

Teaching Two Old Drugs New Tricks: The Use of Lidocaine and Ketamine for Analgesia in the OR and ER for Non-opioid Pain Management

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The authors have no financial conflicts of
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Pharmacist Objectives

1. Describe the routes of administration, dosing and adverse effects profile of the use of sub-dissociative doses of ketamine for pain in the emergency department
2. Discuss common indications for the use of postoperative ketamine
3. Explain alternative dosing strategies and monitoring parameters of intravenous lidocaine in the postoperative setting
4. Identify a candidate to receive lidocaine infusion for pain in the emergency department based on patient cases

Technician Objectives

1. Describe why the most concentrated product is necessary for intranasal ketamine
2. Describe the route of administration and dosing of ketamine in the postoperative setting
3. Explain why intravenous lidocaine is used in the postoperative setting
4. Review how to calculate how much lidocaine is necessary to prepare a compounded lidocaine intravenous infusion.

A Patient walks into the ER....

- A 57 year old male with a history of IV heroin abuse presents to the emergency department with complaints of severe arm pain due to a work related injury where a machine part lacerated his forearm. He is actively trying to "get clean" and refused narcotic pain medications, however rates his pain 10/10. He is 6 feet tall and 85 kg. He has an allergy to NSAIDS – reaction is "gastritis" and is currently screaming for pain medications.

Assessment Question

What would you recommend to the physician for pain control?

- A. Ketorolac 30 mg intramuscularly once
- B. Ketamine 60 mg Intranasally once
- C. Acetaminophen 1000 mg po once
- D. Morphine 10 mg IV once

Acute Pain in the Emergency Department

- Acute pain is a common complaint for emergency department patients
- Current pain strategies rely heavily on opioids
 - Limited oftentimes by sedation, bradypnea, hypotension and tolerance
- National opioid epidemic causes providers to reevaluate use of opioids and consider alternative medications

Am J Emerg Med 33 (2015) 197–201

The opioid crisis: How one emergency department is fighting back.
 Written by Tracy Young, Founder & CEO, TWYOUNG Consulting | October 17, 2017 | Print | Email

H&HN HEALTH NEWS FROM...
 SEARCH H&NMAG

shots HEALTH NEWS FROM...
 TEN ERS IN COLORADO TRIED TO CURTAIL OPIOIDS AND DID BETTER THAN EXPECTED

9 Ways to Use Your Hospital's Emergency Department to Curb the Deadly Opioid Epidemic
 Massachusetts hospitals have made measurable progress in dropping pain pill prescriptions.

Texas ERs advised to prescribe opioids only for short durations
 By David Schwartz, Staff Writer | February 3, 2017

ER Reduces Opioid Use By More Than Half With Dry Needles, Laughing Gas
 February 20, 2018 | 1:02 PM

How to avoid opioid addiction after surgery
 January 30, 2018

How Many Opioid Pills Do You Need After Surgery?
 With heightened addiction concerns, doctors are working to rein in prescriptions of pain relievers like oxycodone and hydrocodone.

The opioid crisis is draining America's workforce
 by Lydia DePillis @CNNMoney

Let's bring back an old drug



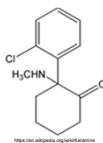
Why consider this?

- Many different routes of administration
- Airway is protected
- Minimal cardiovascular effects
- Rapid onset, short duration of action, titration
- And.... It may work!



Ketamine

- Non-competitive blockade of N-methyl-D-aspartate (NMDA) receptors and direct effect on delta opioid receptor which can augment μ -receptor opioid function
 - Low doses provide analgesia
 - Higher doses provide sedation and amnesia
- Highly lipid soluble
 - Crosses blood-brain barrier easily
 - Quick onset of action
- Rapid recovery to baseline



Lexi-Comp, Inc. (Lexi Drugs®). Lexi-Comp, Inc.; February 17, 2018
 The American Journal of Emergency Medicine 35(6) 918-921.

Sub-dissociative Analgesia Dosing*

- IV: 0.1-0.3 mg/kg
- IM: 0.1-1 mg/kg
- IN**: 0.5-1 mg/kg
 - Mean dose studied 0.7 mg/kg

*off-label use

** off-label route

Emergency Medicine Australasia, 2014;26(3):237-242..
 Am J Health Syst Pharm, 2015;72(18):1544-1554.
 Ann Emerg Med, 2017;70(2):203-211.

