TIIPPANA ANESTH ANALG 2007

Gabapentin

Do Surgical Patients Benefit from Perioperative Gabapentin/Pregabalin? A Systematic Review of Efficacy and Safety

Elina M. Tiippana, MD*

Katri Hamunen, MD, PhD*

Vesa K. Kontinen, MD, PhD*#

Eija Kalso, MD, PhD*#

BACKGROUND: Gabapentin and pregabalin have antiallodynic and antihyperalgesic properties useful for treating neuropathic pain. These properties may also be beneficial in acute postoperative pain. In this study we evaluated randomized, controlled trials examining the analgesic efficacy, adverse effects, and clinical value of gabapentinoids in postoperative pain.

METHODS: A systematic search of Medline, PubMed, and Cochrane Central Register of Controlled Trials (CENTRAL) databases yielded 22 randomized, controlled trials on perioperative administration of gabapentinoids for postoperative pain relief.

Gabapentin

- Reduce opioid consumption 16-67%
- Reduce opioid related side effects
- Additive effect with NSAIDs
- Anxiolysis
- Improve functional recovery
- No increase adverse effects
- Pregabalin 6x more potent

Surgical Outcomes

Preoperative Gabapentin Decreases Anxiety and Improves Early Functional Recovery from Knee Surgery

Christophe Ménigaux, MD*, Frédéric Adam, MD*, Bruno Guignard, MD*, Daniel I. Sessler, MD†, and Marcel Chauvin, MD*

Table 2. Knee Flexion During Physiotherapy

	Postoperative Day 1			Postoperative Day 2		
	Control	Gabapentin	<i>P</i> value	Control	Gabapentin	<i>P</i> value
First passive flexion (°)	50 ± 17	70 ± 14	0.001	65 ± 15	75 ± 14	0.015
First active flexion (°)	44 ± 19	65 ± 14	0.001	62 ± 16	71 ± 17	0.034
Maximal passive flexion (°)	68 ± 15	78 ± 10	0.022	81 ± 7	85 ± 11	0.030
Maximal active flexion (°)	64 ± 18	76 ± 9	0.020	77 ± 11	84 ± 12	0.007

- ↓ anxiety >50%
- ↓ morphine use 58%
- ↑ active & passive flexion POD 1&2

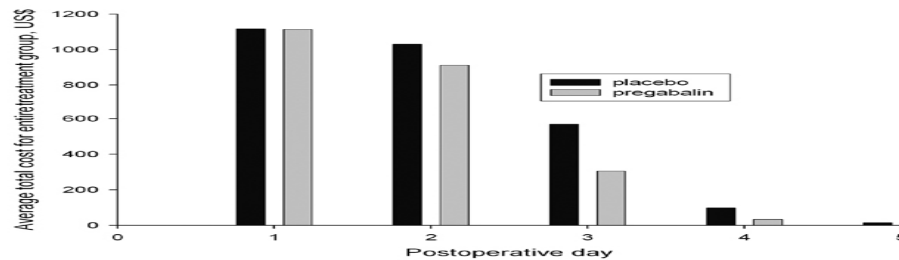
MENIGAUX ANESTH ANALG 2005 100:1394

Surgical Outcomes

Perioperative Pregabalin Improves Postoperative Outcomes after Total Knee Arthroplasty

Reduced Costs and Time to Discharge Following Total Knee Arthroplasty with Perioperative Pregabalin

