ASSESSMENT AND MANAGEMENT OF THE OPIOID TOLERANT PATIENT DURING THE PERIOPERATIVE PERIOD

CLAIRE BAUTISTA & KARLA RAUCH
ADVENTIST UNIVERSITY OF HEALTH SCIENCES

OBJECTIVES

- Present a protocol for use when patient who is opioid tolerant presents to pre op setting.
- Present opioid-to-opioid and opioid-to-nonopioid equi-analgesic tables/calculators/apps.
- REVISED OBJECTIVES:
- Explain why care of this population is challenging
- Review assessment of opioid tolerant patients
- Review physiology of chronic pain
- Present pharmacologic management strategies
- Present case studies of opioid tolerant patients

TREATMENT GOALS FOR OPIOID TOLERANT PATIENTS

- Opioid-based pain reduction from the preoperative period through to discharge to:
  - Prevent opioid withdrawal
  - Reducing acute postsurgical pain

CHALLENGE

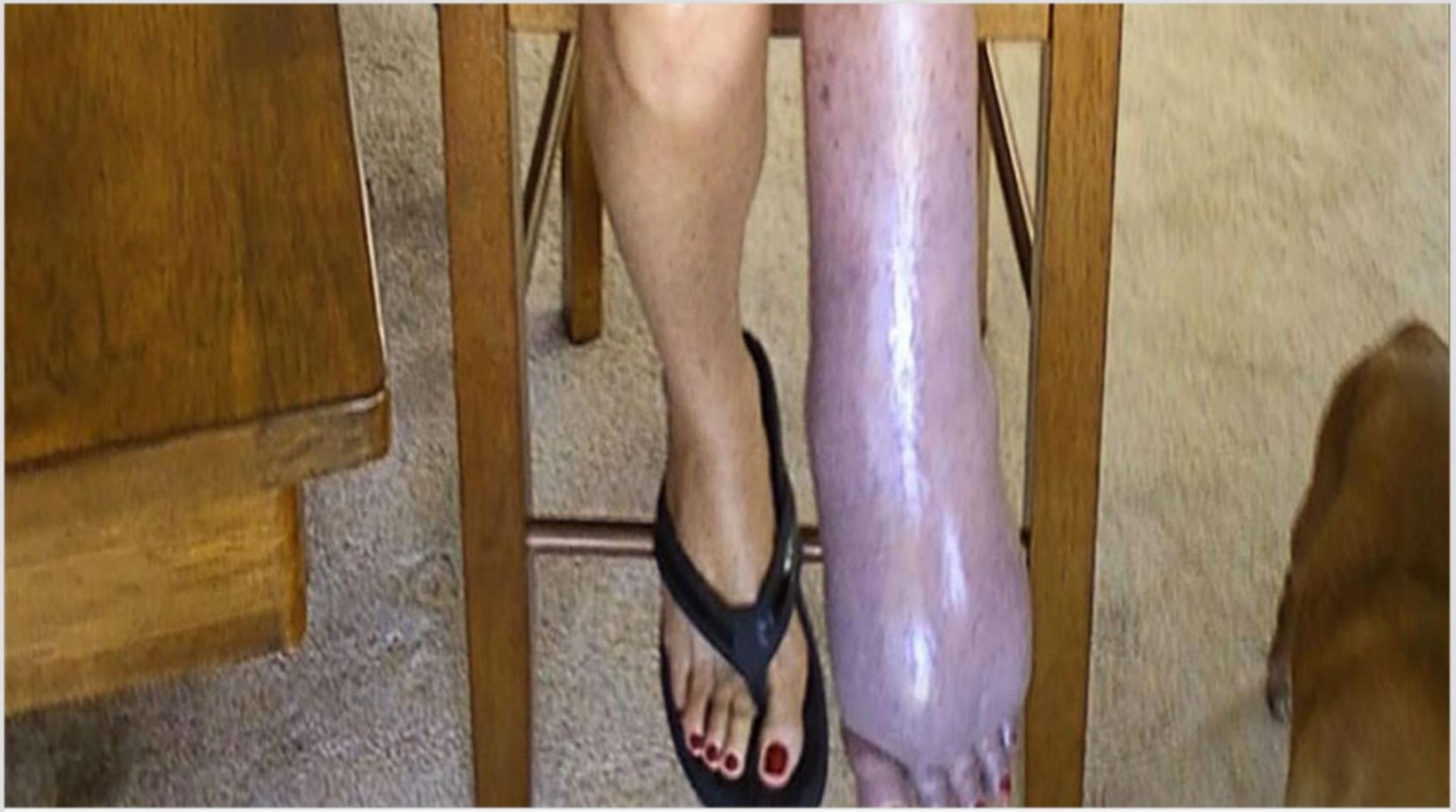
- Challenges:
  - Under medication → ↓patient satisfaction pain control, long-term disability, and delayed mobilization
  - Overmedication → postop respiratory insufficiency with prolonged ventilator dependence
  - Opioid-induced hyperalgesia (OIH),
- Lack of pain control = Leading cause of emergency room visits after surgery