Pharmacokinetics

	Onset of Action	Duration
IV	30 seconds	5-10 min
IM	10-15 min	15-30 min
IN	Within 10 min	Up to 60 min

Intranasal Tips



- Preferred device is an atomizer
 - Does not require patient cooperation in head positioning and maximizes bioavailability and absorption of the medication.
- Ideal volume per nostril 0.2-0.5 ml per nostril, max 1 ml per nostril
 - Too much volume causes run off and swallowing of the medication
 - Give half dose in one nostril, half in other
 - Necessary to use most concentrated product available to help with volume issue

Adverse Effects

- Emergence Reactions
 - Alterations in mood, vivid dreams, out of body experience
 - More common in females, patients > 16 years old, larger doses of ketamine
 - **Uncommon** at sub-dissociative doses
- Dizziness
- Nausea, Vomiting

PAIN MANAGEMENT AND SEDATION/ORIGINAL RESEARCH

Intravenous Subdissociative-Dose Ketamine Versus Morphine for Analgesia in the Emergency Department: A Randomized Controlled Trial

Sergiy Matus, MD¹; Bradley Russell, MD; Victor Cohen, PharmD²; Ilya Pashay, MPH; Antonia Liberman, MA, MPH; Courtney McKay, PharmD³; Erol Suleyman-Zaman, MD; Peter Hornel, PhD; Victoria Torenson, BA; Christian Proulx, MD

- Population: 18-55 years old, moderate to severe acute abdominal, flank, or musculoskeletal pain
 - Comparator Groups: ketamine 0.3 mg/kg IV push vs morphine 0.1 mg/kg IV push
 - Primary outcome: was reduction in pain at 30 minutes
 - Primary mean pain score after 30 min - no difference between morphine and ketamine
 - Secondary outcome: the incidence of rescue analgesia at 30 and 60 minutes.
 - No difference between rescue fentanyl after 30 or 60 min
 - Safety Data
 - No serious adverse effects
 - Ketamine group had increase adverse effects 15 min post infusion
- Overall: Safety and efficacy of subdissociative ketamine at 0.3 mg/kg is comparable to IV morphine for short-term treatment of acute pain

Ann Emerg Med. 2015;66:222-229.

ORIGINAL RESEARCH CONTRIBUTION

Intranasal Ketamine for Analgesia in the Emergency Department: A Prospective Observational Series

Cory Andolfatto, MD; Elaine Williams, MD; Daniel Joo, MD; Philip Miller, MD; Wai-Ben Wong, MD; Martha Kozlowski, MD; Tessa Delmore, Ery; Angeli, MD; and Suzanne Moudrich, PharmD

- Population: pts > 6 years old, median age 47, moderate to severe pain primarily due to orthopedic injuries
- Intervention: 0.5 to 0.75 mg/kg intranasal ketamine
- Outcome Measure: clinically significant reductions in Visual Analog Scale (VAS) scores
 - Intranasal ketamine reduced VAS pain scores to a clinically significant degree in 88% of ED patients in this series.
- Safety Data
 - No serious adverse effects
 - Minor adverse effects included feelings of dizziness, unreality or mood changes
- Overall: Intranasal ketamine may have a role in safe and effective pain control in the emergency department

Academic Emergency Medicine 2013;20(10)1050-1054

A Patient walks into the ER....

- A 57 year old male with a history of IV heroin abuse presents to the emergency department with complaints of severe arm pain due to a work related injury where a machine part lacerated his forearm. He is actively trying to "get clean" and refused narcotic pain medications, however rates his pain 10/10. He is 6 feet tall and 85 kg. He has an allergy to NSAIDS - reaction is "gastritis" and is currently screaming for pain medications.

What would you recommend to the physician for pain control?

- A. Ketorolac 30 mg intramuscularly once
- B. Ketamine 60 mg Intranasally once
- C. Acetaminophen 1000 mg po once
- D. Morphine 10 mg IV once

The MD decides to follow your recommendation and use Ketamine 60 mg intranasally once. Which product is best to be stocked in the automatic dispensing cabinet for the intranasal use?