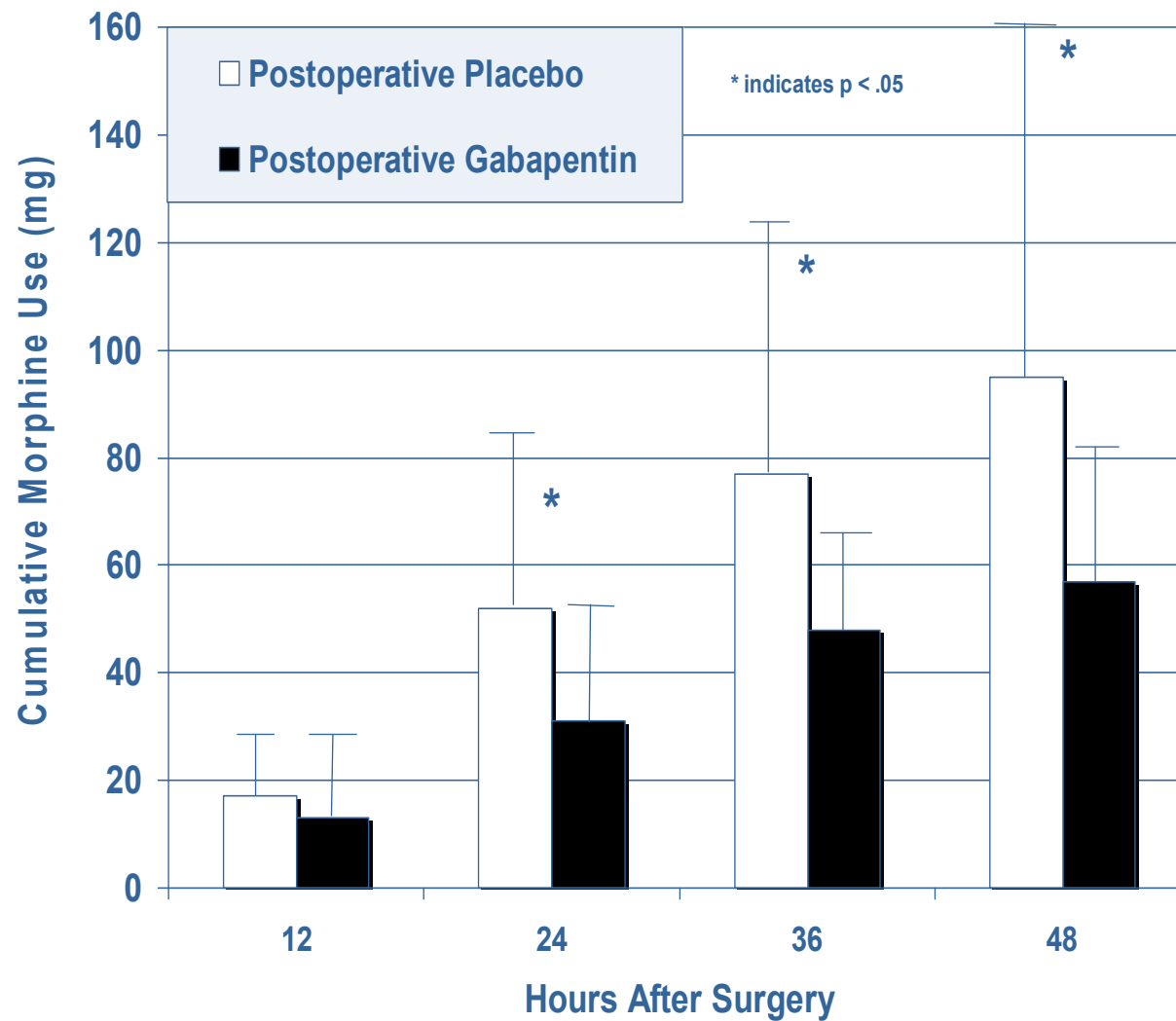
Asokumar Buvanendran, M.D., Scott S. Reuben, M.D., Maruti Kari, M.D., Jeffrey S. Kroin, Ph.D., Mario Moric, Ph.D.
Anesthesiology, Rush Medical College, Chicago, Illinois



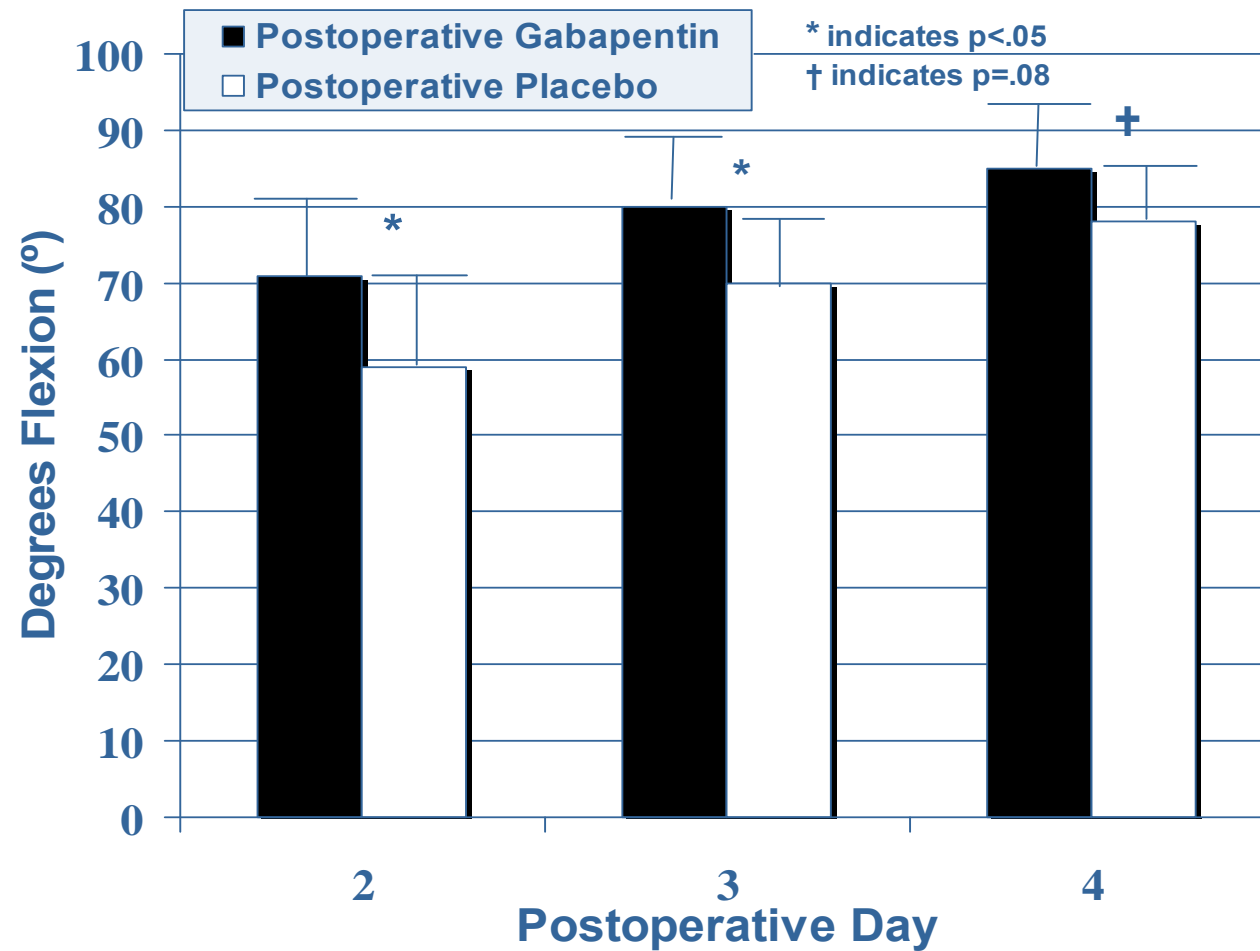
- flexion, sleep, ↓ PCEA, ↓ nausea
- ↓ time to discharge, ↓ cost