CASE STUDY 1

- 56 year old male
- Hx: Chronic low back pain
- Medication: Takes 6 Percocet daily for over 6 weeks
- Sx: Cystoscopy

CASE STUDY 2

- 44 year old male
- Hx: Reflex Sympathetic Dystrophy, Hypertension, Anxiety
- Sx: Cervical Laminectomy
- Home Medications: Hydromorphone, Flexeril, Lisinopril, Trazodone, Temazepam,
- Uses neurostimulator for right arm pain secondary to lymphedema.



REFLEX SYMPATHETIC DYSTROPHY

SYMPTOMS: PAIN, TENDERNESS, SWELLING OF EXTREMITY

http://www.thedoctorstv.com/articles/912-one-woman-s-battle-against-chronic-pain

DEFINITION

- ASA definition of chronic pain = duration beyond the healing period associated with tissue injury and healing (Rosenquist et al., 2010).
- **Onset?**
  - 1 – 6 months? (Rosenquist & Vrooman, 2013)
  - 3 months ?(Bordi, 2014)
  - 2 months postoperatively with no other identifiable causes? (Voscopoulos & Lema, 2010).
  - 8 days? (Van Hecke, Torrance, & Smith, 2013).
  - **All of the above**

PHYSIOLOGIC CONSEQUENCES

- Percentage of patients reporting moderate to severe postoperative pain: 20 to 80%.
- Cardiac
- Pulmonary
- GI
- Endocrine
- Renal
- Immunity
- Psychological disorders

COSTS

- Over 100 million adults living in the U.S.
- **30%** of the population (and rising as is the number of patients having their chronic pain managed with opioids)
- Chronic pain is costly
  - Individual costs
  - Society
- Costs to the U.S. are estimated to range from $550 to $625 billion per year.

  (Dansie & Turk, 2013)

PERIOPERATIVE PROTOCOL

- Little to no consensus among anesthesia clinicians regarding assessment and care of patients with chronic pain
- "Evidence relating to the perioperative management of the opioid-tolerant patient is limited and largely based upon case reports, case series and expert opinion"

  (Huxtable, Roberts, Somogyl, & Macintyre, 2011).

ACUTE PAIN PATHWAY

- Transduction
- Transmission
- Modulation

  (central modulation occurs mostly in the dorsal horns of the spinal cord)

  - Augmentation
  - Modulation
- Perception

  (Macres, Moore, & Fishman, 2013).

PHYSIOLOGY OF CHRONIC PAIN

- Not well understood
- Pro-inflammatory substances → continual activation of nerves → neuroplasticity→ continuously transmits pain impulses from the periphery to the spinal cord. (Voscopoulos & Lema, 2010).
- Cow path analogy
- NMDA receptors
  - Stimulated by inflammation and tissue destruction →lead to central sensitization or wind-up phenomenon and hyperalgesia →neuroplasticity

    (De Pinto & Cahana, 2012).

PREDICTORS OF POSTOPERATIVE PAIN

- Preoperative pain = the most significant predictor
- Others:
  - Preoperative anxiety
  - Type of surgery
  - Catastrophizing

    (Clark & Spanswick, 2014).
- Study: There are no reliable predictive methods that are currently feasible (Werner, Mjobo, Nielsen, & Rudin, 2010).

