7-2019

Opiate Addiction and Considerations for Anesthesia

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Opioid Statistics in the United States

According to the Center for Disease and Prevention from 1999 to 2017 around 218,000 Americans have died from prescription opioid overdoses. Deaths from opioid prescription related overdoses were five times greater in 2017 then in 1999. Prescription opioids are prescribed for moderate-to-severe pain, after surgery or injury, or for health conditions such as cancer.

Due to the high risk for addiction, there has been a push by the government to promote awareness and promote stricter guidelines for prescription and alternative options to treat pain.

From 2006 to 2017 There has been a 19% reduction opioid prescriptions. Despite this reduction, in 2017 there has been almost 58 opioid prescriptions written for every 100 Americans. The average number days per prescription continues to increase at about 18 days per prescription.

Forty-six people die every day from opioid prescriptions. Prescriptions account for 35% of all opioid overdose deaths. Most common drugs involved in overdose deaths include:

- Methadone
- Oxycodone
- Hydrocodone

Of those who died from opioid deaths:

- Overdose was more likely for those over 65 years of age.
- Rates were higher among non-Hispanic and American Indians
- Per 100,000 people men died at a rate of 6.1 and women 4.2 ("Centers for Disease Control and Prevention," 2018).

Pathophyiology of Addiction

The mesocortical dopamine system is a prominent system in the brain's reward pathway. This pathway is activated in opioid users through activation of dopamine receptors that causes the "high" sensation.

In the Ventral tegmental area, dopaminergic neurons innervate the nucleus accumbens. Opioids inhibit GABAergic interneurons located in the ventral tegmental area, this leads to activation of dopamine neurons and increase dopamine in the nucleus accumbens. The role of the nucleus accumbens is to translate motivational signals from the limbic system into goal-oriented behavior and self-control (Sadat-Shirazi et al., 2018)

Pathophysiology of Addiction

The amygdala attributes emotional value to cues. This complex brain structure also plays a critical role in mood regulation and stress reactivity during withdrawal. Studies have demonstrated that the volume of the amygdala is reduced in opiate abusers which can lead to abnormalities in the cognitive memory task and decision making. In opiate users have reward tolerance due to an upregulation of dopamine receptors in the amygdala. There is increased dopaminergic neuron activity, yet release of dopamine is reduced. This leads to a hypersensitivity to pain as well as increased likelihood for patients to be pleasure seeking, that is extenuated during times of stress Sadat-Shirazi et al., 2018)

Signs and Symptoms of Opioid Addiction

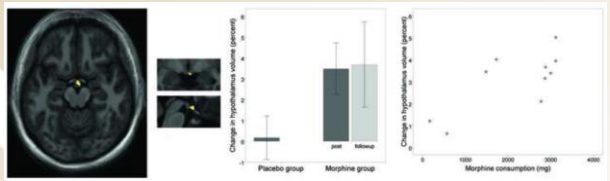
Opioid withdrawal

- Dysphoric mood
- Nausea or vomiting
- Lacrimation
- Rhinorrhea
- Muscle aches
- Pupillary dilation
- Piloerection
- Sweating
- Diarrhea
- Yawning
- Fever
- Insomnia

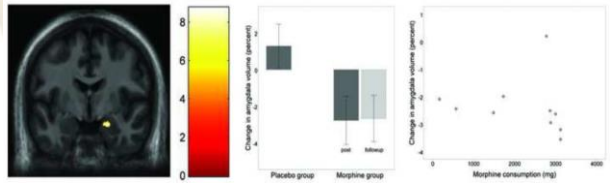
Opioid abuse

- Vomiting
- Pruritus
- Sweating
- Twitching
- Miosis
- Loss of appetite
- Drowsiness
- Respiratory Depression
- Coma
- Needle marks

(Coluzzi et al., 2017)



Gray matter volume increase in the hypothalamus following one month of daily morphine exposure. **(a)** Sagittal view (x = +1) of volume increase in the caudal aspect of the hypothalamus (average volume increase = 3.1%). **(b)** Same hypothalamus cluster presented in coronal plane and **(c)** in sagittal plane. **(d)** Bar graph showing percent volumetric change from baseline in the hypothalamus for the placebo group (left bar) and morphine group (right bars). Dark gray bars indicate the post-medication period, and light gray indicates the follow-up period. Hypothalamus volume is significantly increased after morphine exposure, and the increased volume is maintained 4.7 months later at the follow-up period. The placebo group shows no significant change in hypothalamus volume. **(e)** Post-hoc scatterplot showing relationship between total morphine consumed (x axis) and percent change of hypothalamic volume (y axis) in the morphine group. (Younger et al., 2012)



Gray matter volume decrease in the amygdala following one month of daily morphine Exposure. Bar graph showing percent volumetric change from baseline in the amygdala for the placebo group (left bar) and morphine group (right bars). Dark gray bars indicate the post medication period, and light gray indicates the follow-up period. Amygdala volume is significantly decreased after morphine exposure,
and the decreased volume is maintained 4.7 months later at the follow-up period. The placebo group shows no change in amygdala volume. **(c)** Post-hoc scatterplot showing relationship between total morphine consumed (x axis) and percent change in right amygdala volume (y axis) in the morphine group. One outlier showed no amygdala change over time.