ASA abstracts A392,393 2008

Gabapentin TKA



Gabapentin TKA



Dexamethasone

- Reduce opioid consumption
- Reduce pain scores
- Reduce nausea & vomiting

1361

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CURRENT CONCEPTS REVIEW
**EFFICACY AND SAFETY OF STEROID
USE FOR POSTOPERATIVE PAIN RELIEF**

UPDATE AND REVIEW OF THE MEDICAL LITERATURE

BY ANGELO SALERNO, DIP APP SC, GRAD DIP, MPOD (POD SURG), AND ROBERT HERMANN, DPS

Local Anesthetic

- Improves dynamic pain
- Improves rehabilitation
- Infiltration
- Nerve block
- Neuraxial block

**KLEIN ANESTH ANALG 2005 GERGES J CLIN ANESTH 2006
NODA MASUI 1990 WANG REG ANESTH PAIN MED 2002 ILFIELD ANESTH ANALG 2006
CAPDEVILA ANESTH 1999 CHELLY J ARTHOPLSTY 2001 SINGELYN ANESTH ANALG
1998**

Thoracic Epidural

Anesthesiology 2002; 97:540-9

© 2002 American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.

Epidural Analgesia Enhances Functional Exercise Capacity and Health-related Quality of Life after Colonic Surgery

Results of a Randomized Trial

Franco Carli, M.D., M.Phil.,* Nancy Mayo, Ph.D.,† Kristine Klubien, M.D.,‡ Thomas Schricker, M.D., Ph.D.,‡
Judith Trudel, M.D., M.Sc.,§ Paul Belliveau, M.D.§

- Hastens return of bowel function for colon surgery
- Improves rehabilitation & quality of life

CARLI ANESTHESIOLOG 2002 97:540

BASSE ANN SURG 2000 232:51

Controlled-release Opioid

- Oxycontin, Hydromorphone, MS contin
- Oxycontin : Biphasic release
- Constant low blood levels
- 12 h duration
- Improved rehabilitation

Ketamine / Clonidine / Lidocaine/ Tramadol

- Decrease pain, opioid consumption
- High side effect profile-clonidine
- Difficult administration (ketamine, lidocaine)-must do iv /infusion
- Tramadol well tolerated by elderly

BEAULIEU CAN J ANESTH 2007 McARTNEY ANESTH ANALG 2004 LAUWICK CJA 2008
LIKAR CLIN THER 2006 ROSENTHAL J AM GERIATR SOC 2004

Multimodal Analgesia

EFFECTS ARE ADDITIVE

- **Acetaminophen** FLETCHER CAN J ANESTH 1997
- **NSAIDs /coxib** GILRON PAIN 2005 TURAN ANESTH ANALG 2006
- **Gabapentin / pregabalin** REUBEN ANESTH ANALG 2006 KOC ANESTH ANALG 2007
- **Dexamethasone** KJETIL ANESTH ANALG 2007
- **Local Anesthetic** FASSOUAKI ANESTH ANALG 2005