ASSESSMENT

- #1 = ID patient with chronic pain
- Thorough standard medical and surgical history
- Scale 1 – 10
- Acceptable and current pain levels
- Dosages of opioid, non-opioids, steroids, nonprescription drugs, illicit drugs, alcohol, and nicotine used to treat chronic pain should be obtained.
- Doses should be verified by obtaining the prescription label or by contacting the prescribing physician or pharmacist.

PAIN HISTORY

- Next, review of ineffective regimens, allergic reactions, and surgical experiences should be examined.
- Is acceptable pain control is achieved at these doses?
- Any pain specialist recommendations should be reviewed.
- Be aware of effective equi-analgesic dosing during the procedure.
- Assessment of where the pain is located: Entire body pain versus a certain body location.
- Exacerbating and relieving factors: Is the pain worse at rest or with movement?
- How long have they been on opioids?
- What affect has the pain had on their lives and their ability to function or work?

(Rosenquist et al., 2010).

ASSESSMENT

- Patients tend to underestimate the number of medications that they take for chronic pain leading ↑ risks of:
  - Insufficient medicating during the perioperative period
  - Withdrawal
- Polymedication
  - Opioids, benzodiazepines, non-steroidal anti-inflammatory drugs (NSAIDS), muscle relaxants, cyclooxygenase-2 (COX-2) inhibitors, alpha adrenergic agonists, or antidepressants.
- Side effects with these medications: mood changes, sleep disturbances, nausea, vomiting, pruritus, and fatigue.
- May develop tolerance to side effects with the exception of constipation and immune suppression

(Richebe & Beaulieu, 2009).

PREOPERATIVE

- Often need reassurance that control of their pain will be a priority during and after surgery.
- An individualized treatment plan

  (Rosenquist et al., 2010).
- Communicate to PACU for continuity of care.

  (Dansie & Turk, 2013).

PREOPERATIVE

- **Continue their pain control regimen on the day of surgery, even if the patient is fasting**

  (Huxtable, Roberts, Somogyl, & Macintyre, 2011).
- Forgot to take their baseline opioids or have been instructed to refrain from taking them the morning of surgery?
  - Treat with an equi-analgesic dose of morphine or hydromorphone preoperatively

    (De Pinto & Cahana, 2012).

ASSESSMENT

- Over 50% of patients with chronic pain also experience anxiety.
- Discuss expectations during the perioperative period to allow patient to gain a sense of empowerment
- Education allows them to form realistic expectations of perioperative pain control

(Farrell & McConaghy, 2012).

ASSESSMENT

- Tolerance
- Physical dependence
- Addiction

(King, 2012).

INTRAOPERATIVE

- High intraoperative requirements
- Intraoperative awareness = challenge
  - BIS monitoring
- Multimodal regimen.
- De Pinto and Cahana (2012) state that the opioid tolerant patient will require **three to five times more quantity of pain medication than opioid naïve patients.**

INTRAOPERATIVE

- Spontaneously breathing? titration of opioids to respiratory rate.
- General anesthesia with muscle relaxation?
  - Titrate to effect during surgery
  - Titrate opioids after return of spontaneous respirations to maintain a respiratory rate of 8 - 10 breaths per minute.

    (Huxtable, Roberts, Somogyl, & Macintyre, 2011).

POSTOPERATIVE

- Pain levels elevated and be slower to decrease
- Differentiate between pre-existing chronic pain and new surgical pain. Baseline?
- Monitoring for side effects of opioids must be continued even when a patient is opioid tolerant.
  - Still at risk for respiratory depression.
- Level of sedation = better clinical indicator of early respiratory depression than respiratory rate

(Huxtable, Roberts, Somogyl, & Macintyre, 2011).