(Younger et al., 2012)

Evaluation for Preoperative Patients

Nurses and nurse anesthetists will encounter patients with known and unknown opioid use. It is essential to properly evaluate patients so that the proper measures can be taken to properly treat their pain before, during, and post operatively while reducing the risk for surgical morbidity and mortality. Key points to consider:

1. Always consider the question: "Is my patient an opioid user or abuser?"
2. Always obtain details for the type of opiate, the duration of use, dose, and timing of last dose.
3. Recognize symptoms of opioid abuse and withdrawal as quickly as possible.
4. Identify population at risk.
5. Obtain complete history, including physical and diagnostic studies
6. Assess for common comorbidities in addicted patients.
7. Consider coexisting psychiatric disorders.
8. Avoid prejudices and assure the patient.
9. Keep in mind fears the patient has
10. Develop a plan for perioperative pain medication(Coluzzi et al., 2017).

Common Myths to Avoid

1. Buprenorphine or methadone provides analgesia.
2. Opioids for analgesic will cause relapse for patients at risk for addiction.
3. Patients that require additional opioids for analgesia may cause respiratory depression and central nervous system depression.
4. Patient-Controlled Analgesia is inadequate for opioid tolerant patients post-operatively (Coluzzi et at., 2017).

(Koepke et al., 2018)

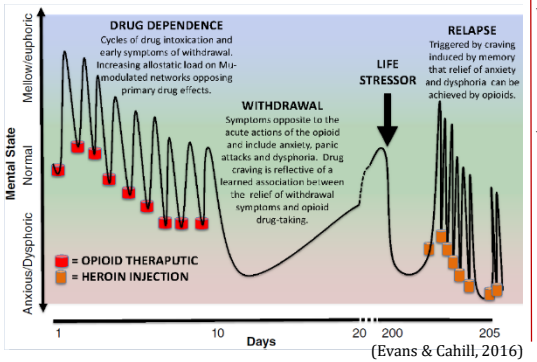
Multimodal Options for Anesthesia Providers

Anesthesia providers can utilize a variety of nonopioid medications to reduce the overall use of opiates required for patients with an opioid tolerance before, during, and post-operatively.

- Acetaminophen
  - Metabolite of medication works on brain and spinal cord to help reduce amounts of opioids required for pain reduction.
- Nonsteroidal anti-inflammatory drugs
  - Reduces prostaglandin release which reduces inflammation and thus pain.
- Ketamine
  - Studies show this medication works on N-methyl-D-aspartate receptor involved in the pain pathway. Patients required fewer opioids during surgery while on ketamine.
- Gabapentin and pregabalin
  - Medication agonise alpha2 receptors, thus decreasing pain signal transmission.
- Local Anesthetics
  - Work by blocking sodium channels of nerve fibers, there-by inhibiting the conduction of sensory and motor nerve impulses. These can be further classified into regional nerve blocks, spinals, epidurals, and infiltration. These are very promising in reducing overall opioid requirements. The FDA recently granted permission of liposomal local anesthetics that allow for slow release pain relief to decrease opioid use post-operatively.
- Transcutaneous electrical nerve stimulation
  - Being used more frequently. Involves electrical stimulation to sensory nerves that activate inhibiting centers of the central nervous system.
- Nonpharmacological interventions
  - Education, Rest, ice, compression, elevation. Cooling and heating (Johnson & Patel, 2019)

Considerations or Providers

It is important for anesthesia providers to remain empathetic and see the situation of addiction from the patient's point of view. Often times the patients are from a lower social economic background and have many co-morbidities. Often providers will experience a disjunct with a patient's expectations for pain management and the reality of what is available for their pain management. The current climate places many restrictions on opioid prescriptions, this can make it difficult when determining the best options to adequately care for a patient's needs. Current research shows that there burnout caring for patients when addicted to opioids, because providers want to care for the patient, but are not properly trained to utilize other options to treat patients with chronic pain. The prevalence of poverty among chronic pain patients requires that providers see their job differently. More advocacy for improving patients access to resources and provide for patients basic needs is an important step in adjunct with reducing opiate usage. There are many socio-economic components that many patients with chronic pain cannot access that many providers do not realize due to their privilege in socio-economic status. Physiotherapy, massage, exercise, and mental health access may be great alternatives for patients with chronic pain that a provider can utilize or advocate for. It is important as providers to lobby and vote for out patients to have access to these alternative therapies to reduce opioid use and abuse (Webster et al., 2019).



(Evans & Cahill, 2016)

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