Pain Management and Dosing Guide

PAMI ED

Pain Assessment and Management Initiative

Updated April 2016

http://pami.emergency.med.jax.ufl.edu/

https://goo.gl/4Yh1cB

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Pain Management and Dosing Guide Includes:

1. Principles of Pain Management, Discharge and Patient Safety Considerations, Analgesic Ladder
2. Non-opioid Analgesics, Opioid Prescribing Guidelines and Equianalgesic Chart, Opioid Cross-Sensitivities, Intranasal Medications
3. Nerve Blocks, Neuropathic Pain Medications, Muscle Relaxer Medications, Ketamine Indications
4. Topical and Transdermal Medications
5. Procedural Sedation and Analgesia (PSA) Medications
6. Stepwise Approach to Pain Management and PSA

Funding provided by Florida Medical Malpractice Joint Underwriting Association (FMMJUA) and University of Florida College of Medicine-Jacksonville, Department of Emergency Medicine

Principles of Pain Management

Establish realistic pain goals
Will vary depending on patient and type of pain - goal of zero may not be feasible

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Educate patient/caregivers on pain management goals and regimen

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Consider pharmacologic and non-pharmacologic treatment options and initiate therapy

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Continually reassess patient's pain and monitor for medication efficacy and side effects

- Use same scale to reassess pain
- Use scale that is age and cognitively appropriate
- If no improvement, adjust regimen

Pain Management Considerations

- Type of pain: nociceptive, neuropathic, inflammatory
- Acute vs. chronic vs. acute on chronic pain exacerbation
- Pain medication history: OTC, Rx and herbal
- Patient factors: genetics, culture, age, previous pain experiences, comorbidities
- Verify dosing for < 6 mo and > 65 yo

Treatment Options

- Pharmacotherapy: systemic, topical, transdermal - nerve blocks
- Non-pharmacologic modalities
- Refer to pain, palliative or other specialists for advanced treatment

Non-pharmacological modalities
Splinting, distraction, hot/cold therapy, exercise, massage, imagery, and others

Discharge and Patient Safety Considerations

- Assess and counsel regarding falls, driving, work safety, and medication interactions
- Bowel regimen for opioid induced constipation
- Vital signs and oral intake before discharge
- Document all pain medications administered and response at time of discharge or disposition
- Consider OTC and non-pharmacologic options
- Can patient implement pain management plan? - insurance coverage, transportation, etc.

Analgesic Ladder and Treatment Basics

Step 3: Severe Pain
Step 1 and Step 2 Strategies +/- Scheduled Opioid Analgesics

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Step 2: Moderate Pain
Step 1 Strategy + Intermittent Dose of Opioid Analgesics (PO, IV) +/-
Interventional (Blocks & Procedures)

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Step 1: Mild Pain
Non-opioid Analgesic (APAP, NSAIDs, COX-2 Inhibitors) +/- Local/Topical Anesthetics

Ladder Basics

1. Use oral route when possible
2. Give analgesics at regular intervals
3. Prescribe according to pain intensity
4. Dosing must be adapted to individual
5. Analgesic plan must be refined and communicated with patient and staff

Non-Opioid Analgesics*

Generic (Brand)	Adult	Pediatric (<12 yo)
Acetaminophen (Tylenol®)	325-650 mg PO q 4-6 h Max: 4 g/d or 1 q 4 h	15 mg/kg PO q 4-6 h Max: 90 mg/kg/d
Acetaminophen IV (Ofirmev®) Use only if not tolerating PO	1 g IV q 6 h Max: 4 g/d or 650 mg q 4 h prn pain	<50 kg 15 mg/kg IV q 6 h or 12.5 mg/kg IV q 4 h prn pain Max: 75mg/kg/d
Celecoxib (Celebrex®)	100-200 mg PO daily to q 12 h Max: 400 mg/d	>2 yo 50 mg PO BID
Ibuprofen (Motrin®)	400-800 mg PO q 6 to 8 h Max: 3200 mg/d	10 mg/kg PO q 6 to 8 h Max: 40 mg/kg/d or 2400 mg/d
Indomethacin (Indocin®)	25-50 mg PO q 6 to 12 h Max: 200 mg/d	1-2 mg/kg PO q 6 to 12 h >6 mo Max: 4 mg/kg/d or 200 mg/d
Ketorolac† (Toradol®)	15-30 mg IV/IM q 6 h Max: 120 mg/d x 5 d	0.5-1 mg/kg/ dose IM/IV q 6 h Max: 15-30 mg q 6 h x 5 d
Naproxen (Naprosyn®)	250-500 mg PO q 8 to 12 h Max: 1500 mg/d	5 mg/kg PO q 12 h Max: 1000 mg/d
Meloxicam (Mobic®)	7.5-15 mg PO daily Max: 15 mg/d	—