Multimodal Analgesia

REDUCES PCEA USE

- Celecoxib - TKA BUVANENDRAN JAMA 2003

↓ PCEA use 60%

- Gabapentin - LES TURAN BR J ANAESTH 2006

↓ PCEA use 60%

Clinical Pathways

PREOPERATIVE

- celecoxib, acetaminophen, gabapentin, dexamethasone, ± oxycontin

INTRAOPERATIVE

- local infiltration, nerve block, neuraxial block, +/- ketamine

Clinical Pathways

POSTOPERATIVE

- celecoxib, acetaminophen, gabapentin, oxycontin, continuous nerve block, wound infiltration, epidural

HOME

- Continue oral multimodal analgesia at home days to 2 weeks

Clinical example I

L4/5 Laminectomy

PREOP (2 hr)

- celecoxib 400 mg
- acetaminophen 1000mg
- gabapentin 600 mg
- oxycontin 20 mg

Clinical example I

INTRAOP

- ketamine 20 mg iv
- dexamenthasone 8 mg iv
- Local infiltration 20 ml 0.5% bupivacaine by surgeon

Clinical example I

POSTOP

- celecoxib 200 mg q12h
- acetaminophen 1000mg q6h
- gabapentin 100-200 mg q8h
- oxycontin 10 mg q8h
- oxycodone 5-10 mg prn b/t

Clinical example II

THA

PREOP (2 hr)

- celecoxib 400 mg
- acetaminophen 1000mg
- gabapentin 600 mg

- Spinal: 15mg 0.5% bupivacaine
10ug fentanyl + 100ug epimorph

Clinical example II

INTRAOP

- ketamine 20 mg iv
- dexamethasone 8 mg iv
- extensive local infiltration 0.2% ropivacaine by surgeon

Clinical example II

POSTOP

- celecoxib 200 mg q12h
- acetaminophen 1000mg q6h
- gabapentin 100-200 mg q8h
- oxycontin 10-20 mg in PACU & 5-10 mg q8h
- oxycodone 5-10 mg prn b/t

Clinical example III

TKA

PREOP (2 hr)

- celecoxib 400 mg
- acetaminophen 1000mg
- gabapentin 600 mg

CFNB/FNB 20 ml 0.5% ropivacaine

SNB 20 ml 0.5% ropivacaine

Clinical example III

PREOP

- spinal 10 mg 0.5% bupivacaine
10 µg fentanyl

POSTOP

- celecoxib 200 mg q12h
- acetaminophen 1000mg q6h
- gabapentin 100-200 mg q8h
- oxycontin 10-20 mg in PACU & 5-10 mg q8h
- PCA or oxycodone 5-10 mg prn b/t

Clinical example III

PREOP

- spinal 10 mg 0.5% bupivacaine
10 µg fentanyl

INTRAOP

- ketamine 20 mg iv
- dexamethasone 8 mg iv

Clinical example IV

Lap-Chole

PREOP (2 hr)

- celecoxib 400 mg
- acetaminophen 1000 mg
- gabapentin 600 mg
- oxycontin 10 mg

Clinical example IV

INTRAOP

- ketamine 20mg iv
- dexamethasone 8 mg iv
- Infiltration 0.5% bupivacaine
umbilical port: skin to
preperitoneal
- Infiltration port sites 0.5%
bupivacaine

Clinical example IV

INTRAOP

- 2I RL

SB order sheet



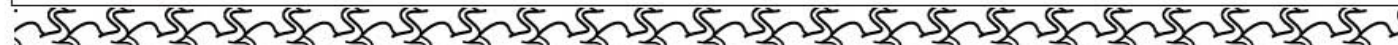
PHYSICIAN'S ORDERS

PHYSICIAN'S ORDERS

All orders shall be DATED, TIMED, and SIGNED
 All medication orders shall be written in the GENERIC or non-proprietary name.
 All orders shall be written legibly using ball point pen.

PATIENT IDENTIFICATION

TIME & DATE			SIGNATURE OF NURSE WHEN DRUG ADMINISTERED
YYYY/MMDD			
HOLLAND ORTHOPAEDIC & ARTHRITIC CENTRE ACUTE PAIN SERVICE (APS) PRE-OPERATIVE MEDICATION ORDER FORM			
	Yes	No	Doctor must check off appropriate orders.
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Give the following medication(s) with a sip of water 1 - 2 hours pre-operatively
		1	acetaminophen 1000 mg po
		2	celecoxib _____ mg po (hold if creatinine >106umol/L).
		3	gabapentin _____ mg po
		4	
		5	
		6	
Doctor's Signature:		PRINT NAME:	



Summary

- Use preventative, perioperative, multimodal analgesia in every case
- This will reduce opioid use, improve outcome and reduce chronic pain