PCA

- Postoperatively, **require three to five times more quantity of pain medication than opioid naïve patients.**
- Benefits:
  - Self-titration,
  - ↓risk of underdosing,
  - ↓demands on and conflicts with nursing staff
  - therapeutic plasma levels,
  - ↓ pain levels with decreased total opioid requirements,
  - avoidance of withdrawal,
  - ↓ anxiety

    (Richebe & Beaulieu, 2009).
- Shorter lockout intervals
- Higher bolus doses of opioids

  (Clark & Spanswick, 2014).

TREATMENT

- Multimodal treatment of pain focuses on all four pain components
- Transduction phase: opioids, NSAIDS, antihistamines, local anesthetic cream, and bradykinin and serotonin antagonists.
- Transmission: Local anesthetics via regional anesthetic techniques
- Modulation: Spinal opioids, NSAIDs, NMDA receptor antagonists, and a_2 agonists
- Perception: Parenteral opioids, general anesthetics and a_2 agonists alter the perception of pain (Macres, Moore & Fishman, 2013).

OPIOIDS

- Gold standard
- **Routes of administration = oral, parenteral, buccal, sublingual, epidural, intrathecal, rectal, and transdermal.**
- **Transdermal patches:**
  - **Leave in place**
  - **Caution: Warming devices may accelerate drug release**
- Disadvantages = side effects
  - **According to current literature, 80% of patients experience at least one side effect**
- Avoid: Opioid agonist-antagonists
  - Nalbuphine, buprenorphine, and pentazocine
  - Risk of sudden withdrawal and associated side effects.

REMIFENTANIL

- Induction dose: 0.5 – 1 mcg/kg
  - 70 kg patient. Induction dose = 35 – 70 mcg (0.7 – 1.4 ml).
- Maintenance dose: 0.05 – 2 mcg/kg/min
- LBW: Induction and maintenance doses
- Remi comes in powdered form and at Florida Hospital in 1 mg or 2 mg vials. Mix 1 mg in 20 ml of NS or 2 mg in 40 ml of NS.
- Final concentration = 0.05 mg/ml = 50 mcg/ml
- Hints:
  - Start low and titrate to effect
  - Vasopressor infusion for hemodynamic stability
  - Short elimination half life →long acting opioid!
  - High potential for OIH. Caution in opioid tolerant patients!

REMIFENTANIL

Reconstitution and dilution prior to administration[1]

Final concentration (mcg/mL)	Amount of ULTIVA in each vial (mg)	Final volume after reconstitution and dilution (mL)
25	1 2 5	40 80 200
50	1 2 5	20 40 100

http://www.ultiva.com/HowToUseULTIVA/Dosing.aspx

SUFENTANIL

- Induction dose: 1 – 10 mcg/kg (up to 30 mcg/kg as primary or only induction agent)
- 0.3 to 1 mcg/kg IV given 1 to 3 minutes before laryngoscopy
- For maintenance of balanced anesthesia, intermittent doses (0.1-0.5 mcg/kg IV) or as a continuous infusion (0.3 – 1mcg/kg/hr IV).
- Induction dose based on TBW. Maintenance dose based on IBW.

SUFENTANIL

- At Florida Hospital, vial comes in **100 mcg in 2 ml. Mix with 18 ml of NS for total volume of 20 ml**.
- Final concentration = 5 mcg/ml or 0.005 mg/ml
- Hints:
  - Pumps at FH are set to **mg**/ml concentration!
  - Caution in using as primary induction agent due to likelihood of chest rigidity.
  - Elimination half time = 2.2 – 4.6 hours → Plan ahead!
  - Excellent for opioid tolerant patients!

SUFENTANIL PUMP SETTINGS

Photo by Karla Rauch

OPIOID INDUCED HYPERALGESIA (OIH)

- High dose or extended opioid exposure
- Mechanism unknown
- Possible causes = NMDA activation.
- Suspect if:
  - Pain changes in site and quality
  - Pain more extensive than the injury
  - Sensitization to pain occurs at lower levels.
- **A reduction in opioid consumption is the best management for OIH** (Gupta & Atcheson, 2013)
- **Methohexital ↑ OIH.**
- Propofol, Dexmedetomidine, and Ketamine ↓ OIH.