*Doses can be scheduled or PRN pain. Avoid NSAIDs in renal dysfunction, PUD, CHF, and if < 6 mo of age. Use with caution in elderly patients.
†For patients < 65 yo, 60 mg IM or 30 mg IV x 1, followed by 30 mg IV/IM q 6 h PRN up to a max daily dose of 120 mg for 5 days. For patients >65 yo, <50 kg, and/or with renal impairment, 30 mg IM or 15 mg IV x 1, followed by 15 mg IV/IM q 6h PRN up to a max daily dose of 60 mg for 5 days.

Opioid Prescribing Guidelines and Equianalgesic Chart

Generic (Brand)	Onset (O) and Duration (D)		Approximate Equianalgesic Dose		Recommended *STARTING* dose for ADULTS		Recommended *STARTING* dose for CHILDREN (> 6 mo)	
	Oral	IV	Oral	IV	Oral	IV	Oral	IV
Morphine (MSIR®) [CII]	O: 30-60 min D: 3-6 h	O: 5-10 min D: 3-6 h	30 mg	10 mg	15-30 mg q 2-4 h	2-10 mg q 2-4 h	0.3 mg/kg q 4 h	0.1 mg/kg q 2-4 h
Morphine extended release (MS Contin®) [CII]	O: 30-90 min D: 8-12 h	—	30 mg	10 mg	15-30 mg q 12 h	—	0.3-0.6 mg/kg q 12 h	—
Hydromorphone (Dilaudid®) [CII]	O: 15-30 min D: 4-6 h	O: 15 min D: 4-6 h	7.5 mg	1.5 mg	2-4 mg q 4 h	0.5-2 mg q 2-4 h	0.06 mg/kg q 4 h	0.015 mg/kg q 4 h
Hydrocodone/APAP 325 mg (Norco 5, 7.5, 10®) [CII] Hycet (7.5 mg/325 mg per 15 mL)	O: 30-60 min D: 4-6 h	—	30 mg	—	5-10 mg q 6 h	—	0.1-0.2 mg/kg q 4-6 h	—
Fentanyl [CII] (Sublimaze® Duragesic®) *Patch for opioid tolerant patients ONLY*	Transdermal O: 12-24 h D: 72 h per patch	O: immediate D: 30-60 min	—	100 mcg (0.1 mg)	Transdermal 12-25 mcg/h q 72 h	50 mcg q 1-2 h	Transdermal 12-25 mcg/h q 72 h	1-2 mcg/kg q 1-2 h (max 50 mcg/dose)
Methadone (Dolophine®) [CII] *Opioid tolerant patients ONLY*	O: 30-60 min D: >8 h (chronic use)	—	Variable	Variable	5-10 mg q 8-12 h	—	0.7 mg/kg/d PO/SC/IM/IV divided q 4-6 h prn severe chronic pain	
Oxycodone 5, 15, 30 mg (Roxicodone®), Oxycodone 5, 7.5, 10 mg/ APAP 325 mg (Percocet®), ER=Oxycontin® [CII]	O: 10-15 min D: 4-6 h	—	20-30 mg	—	5-10 mg q 6 h ER 10 mg q 12 h	—	0.05-0.15 mg/kg q 4-6 h	—
Tramadol (Ultram®) [CIV]	O: 1 h D: 3-6 h	—	300 mg	—	50-100 mg q 6 h Max: 400 mg/d	—	—	—
Codeine* 15, 30, 60 mg/APAP 300 mg	O: 1-2 h D: 4-6 h	—	200 mg	—	30-60 mg q 4 h	—	0.5-1 mg/kg q 6 h or 3-6 yo = 12mg 7-12 yo = 15-30mg	—

*Codeine is often ineffective. Use for cough and cold is contraindicated in children. Not recommended for < 12 yo or 12-18 yo with respiratory condition or nursing mothers.