- A. Ketamine 10 mg/mL (20 mL vial)
- B. Ketamine 50 mg/mL (10mL vial)
- C. Ketamine 100 mg/mL (5mL vial)

Postoperative Analgesia

Multimodal Analgesia

- Total and optimal pain relief allowing normal function often cannot be achieved by a single drug
- Achievement of sufficient analgesia through additive or synergistic effects between different analgesics
 - Reduction of side effects
 - Lower doses of analgesics
- Inadequate postoperative analgesia may impede rehabilitative efforts, increase length of stay and impede the return to daily activities

Anesth Analg. 1993 Nov;77(5):1048-56

Multimodal Analgesia

https://www.medscape.org/viewarticle/536924_5



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The Journal of Pain, Vol 17, No 2 (February), 2016; pp 131-157
Available online at www.jpain.org and www.sciencedirect.com

Guidelines on the Management of Postoperative Pain

The panel recommends that clinicians offer multi- modal analgesia, or the use of a variety of analgesic medications and techniques combined with non- pharmacological interventions, for the treatment of postoperative pain in children and adults (strong recommendation, high-quality evidence)

J Pain. 2016 Feb;17(2):131-57

Multimodal Analgesic Agents

- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Acetaminophen
- Alpha-2 adrenergic agonists
 - Clonidine
 - Dexmedetomidine
- Gabapentinoid
 - Gabapentin
 - Pregabalin
- Glucocorticoids
- Opioids
 - Tramadol
- N-methyl-D-aspartate (NMDA) antagonists
 - Ketamine**
 - Methadone
- Local anesthetic
 - Bupivacaine
 - Lidocaine
- Intravenous lidocaine

Curr Opin Anaesthesiol 22:588-593
JAMA Surg. 2017;152(7):691-697.

Ketamine

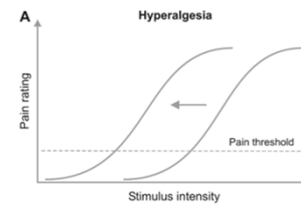
- Niche as an anesthetic in operating room
- Recent interest in NMDA antagonism for postoperative pain

How Does Ketamine Work for Postoperative Pain?

- Main analgesic effect by antagonism of NMDA receptors
 - Modulates central sensory processing of pain
- Potent antihyperalgesic agent
 - Counteracts opioid-induced hyperalgesia
 - Prevent the development of opioid tolerance
- Given as a low-dose continuous infusion

Biomed Res Int. 2015;2015:749837

Hyperalgesia



Best Pract Res Clin Anaesthesiol. 2007 Mar;21(1):65-83.

Preemptive Ketamine Decreases Postoperative Narcotic Requirements in Patients Undergoing Abdominal Surgery

Study Design	Prospective, randomized, single-center study
Patients	Adult patients scheduled for abdominal surgery N=40
Methods	Patients were randomized to a preemptive ketamine vs post-wound closure group <u>Preemptive</u> : ketamine 0.5mg/kg IVP x 1 at induction then 10mcg/kg/min from incision to closure <u>Post-wound closure</u> : ketamine bolus 0.5 mg/kg IVP administered after closure of incision All patients received opioids postoperatively
Outcomes	Postoperative opioid consumption
Results	Patients in the preemptive group had significantly lower morphine consumption on postoperative Days 1 and 2 ($p < 0.002$)

Anesth Analg 1997;84:1086-90

Intraoperative Ketamine Reduces Perioperative Opiate Consumption in Opiate-dependent Patients with Chronic Back Pain Undergoing Back Surgery

Study Design	Randomized, prospective, double-blinded, and placebo-controlled trial
Patients	Patients undergoing major lumbar spine surgery N=102
Methods	Ketamine 0.5 mg/kg IVP on induction followed by an infusion at 10mcg/kg/min until wound closure vs placebo (saline) of equivalent volume Patients were observed for 48 h postoperatively and followed up at 6 weeks
Outcomes	The primary outcome was 48-h morphine consumption
Results	Total morphine consumption (morphine equivalents) was significantly reduced in the treatment group 48 h after the procedure ($p=0.029$) Also reduced at 24 h ($p=0.032$) and at 6 weeks ($p=0.041$)

Anesthesiology 2010; 113:639 - 46

Effect of intraoperative infusion of low-dose ketamine on management of postoperative analgesia

Study Design	Prospective, randomized, double-blinded, placebo-controlled, single center
Patients	N= 80; scheduled for open cholecystectomy under general anesthesia
Methods	Group K received bolus of ketamine 0.2 mg/kg intravenously followed by an infusion of 0.1 mg/kg/hour before skin incision until end of surgery Group C: Similar volume of saline was infused
Outcomes	<u>Primary:</u> Pain score at different intervals and cumulative morphine consumption over 24 h <u>Secondary:</u> Hemodynamic parameters, patient satisfaction score and incidences of side effects
Results	Intraoperative infusion of low-dose ketamine in first 6 h of the postoperative period resulted in reduced pain scores and reduced opioid requirements ($P = 0.001$) The incidence of side effects and patient satisfaction were similar in both groups

J Nat Sci Biol Med. 2015 Jul-Dec;6(2):378-82.