METHADONE

- Indication: When pure opioid agonists are not effective
- Receptors: Opioid agonist, NMDA antagonist, and serotonin reuptake inhibitor.
- Dose: Single dose 2.5 – 10 mg intraoperatively
- Benefits: Economical, long DOA, no active metabolites, and can use with renal or hepatic impairment
- Severe adverse effects: QT prolongation, respiratory depression, torsades de pointes, sudden death (Gupta & Atcheson, 2013).

METHADONE

- Study group received methadone 0.2 mg/kg vs. sufentanil infusion 0.25 mcg/kg/hr
- Methadone
  - Postoperative opioid requirement ↓50%
  - Pain scores ↓50% at 48 hours after surgery.
- Conclusion: Perioperative bolus of methadone improves postoperative pain control for patients undergoing complex spine surgery.
- Gottschalk et al., 2011

OPIOID ROTATION

- Definition = switching to different opioid to improve therapeutic response or ↓ undesirable effects
- Mechanism is unknown
- Different mu-agonists variations
- Incomplete cross-tolerance

OPIOID ROTATION

- Logical course of action for pain management
- First step = calculation of an approximate equianalgesic dose
- Starting dose of the new opioid
  - Below toxic levels
  - High enough to produce no worsening of the pain
  - From this initial dose, the new drug must be titrated based on the patient's pain level and lack of side effects
- **Due to the phenomenon of incomplete cross tolerance, when practicing opioid rotation, one should choose: A lower dose of replacement opioid**

Dosing and Conversion Chart for Opioid Analgesics

Drug	Route	Equianalgesic Dose (mg)	Duration (h)	Plasma Half-Life (h)
Morphine	IM	10	4	2-3.5
Morphine	PO	30	4	4
Codeine	IM	130	4	3
Codeine	PO	300	4	
Oxycodone	IM	-		
Oxycodone	PO	30	3-4	4
Hydromorphone (Dilaudid)	IM	1.5	4	2-3
Hydromorphone (Dilaudid)	PO	7.5	4	
Meperidine	IM	75	3-4	2
Meperidine	PO	300	3-4	normeperidine
Methadone	IM	10*	6-8†	12-24
Methadone	PO	20*	6-8†	20-200
Fentanyl	IV	0.1		
Hydrocodone	IM	-		
Hydrocodone	PO	30	3-4	4

www.acpinternist.org/archives/2008/01/extra/pain_charts.pdf

EXAMPLE OF CONVERTING OPIOIDS

- A patient is taking a sustained-release oxycodone 100 mg Q12 hours, but has experienced intolerable sedation. To use an immediate-release opioid agent, hydromorphone. What is the equivalent dose of hydromorphone?
- 100 mg X 2 = 200 mg

- $\frac{\text{200 mg oxycodone}}{\text{X mg hydromorphone}} = \frac{\text{30 mg equianalgesic dose}}{\text{7.5 mg equianalgesic dose}}$

- Equianalgesic dose of hydromorphone = 50 mg
- Due to incomplete cross-tolerance reduce new drug dose by 25-50%
- 24 mg/ 6 doses q 24 hours = 4 mg every 4 hours

OPIOID CALCULATORS

- www.globalrph.com
- www.hopweb.org
- www.Opiodcalculator.practicalpainmanagement.com

DEFINITION OF OPIOID TOLERANT

- Arbuck (2012) definition of opioid tolerant patient:
  - Morphine po 60 milligrams per day
  - Oxycodone po 30 milligrams per day,
  - Transdermal fentanyl 25 micrograms per hour
  - Hydromorphone po eight milligrams per day

MULTIMODAL

- Definition = Usage of analgesics of divergent classes with varying routes of administration.
- Facilitate recovery times
- Decrease hospital length of stay
- Preoperative non-opioid administration ↓ perioperative opioid consumption by 25 – 30%
- Enhance prompt rehabilitation.
- Decrease the advancement to chronic pain.
- Opioid tolerant may have less benefit

(Clark & Spanswick, 2014).

MULTIMODAL

- Includes opioid therapy, benzodiazepines, NMDA receptor antagonists, NSAIDs, selective cyclooxygenase-2 (COX-2) inhibitors, skeletal muscle relaxants, a_2 agonists, gabanoids, anticonvulsants, antidepressants and topical agents.
- Alternative methods:
  - Neuraxial analgesia
  - Peripheral nerve blockade
    - (Rosenquist et al., 2010).