Opioid Cross-Sensitivities

Phenanthrenes (related to morphine): morphine, codeine, oxycodone, hydrocodone, hydromorphone
Phenylpiperidines (related to meperidine): meperidine, fentanyl
Risk of cross-sensitivity in patients with allergies is greater when medications from the same opioid family are administered.

Intranasal Medications*

Generic	Dose	Max Dose	Comments
Fentanyl	1.5-2 mcg/kg q 1-2 h	3 mcg/kg or 100 mcg	Divide dose equally between each nostril
Midazolam 5 mg/mL	0.3 mg/kg	10 mg or 1 mL per nostril (total 2 mL)	Divide dose equally between each nostril
Ketamine+	0.5-1.0 mg/kg Large range	Limited data	Use with caution until further studied

*Use the MOST concentrated form available with an atomizer. + Dosing not well established. Studies have used 0.5-9 mg/kg.

NERVE BLOCKS

Type of Block	General Distribution of Anesthesia
Interscalene Plexus Block	Shoulder, upper arm, elbow and forearm
Supraclavicular Plexus Block	Upper arm, elbow, wrist and hand
Infraclavicular Plexus Block	Upper arm, elbow, wrist and hand
Axillary Plexus Block	Forearm, wrist and hand. Elbow if including musculocutaneous nerve
Median Nerve Block	Hand and Forearm
Radial Nerve Block	Hand and Forearm
Ulnar Nerve Block	Hand and Forearm
Femoral Nerve Block	Anterior thigh, femur, knee and skin over the medial aspect below the knee
Popliteal Nerve Block	Foot and ankle and skin over the posterior lateral portion, distal to the knee
Tibial Block	Foot and ankle
Deep Peroneal Block	Foot
Saphenous Nerve Block	Foot
Sural Nerve Block	Foot

Local Anesthetics†	Onset	Duration without Epi (h)	Duration with Epi (h)	Max Dose without Epi, mg/kg	Max Dose with Epi, mg/kg
Lidocaine (1%)	Rapid	0.5–2	1–6	4.5 (300 mg)	7 (500 mg)
Bupivicaine (0.5%)*	Slow	2-4	4-8	2.5	3
Mepivicaine (1.5%)	Rapid	2-3	2-6	5	7
2-Chloroprocaine (3%)	Rapid	0.5-1	1.5-2	10	15
Ropivicaine (0.5%)	Medium	3	6	2-3	2-3

*Most cardiotoxic †1% = 10mg/ml, 0.5% = 5mg/ml

Neuropathic Pain Medications

Generic (Brand)	Beginning Dose	Max Dose
Gabapentin* (Neurontin®)	300 mg PO QHS to TID	3600 mg/d
Pregabalin* (Lyrica®)	50 mg PO TID	300 mg/d**
SNRIs: Duloxetine (Cymbalta®) Venlafaxine ER (Effexor XR®)	30 mg PO daily† 37.5 mg PO daily	60 mg/d** 225 mg/d
TCAS: Amitriptyline (Elavil®) Nortriptyline (Pamelor®)	25 mg PO QHS 25 mg PO QHS	200 mg/d 150 mg/d

†30 mg daily for at least 7 days to decrease nausea
*Requires dose adjustment based on renal function **Varies depending on indication

Muscle Relaxer Pain Medications

Generic (Brand)	Beginning Dose	Max Dose
Baclofen (Lioresal®)	5 mg PO TID	80 mg/d
Cyclobenzaprine (Flexeril®)	5 mg PO TID	30 mg/d
Methocarbamol (Robaxin®)	1-1.5 g PO TID to 4x/day x 48-72 h, then 500-750 mg PO TID to 4x/day	8 g/d
Diazepam (Valium®)	Adult: 2-10mg PO TID-QID; 5-10mg IV/IM Ped: (6-12yo): 0.12-0.8 mg/kg/day PO divided q 6-8 h; 0.04-0.2 mg/kg IV/IM q 2-4 h prn;	Ped: 0.6 mg/kg/8h IV/IM to adult max