Low-dose Ketamine Infusion In Acute Burn Patients Improves Analgesia And Reduces Opioid Consumption After Infusion Completion

Study Design	Single-center, retrospective study
Patients	Adult (age ≥ 18 years) burn patients admitted to a burn center
Methods	Patients received a low-dose ketamine infusion (1-5 mcg/kg/min) and multi-modal analgesia
Outcomes	<u>Primary:</u> Change in mean pain scores 24 hours before and after ketamine implementation <u>Secondary:</u> Change in opioid requirements in oral morphine equivalents (OME) 24 hours before and after ketamine initiation
Results	<ul style="list-style-type: none"> There was no difference in mean pain scores 24 hours before and 24 hours after infusion ($p=0.55$) Difference in mean pain scores 24 hours before and 24 hours after completion of ketamine infusion ($p=0.02$) No difference in the change in opioid requirements 24 hours before and 24 hours after infusion ($p=0.61$) Opioid requirements were reduced 24 hours after completion of ketamine ($p=0.03$) No adverse events reported

Miller MK, Knobell R, Gottlieb LJ, Dickerson DM. Poster presentation at the American Burn Association Conference; 2017 Mar 21-24; Boston, MA.



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The Journal of Pain, Vol 17, No 2 (February), 2016: pp 131-137
Available online at www.jpain.org and www.sciencedirect.com

Guidelines on the Management of Postoperative Pain

The panel recommends that clinicians consider i.v. ketamine as a component of multimodal analgesia in adults (weak recommendation, moderate- quality evidence)

J Pain. 2016 Feb;17(2):131-57

Ideal Patients

- Opioid-tolerant patients
- Patients who have difficulty tolerating opioids
- Severe intractable pain not controlled by escalating doses of opioids
- Severe neuropathic pain
- Evidence of opioid-induced hyperalgesia

Anesth Essays Res. 2014 Sep-Dec; 8(3): 283-290

How Is Ketamine Administered?

- Low-dose continuous infusion
 - 1-5mcg/kg/min
- Bolus intra-operatively after anesthesia induction and continue low dose infusion for 24-48 hours
- For complex pain syndromes, can be administered as low-dose infusion in the ICU or hospital ward with consultation to acute pain service

How does ketamine for postoperative pain differ than ketamine for use in the emergency department?

- No difference
- We use higher doses in the postoperative setting
- It is given orally
- It is given as a low-dose continuous infusion

Multimodal Analgesia

https://www.medscape.org/viewarticle/536924_5

Multimodal Analgesic Agents

- Nonsteroidal anti-inflammatory drugs (NSAIDs)
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- Alpha-2 adrenergic agonists
 - Clonidine
 - Dexmedetomidine
- Gabapentinoid
 - Gabapentin
 - Pregabalin
- Glucocorticoids
- Opioids
- Tramadol
- N-methyl-D-aspartate (NMDA) antagonists
 - Ketamine
 - Methadone
- Local anesthetic
 - Bupivacaine
 - Lidocaine
- Intravenous lidocaine

Curr Opin Anaesthesiol 22:588-593
JAMA Surg. 2017;152(7):691-697.

Lidocaine

- **Traditional roles:**
 - Class Ib antiarrhythmic
 - Prolongs depolarization and decreases automaticity of myocytes in the ventricles by blocking sodium-gated ion channels to reduce impulse conduction velocity
 - Intravenous (IV) infusion
 - Local and regional anesthetic
 - Subcutaneous, nerve block
- **Emerging role:**
 - Postoperative analgesia
 - Systemic intravenous infusion

Anesthesiology 2010; 113:1433-7
Lidocaine. Lexi-Comp, Inc. (Lexi-Drug®). Lexi-Comp, Inc.; March 7, 2018.