NSAIDS

- Benefits: reduce opioid usage, analgesic, anti-inflammatory, and antipyretic effects.
- Cons: Ceiling effect, side effects
- ASA guidelines
- Particularly useful in the treatment of pain due to inflammation

  (De Pinto & Cahana, 2012).

KETOROLAC

- Surgery type: thoracotomy, urological, laparoscopic, and orthopedic surgeries.
- Dose: Single dose of 30 mg or 15 - 30 mg doses every six hours for <5 days.
  - Over age 60 or less than 50 kg, reduce the dose by half.
- Administer: End of surgery
- Benefits: ↓↓↓PONV, constipation, and respiratory complications

KETOROLAC

- Contraindications:
  - Used more than five days,
  - Over age 75,
  - Impaired renal function
  - Risk for bleeding at the surgical site, e.g. tonsillectomy

    (De Pinto & Cahana, 2012).
- Not proven: Efficacy and safety for patients under age 17

COX 2 INHIBITORS

- Celecoxib (Celebrex)

Day 1	400 mg initial dose + 200 mg if needed
Days >1	200 mg BID as needed

- Dosing recommendations for acute pain in adults https://s3.amazonaws.com/pfizerpro.com/fixtures/celebrex/docs/Celebrex%20Dosing.pdf
- Benefits: No GI upset or platelet disruption
- Contraindication: HTN or risk for stroke, MI, or thrombosis

(De Pinto & Cahana, 2012).

ACETAMINOPHEN

- Similar efficacy to NSAIDS unless pain is inflammatory (De Pinto & Cahana, 2012).
- Maximum daily dose of acetaminophen has been lowered to 3 grams per day
  - (Rosenquist & Vrooman, 2013).
- Acetaminophen and NSAIDS
  - Moderate to severe pain
  - Safe in the majority of patients
  - Pivotal in an opioid-sparing multimodal analgesic regimen (De Pinto & Cahana, 2012).

ACETAMINOPHEN

Dosing

Dosing of OFIRMEV for adults, adolescents, and children ≥2 years old[5]

Age group	Dose given every 4 hours	Dose given every 6 hours	Maximum single dose	Maximum total daily dose of acetaminophen (by all routes)
Adults and adolescents (13 years and older) **weighing ≥50 kg**	650 mg	1000 mg	1000 mg	4000 mg in 24 hours
Adults and adolescents (13 years old and older) **weighing <50 kg**	12.5 mg/kg	15 mg/kg	15 mg/kg (up to 750 mg)	75 mg/kg in 24 hours (up to 3750 mg)
Children 2 to 12 years of age				

http://www.ofirmev.com/include/pdf/OFIRMEVPharmacyFactSheet.pdf

DEXMEDETOMIDINE

- Works synergistically with opioids, decreasing requirements without a reduction in analgesia.
- Benefits: Anxiolysis, lack of respiratory depressant effects, attenuate withdrawal symptoms, and prevent OIH in opioid tolerant patients.
- Doses:
  - 1 mcg/kg over 10 minutes
  - Maintenance infusion of 0.2 to 0.7 mcg/kg/hour
- Adverse effects: Hypotension, bradycardia, prolonged QTI

DEXMEDETOMIDINE

- Belgrade (2010) studied opioid tolerant ICU patients who used equivalents of 30 mg of morphine for longer than one month.
- Placed on a dexmedetomidine treatment regimen
- Opioids were discontinued.
- Results:
  - No episodes of withdrawal,
  - Reduced doses of opioids required,
  - Improved pain control even after discontinuation of dexmedetomidine,
  - Rebooting effect.
- Disadvantages of study = small sample size

CLONIDINE

- Less selective a_2 adrenergic receptor agonist
- Decreases the incidence of OIH
- Reduces postoperative opioid requirements.
- Postoperatively, administer orally, intravenously, or via transdermal patch
- Literature varies on its effectiveness in the perioperative period (De Pinto & Cahana, 2012).
- Dose:
  - PO 0.1 – 0.3 mg
  - Weekly transdermal patch available in 2.5, 5 or 7.5 mgs.