Ketamine (Ketalar®) Indications

Indications	Starting Dose
Procedural Sedation	**IV:** Adult 0.5-1.0 mg/kg, Ped 1-2mg/kg; **IM:** 4-5 mg/kg
Sub-dissociative Analgesia	**IV:** 0.1 to 0.3 mg/kg, *max initial dose* ≤ 10 mg **IM:** 0.5-1.0 mg/kg; **IN*:** 0.5-1.0 mg/kg
Excited Delirium Syndrome	**IV:** 1 mg/kg; **IM:** 4-5 mg/kg

*Dosing not well established. Studies have used 0.5-9 mg/kg.

Topical and Transdermal Medications*

Generic (Brand)	Indications	Onset (O) and Duration (D)	Recommended *STARTING* dose for ADULTS	Recommended *STARTING* dose for CHILDREN	Maximum Dose
Diclofenac sodium 1.5%, 2% w/w topical solution (Pennsaid) 1% gel (Voltaren gel)	Osteoarthritis	Variable	1.5% soln: 40 drops QID 2% soln: 2 pumps (40mg) BID to affected knee 1% gel: 2 or 4g QID	—	1.5% soln: 40 drops QID 2% soln: 2 pumps (40mg) BID 1% gel (2g): 8 g/d to single joint of **upper** extremity; 1% (4g): 16 g/d to single joint of **lower** extremity
Diclofenac epolamine 1.3% patch (Flector patch)	Acute pain from sprains, strains, contusion	Variable	1 patch (180 mg) BID	—	1 patch BID
Lidocaine 5% patch (Lidoderm patch)	Postherpetic neuralgia	Variable	1-3 patches applied once daily, remove after 12 h	—	3 patches in a 12 h period per day
Fentanyl (Duragesic®)	Persistent moderate to severe chronic pain	O: 12-24 h D: 72 h per patch	12-25 mcg/h q 72 h		Variable
Capsaicin cream (Theragen®, Zostrix®, Salonpas) Exists as several OTC formulations in combination with camphor and menthol	Strains, sprains, backache or arthritis	Variable	Apply a thin layer to the affected area and gently massage up to QID	>12 yo: Apply a thin layer to the affected area and gently massage up to QID	Up to QID
Lidocaine 4% (L.M.X.4®)	Minor cuts, scrapes, burns, sunburn, insect bites, and minor skin irritations	O: 20-30 min D: 60 min	Apply externally		Externally 3-4 times per day. Apply in area less than 100cm² for children less than 10kg. Apply in area less than 600cm² for children between 10 and 20kg
LET (Lidocaine Epinephrine Tetracaine) (gel or liquid)	Wound repair (non-mucosal)	O: 10 min D: 30-60 min	Topical 4% Lidocaine, 1:2,000 Epinephrine, 0.5% Tetracaine		3 mL (not to exceed maximal Lidocaine dosage of 3-5 mg/kg)
EMLA (2.5% Lidocaine 2.5% Prilocaine) Cover with occlusive dressing Maximum application time 4 hours	Dermal analgesic (intact skin)	O: 60 min D: 3-4 h	20 gm	3-12 mo (>5 kg): 2 gm 1-6 yo (>10kg): 10 gm 7-12 yo (>20kg): 20 gm	3-12 mo max area 20cm² 1-6 yo max area 100cm² 7-12 yo max area 200cm²
Pain-Ease® Vapocoolant/Skin Refrigerant	Cooling intact skin and mucus membranes and minor open wounds	O: immediate D: few sec to 1 min	—	Spray for 4-10 sec from distance of 8-18 cm. Not recommended for < 3 yo	Stop when skin turns white to avoid frostbite
Lidocaine	Foley catheter and nasogastric tube insertion; intubation; nasal packing; gingivostomatitis	O: 2-5 min D: 30-60 min	2% topical gel/jelly, 5% topical ointment, 2% oropharyngeal viscous topical solution		3-5 mg/kg