Lidocaine

- **Local anesthetic:**
 - Decreases central hyperexcitability by blocking the initiation and conduction of nerve impulses through blockade of sodium channels
 - FDA approved in 1948 as local anesthetic
- **Antiarrhythmic:**
 - Prolongs depolarization and decreases automaticity of myocytes in the ventricles by blocking sodium-gated ion channels and reducing impulse conduction velocity
 - FDA approved in 1960s as treatment for cardiac arrhythmias

Anesthesiology 2010; 113:1433-7
Lidocaine. Lexi-Comp, Inc. (Lexi-Drug®). Lexi-Comp, Inc.; March 7, 2018.

Common Routes of Administration

- Topical
- Rectal
- Epidural
- Intravenous
- Subcutaneous
- Intramuscular
- Intradermal
- Ophthalmic
- Mucous membrane

Intravenous Lidocaine

- Analgesic, anti-inflammatory and anti-hyperalgesic properties

Br J Surg. 2008 Nov;95(11):1331-8.

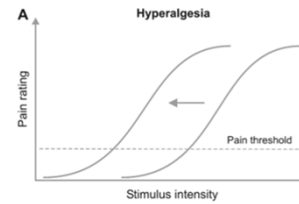


Definitions

Allodynia	Pain evoked by a normally innocuous stimulus
Central sensitization	Changes in synaptic efficacy between sensory neurons and central (spinal dorsal horn) neurons that increase the perception of pain, especially in regions adjacent to the primary site of injury
Hyperalgesia	An increase in the perception of pain elicited by a noxious stimulus
Nociceptor	A peripherally localized neuron preferentially sensitive to a noxious stimulus or to a stimulus that would become noxious if prolonged

J Clin Invest. 2010;120(11):3760–3772

Hyperalgesia



Best Pract Res Clin Anaesthesiol. 2007 Mar;21(1):65-83.

Lidocaine and Hyperalgesia

- Mechano-insensitive nociceptors
 - A subgroup of nociceptors that play a key role in the initiation and maintenance of hyperalgesia
- Subgroup of neurons found to be sensitive to intravenous lidocaine
 - Sodium channel blockers lead to sensitization and increased responses of nociceptive signals

Anesth Analg 2004;98:1050–5

Additional Benefit

- Excessive stimulation of the inflammatory response after major abdominal surgery has major impact on the development of several inflammatory disorders
 - Impaired gastrointestinal motility
 - Postoperative ileus
- Epidurals
 - Increase the risk of urinary retention, hypotension, impairs mobilization and can cause serious complications such as epidural hematoma or abscess

Ann Surg 2007;246: 192–200
Br J Surg. 2008 Nov;95(11):1531-6.

Intravenous Lidocaine Infusion Facilitates Acute Rehabilitation after Laparoscopic Colectomy

Abdourahmane Kaba, M.D.,* Stanislas R. Laurent, M.D.,† Bernard J. Detroz, M.D.,† Daniel I. Sessler, M.D.,‡ Marcel E. Durieux, M.D., Ph.D.,§ Maurice L. Lamy, M.D.,|| Jean L. Joris, M.D., Ph.D.,#

Study Design	Single-center, randomized
Patients	N=40 undergoing laparoscopic colectomy
Methods	IV lidocaine bolus 1.5 mg/kg at induction, then a continuous infusion of 2 mg/kg/hr intraoperatively and 1.33 mg/kg/hr for 24 hours postoperatively vs equal volume of saline
Outcomes	Postoperative pain scores, opioid consumption, fatigue scores, times to first flatus, defecation, and hospital discharge
Results	Times to first flatus ($p < 0.001$), defecation ($p=0.001$), and hospital discharge ($p=0.001$) were significantly shorter in patients who received lidocaine. Lidocaine significantly reduced opioid consumption ($p=0.005$) and postoperative pain and fatigue scores

Anesthesiology 2007; 106:11– 8

Systemic Lidocaine Shortens Length of Hospital Stay After Colorectal Surgery A Double-blinded, Randomized, Placebo-controlled Trial