NMDA RECEPTOR ANTAGONISTS

- Pivotal in decreasing development of OIH, neuroplasticity, and opioid tolerance.
- Dextromorphan and memantine

KETAMINE

- Benefits: In opioid tolerant patients who are more at risk for developing postoperative complications, such as OIH or chronic pain.
- Side effects are well-known:
  - Hallucinations,
  - Dysphoria,
  - Tachycardia,
  - ↑ICP,
  - ↑oral secretions,
  - HTN

KETAMINE DOSING

- Various dosing suggestions:
  - Mixed with morphine postoperatively for use in PCA machines as an opioid-sparing mechanism to reduce side effects of opioids.
  - Bolus dose followed by an infusion of ketamine
  - Subanesthetic dosing to prevent severe side effects
  - Rates of 0.1 mg/kg/hour with reduced dosing for the elderly.

  (Clark & Spanswick, 2014 and Huxtable, Roberts, Somogyl, & Macintyre, 2011).
- **What two drugs cannot be mixed with ketamine?**
  - **Methohexital & Diazepam**

Table 1 Route of administration, bioavailability, and the starting dose of ketamine

Route of administration	Bioavailability	Starting dose
Intravenous	100%	0.25–1 mg/kg (adults)* 0.25–2 mg/kg (children)* 1–2 mg/kg†
Intraosseous	100% [141,142]	0.5–1 mg/kg* 1–2 mg/kg†
Intramuscular	93% [143]	4–5 mg/kg* [144] 8–10 mg/kg† [144]
Oral	16–20% [145,146]	Children: 3–15 mg/kg* [6,145] Adults: 500 mg max.* [6]
Nasal	45–50 % [143,147]	0.25–4 mg/kg * [19,20,57] 3–9 mg/kg† [19,20,57]
Rectal	25–30% [147]	50 mg* 8–15 mg/kg† [22,23,143,147]

Note that ketamine should be titrated to the required clinical effect. *Analgesic and sedation dose. †Anesthetic dose.

(Marland et al., 2013)

KETAMINE

- Ketamine works on what receptors? NMDA, muscarinic, glutamate, nicotinic, opioid, GABA, dopamine, serotonin, voltage-gated sodium channel , L-type calcium channel blocker, and HCN1 cation channel blocker. It is also an inhibitor of nitric oxide synthase.
- **WEAK** affinity to GABA-A receptors
- An agonist effect at muscarinic receptors is less likely than an antagonist effect
- Shares a binding site with local anesthetics at voltage-gated sodium channels
- Combined with benzodiazepine administration and control of ventilation, intracranial pressure has not been shown to increase.

INHALATION AGENTS

- Pain reduction has not been studied
  (Clark & Spanswick, 2014).

N2O

- NMDA receptor antagonist.
- No decrease in pain during the early postop period
- Reduction in the development of chronic postsurgical pain

(Chan, Wan, Gin, Leslie, & Myles, 2011 and Stiglitz, Amaratunge, Konstantatos, and Lindholm 2010)

- 0.5% ↑ MI within 30 days of surgery (Leslie et al., 2011).
- Do benefits outweigh the risks?

PROPOFOL

- No analgesic properties
- ↓ OIH and allodynia.
- Vs. isoflurane ↓amounts of opioids and ↓ post op pain
- GABA agonist
- Inhibitory transmission within the pain pathway
- Interacts with NMDA receptors → ↓ hyperalgesia
- Dose for amnesia: 25 – 100 mcg/kg/min
- GA dose: 100 – 300 mcg/kg/min with addition of opioid for analgesia

INTRAVENOUS LIDOCAINE

- Amide local anesthetic
- MOA:
  - Peripherally: sodium channel blockade → ↓ discharges by damaged neurons.
  - Centrally: NMDA antagonism ?

    (De Pinto & Cahana, 2012).