*Dosages are guidelines to avoid systemic toxicity in patients with normal intact skin and with normal renal and hepatic function

Procedural Sedation and Analgesia Medications

Generic (Brand)	Adult	Pediatric	Comments
Ketamine (Ketalar®)	IV 0.5-1.0 mg/kg IM 4-5 mg/kg	>3 mo: IV 1-2 mg/kg; additional doses 0.5 mg/kg IV q 10-15 min prn; IM 4 - 5 mg/kg	Risk of laryngospasm increases with active upper respiratory infection and procedures involving posterior pharynx; vomiting common - consider premedication with Ondansetron (Zofran). Not recommended in patients <3 mo.
Midazolam (Versed®)	IV 0.05-0.1 mg/kg IV slow push over 1-2 min	IV 0.05-0.1 mg/kg IN 0.2-0.3 mg/kg (IN max 10 mg)	Initial max dose 2 mg. Max total dose in >60 yo is 0.1 mg/kg Decrease dose by 33-50% when given with opioid
Propofol (Diprivan®)	IV 0.5-1 mg/kg slow push (1-2 min); additional doses 0.5 mg/kg	IV 1 mg/kg slow push (1-2 min); additional doses 0.5 mg/kg	Risk of apnea, hypoventilation, respiratory depression, rapid changes in sedative depth, hypotension; provides no analgesia
Etomidate (Amidate®)	IV 0.1 - 0.2mg/kg; additional doses 0.05mg/kg		Risk of myoclonus (premedication w/ benzo or opioid can decrease), pain with injection, nausea and vomiting, risk of adrenal suppression; provides no analgesia
Ketamine + Propofol	—	IV ketamine 0.75 mg/kg + propofol 0.75 mg/kg. Additional doses: ketamine 0.5 mg/kg, propofol 0.5-1 mg/kg	See ketamine and propofol comments respectively
Dexmedetomidine (Precedex®)	IV 1 mcg/kg loading dose (over 10 min) followed by 0.5 to 2 mcg/kg/h continuous infusion. Use 0.5 mcg/kg for geriatric patients	IV 0.5–2 mcg/kg loading dose (over 10 min) followed by 0.5 to 2 mcg/kg/h continuous infusion IN 2-3 mcg/kg	Risk of bradycardia, hypotension, especially with loading dose or rapid infusions, apnea, bronchospasm, respiratory depression
Nitrous oxide	—	50% N2O/50% O2 inhaled	Do not use if acute asthma exacerbation, suspected pneumothorax/other trapped air or head injury with altered level of consciousness
Morphine	IV 0.05-.0.1 mg/kg or 5-10 mg	IV 0.1-0.2 mg/kg, titrated to effect	Monitor mental status, hemodynamics, and histamine release. Requires longer recovery time than fentanyl. Difficult to titrate during procedural sedation due to slower onset and longer duration of action. Reduce dosing when combined with benzodiazepines (combination increases risk of respiratory compromise)
Fentanyl	IV 0.5-1 mcg/kg	1-3 yo: 2 mcg/kg; 3-12 yo 1-2 mcg/kg	100 times more potent than morphine; Rapid bolus infusion may lead to chest wall rigidity. Reduce dosing when combined with benzodiazepines and in elderly. Preferred agent due to rapid onset and short duration.

Stepwise Approach to Pain Management and Procedural Sedation Analgesia (PSA)

http://pami.emergency.med.jax.ufl.edu/resources/educational-materials/procedural-sedation/

1. Situation Checkpoint
What are you trying to accomplish?: analgesia, anxiety, sedation, procedure, etc.

2. Developmental/Cognitive Checkpoint
What is the patient's development stage?

3. Family Dynamic Checkpoint
Who is caring for the patient?
What are the family dynamics?

4. Facility Checkpoint
Type of staffing and setting, team experience, facility policies, etc.

5. Patient Assessment Checkpoint
Review patient's risk factors and history.

6. Management Checkpoint
Choose your "ingredients" for pharmacologic and non-pharmacologic "recipe."

7. Monitoring & Discharge Checkpoint
Joint Commission standards, reassessments, facility policies, discharge and transportation considerations.