Study Design	Single-center, double-blinded, randomized, placebo-controlled
Patients	N=60 undergoing colorectal surgery
Methods	IV lidocaine bolus (1.5 mg/kg) followed by a continuous lidocaine infusion (2 mg/min) until 4 hours postoperatively
Outcomes	<u>Primary:</u> length of hospital stay <u>Secondary:</u> length of PACU stay, time until return of bowel function, postoperative pain and opioid consumption, plasma levels of several pro- and anti-inflammatory interleukins
Results	Lidocaine significantly shortened length of hospital stay ($p=0.004$) accelerated return of bowel function ($p < 0.05$) No difference in daily pain ratings Plasma levels of IL-6, IL-8, complement C3a, and IL-1ra and expression of CD11b, L- and P-selectin, and platelet-leukocyte aggregates were significantly attenuated by systemic lidocaine

Ann Surg. 2007;246: 192–200

Meta-analysis

Meta-analysis of intravenous lidocaine and postoperative recovery after abdominal surgeryE. Marret¹, M. Rolin², M. Beaussier² and F. Bonnet¹

Study Design	Meta-analysis of randomized, double-blinded trials
Patients	8 trials selected N=161 patients receiving abdominal surgery
Methods	Lidocaine bolus followed by infusion vs placebo
Outcomes	Duration of ileus, length of hospital stay, postoperative pain, and incidence of nausea and vomiting
Results	Intravenous lidocaine administration decreased the duration of ileus ($p < 0.001$), length of hospital stay ($p = 0.002$), postoperative pain intensity at 24 h after operation on a visual analogue scale ($p = 0.002$), and the incidence of nausea and vomiting ($p = 0.006$)

Br J Surg. 2008 Nov;95(11):1331-6.

Perioperative Intravenous Lidocaine Has Preventive Effects on Postoperative Pain and Morphine Consumption After Major Abdominal Surgery

Study Design	Single-center, prospective, randomized, double-blinded
Patients	N=40 patients undergoing abdominal surgery
Methods	Lidocaine IV bolus 1.5 mg/kg in 10 min followed by an IV infusion of 1.5 mg/kg/hr vs placebo Infusion started 30 minutes before skin incision and was stopped 1 hour after the end of surgery
Outcomes	Postoperative pain ratings (numeric rating scale of 0–10) and morphine consumption (patient-controlled analgesia) were assessed up to 72 hours after surgery
Results	No difference in pain rating Patients receiving lidocaine required less morphine during the first 72 hours after surgery ($p < 0.05$)

Anesth Analg. 2004;98:1050–5

RESEARCH
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ADVOCACYThe Journal of Pain, Vol 17, No 2 (February), 2016: pp 131-137
Available online at www.jpain.org and www.sciencedirect.com**Guidelines on the Management of Postoperative Pain**

The panel recommends that clinicians consider i.v. lidocaine infusions in adults who undergo open and laparoscopic abdominal surgery who do not have contraindications (weak recommendation, moderate-quality evidence)

J Pain. 2016 Feb;17(2):131-57

Dosing

- Range of doses and units used in the literature
 - mg/kg/hr most frequently used for analgesia
 - mg/min commonly used for arrhythmias
 - Education is key!
- Lidocaine dosing for analgesia
 - Bolus: 1-1.5mg/kg (IBW)
 - Continuous infusion: 0.5-2mg/kg/hr (IBW)

Monitoring

- Lidocaine has a narrow therapeutic window
 - Serum concentrations must be monitored to prevent toxicity
 - Therapeutic concentrations: 1.5-6 mcg/mL
- Caution in hepatic disease

Lidocaine, known as a local anesthetic and antiarrhythmic, has been found to have _____ properties.

- Analgesic
- Anti-inflammatory
- Anti-hyperalgesic
- All of the above

A nurse calls down to the pharmacy and states she needs a lidocaine infusion for pain. The proper dosage form to send to the nurse would be:

- A C
B D

Lidocaine in the Emergency Department

Lidocaine Patch

FDA Approved	Post-herpetic neuralgia
Off-Label Indications	Diabetic polyneuropathy, fibromyalgia, low back pain, rib fractures, osteoarthritis
Mechanism of Action	Lidocaine is continuously released at the site of application without exerting numbness
Dosing	Apply to painful area 12 hours on, 12 hours off, up to three patches can be applied at the same time and they can be cut for smaller areas
Availability	OTC 4%, RX 5% 5% Lidocaine cream available by RX for cost prohibitive patches
Benefit	Very small fraction of the dose ever reaches the systemic circulation, good for patients on multiple medications concerned for drug interactions