INTRAVENOUS LIDOCAINE

- Dosing:
  - Preop bolus dose of 1 – 3 mg/kg.
  - Maintenance infusion 1 – 3 mg/kg/hour
- Max dose = 4 mg/kg
- Beneficial for patient types: burns, chronic pain, and abdominal surgeries
- Benefits: ↓OIH, anti-inflammatory, analgesic properties.
- Adverse effects: lethargy, allergic reactions, arrhythmia, hypotension, seizures, toxicity, and vertigo (De Pinto & Cahana, 2012).

GABAPENTIN

- Conflicting evidence of benefit
  - Reduce pain levels and postoperative opioid consumption,
- **Side effects: Drowsiness, confusion, nausea, and xerostomia (dry mouth).**
- Single dose of 600 to 1200 milligrams preoperatively
- Continue postoperatively with dosing based on the patient's ability to withstand possible adverse effects (De Pinto & Cahana, 2012).
- Although pregabalin and gabapentin work via a similar mechanism, pregabalin is more potent, superior absorption, and has reduced adverse effects.

PREGABALIN

- Has not been shown to improve perioperative pain control
- Benefits:
- Reduce opioid requirements and related side effects,
- ↓ development of chronic neuropathic pain
- Less sleep interference
- Management of diabetic neuropathy and fibromyalgia
- Anxiolytic
- Reduction of PONV

(Agarwal, Arora, Baidya, & Khanna, 2011 & Bunvanedran et al, 2010).

PREGABALIN

- Dose: 300 mg orally 1-2 hours before surgery to provide analgesia in the postoperative period, then decreasing doses twice daily over the next 14 days.
- Adverse effects: confusion, drowsiness, and dry mouth. However, these adverse effects were significantly reduced by postoperative day 2 or reduced doses.

CASE STUDY 1 REVISITED

- 56 year old male
- Hx: Chronic low back pain
- Medication: Takes 6 Percocet daily for over 6 weeks
- Sx: Cystoscopy

CASE STUDY 1 TREATMENT

- Takes Percocet 6 daily for over 6 weeks
  - 30 mg of oxycodone
  - Reduction of 25% due to cross tolerance → 1.69 mg of Dilaudid
- Best pain level 5:10
- Pain level in pre op = 7:10
- Dilaudid 2 mg IV in pre op
- Ofirmev was not given (OP)
- Dilaudid 4 mg IV intraoperatively (6 minute procedure)

Step 1: Oxycodone (Oral)

Step 2: 30 (Enter total daily dose in mg)

Incomplete cross-tolerance correction

Step 3: **Reduction for incomplete cross tolerance:** 25 % ?

(Usual range: 25 - 75% reduction)

Converting To:

Step 4: Hydromorphone (IV/IM/SC)

Calculate the equivalent dose | Reset

Results

Based on your selections above, here is the result:
Equivalent dose for opiate selected in Step 4 above: **1.69 mg**
Reduction for incomplete cross tolerance: **25** %

Chronic oral morphine equivalent dose is: **33.75 mg**

CASE STUDY 2 REVISITED

- 44 year old male
- Hx: Reflex Sympathetic Dystrophy (RSD), Hypertension, Anxiety
- Sx: Cervical Laminectomy
- Home Medications: Hydromorphone, Flexeril, Lisinopril, Trazodone, Temazepam,
- Uses neuro-stimulator for right arm pain secondary to lymphedema.

CASE STUDY 2 TREATMENT

- Induction: Sufentanil 25 mcg IV = 5 ml(80 kg)
- Sufentanil infusion: 0.25 mcg/kg/min
- Orphenadrine 60 mg IV & Ofirmev 1 gm administered
- Sufentanil infusion discontinued at start of closing of incision.
- No long-acting opioid
- Extubated when awake
- VSS in PACU, patient comfortable.
- Neuro-stimulator turned on in PACU.

FUTURE STUDIES

- Study anesthetic techniques to prevent the onset of chronic pain after surgery.
- The effect of the chronic use medical marijuana on patients undergoing anesthesia.
- Multimodal regimens mostly studied in opioid naïve patients.
- Formation of protocol
- Creation of a table converting oral opioids into intravenous and oral nonopioid therapies

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