Arch Neurol. 2004;61(6):914-918
Clin Ther. 2009;31(4):705-720
Am Surg. 2011;77(4):438-442
Osteoarthritis and cartilage. 2004;12(3):253-255

Lidocaine for Renal Colic

Off-Label Usage	
Dose	1.5 mg/kg IVPB (max 200 mg) over 20 min
Onset	2-5 min
Half-Life	1.5-2 hours
Contraindications	Pregnancy, liver disease, allergy to amide anesthetics, uncontrollable seizure disorder, unstable CAD, MI within 90 days, CHF (EF < 35%), CKD (eGFR < 35 ml/min)
Monitoring	EKG, Cardiac Monitor, Pulse oximetry, Vitals
Adverse Reactions	Tinnitus, constipation, dizziness/lightheadedness, perioral numbness, drowsiness, nausea/vomiting, seizures

American Journal of Emergency Medicine. 2016; 34: 443-448
Anesthesia Pain Medicine. 2014; 4(1): e16222
BMC Urology. 2012; 12: 13

Effectiveness of intravenous lidocaine versus intravenous morphine for patients with renal colic in the emergency department



Hassan Soleimanpour^{1*}, Kamaleddin Hasanadeh², Hassan Vaezi³, Samad El Gohari⁴,
Robab Mehdizadeh Esfahani⁵ and Maryam Soleimanpour⁶

- Population: 18-65 years old, pain due to renal colic
- Comparator Groups: Single dose IV lidocaine (1.5 mg/kg) vs IV morphine (0.1 mg/kg) pushed slowly
- Objective: To compare pain scores between two groups at 5, 10, 15 and 30 min along a VAS scale
 - Statistically significant difference in pain relief in lidocaine group compared to morphine at 5, 10, 15 or 30 min.

Safety Data

- No serious adverse effects
- Side effects in lidocaine group included transient dizziness (8.3%), perioral numbness (2.5%), dysarthria (1.7%)

Overall: Lidocaine can significantly reduce pain associated with renal colic compared to morphine

Which ER patient would be best suited to receive a lidocaine infusion for renal colic?

- 23 year old pregnant female with no past medical history
- 46 year old male on dialysis
- 56 year old female with non-hodgkins lymphoma in remission
- 84 year old male with an allergy to penicillin and CHF (EF < 10%)

Tech Check

- Renal Colic Order for Lidocaine 1.5 mg/kg IVPB infusion over 20 min, patient weights 85 kg.
- You would like to make this in a 100mL NS IVPB
- You have lidocaine 2%
- How many mls of lidocaine do you need?

1. $1.5\text{mg/kg} \times 86\text{ kg} = 129\text{ mg}$
2. Each vial of 2% lidocaine contains 100 mg per 5mL
3. Set up your proportion
 - $100\text{ mg}/5\text{mL} = 129\text{ mg}/X\text{mL}$
4. Cross multiply
 - $100\text{ mg}(X\text{mL}) = 645(\text{mg})(\text{mL})$
5. Divide
 - $X\text{mL} = 645(\text{mg})(\text{mL})/100(\text{mg})$
 - $X = 6.45\text{ mL}$
6. Answer: 6.4 mL is needed to make a 129 mg dose of lidocaine for this patient.

Topical Lidocaine 4%

Off-Label Usage	
Indications	Awake fiberoptic intubation, Alleviate bronchoconstriction and cough, nasal anesthesia prior to transnasal bronchoscopy, NG Tube insertion
Dose	200mg - 5 mL of a 4% (40mg/mL) topical lidocaine solution via nebulizer, o2 flow 6L to 8L oxygen/min <ul style="list-style-type: none"> • Do not exceed 5 mg/kg dose • Can repeat one to two times for a total max dose of 600 mg
Onset of Action	10 min
Contraindication	Hepatic Disease
Monitoring	Mental Status
Adverse Effects	<i>Common:</i> lightheadedness, numbness of tongue <i>Serious:</i> Serum concentrations > 5mg/L - Lightheadedness, tremors, hallucinations, cardiac arrest

Ann Emerg Med. 2004 Aug;44(2):131-7
Am J Health Syst Pharm. 2006;63(18):1704-1716

Teaching Two Old Drugs New Tricks: The Use of Lidocaine and Ketamine for Analgesia in the OR and ER for Non-opioid Pain Management

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