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Comprehensive Approaches in Battling Opioid use Disorder: Analysis and Treatment Strategies

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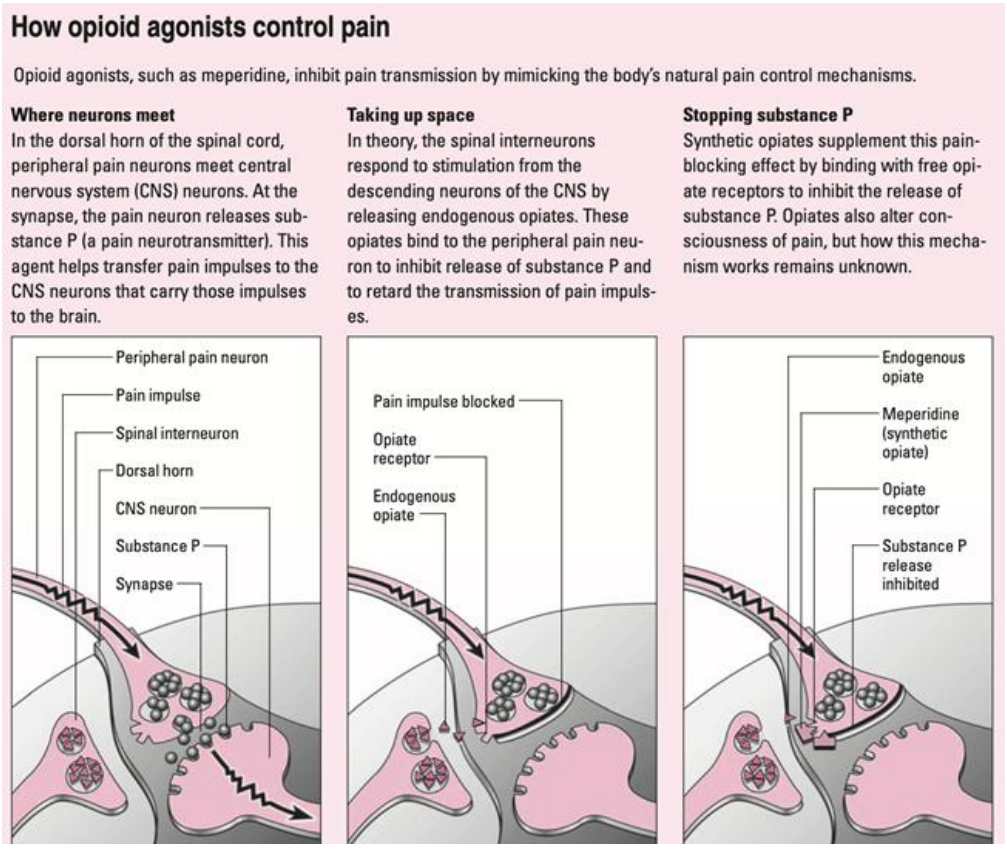
Abstract: ***This article delves into the multifaceted issue of opioid use disorder (OUD), encompassing its mechanisms, addiction trends and treatment strategies. It provides a comprehensive overview of opioid classification, their mechanism of action, the evolution of opioid overdose cases, and current therapeutic approaches, emphasizing the need for a balanced and informed response to this public crisis. Opioids are a class of drug that derive from, or mimic, natural substances found in the opium poppy plant. Opioids are derived in 3 major classes that is natural opiates (morphine, codeine), semi - synthetic opioids (hydromorphone, hydrocodone, oxymorphone & oxycodone) and lastly fully synthetic opioids (fentanyl, methadone).***

Keywords: Opioid Use Disorder, Addiction Treatment, Overdose Prevention, Medication-Assisted Therapy, Public Health Crisis

1. Mechanism of Action

The opioids show their effect by acting on opioids receptors, there are basically 3 types of opioids receptors that are present within the central nervous system (CNS) as well as throughout the peripheral tissue.1) Mu (μ) (agonist morphine) Mu receptors are found primarily in the brainstem and medial thalamus. Mu receptors are responsible for supraspinal analgesia, respiratory depression, euphoria, sedation, decreased gastrointestinal motility, and physical dependence. Subtypes include Mu1 and Mu2, with Mu1 related to analgesia, euphoria, and serenity, while Mu2 is related to respiratory depression, pruritus, prolactin release, dependence, anorexia, and sedation. These are also called OP3 or MOR (morphine opioid receptors).2) Kappa (κ) (agonist ketocyclazocine) Kappa receptors are found in the limbic and other diencephalic areas, brain stem, and spinal cord, and are responsible for spinal analgesia, sedation, dyspnea, dependence, dysphoria, and respiratory depression. These are also known as OP2 or KOR (kappa opioid receptors).3) Delta (δ) (agonist delta - alanine - delta - leucine - enkephalin) Delta receptors are located largely in the brain and their effects are not well studied. They may be responsible for psychomimetic and dysphoric effects. They are also called OP1 and DOR (delta opioid receptors).[1]



Opioids inhibit pain transmission by mimicking the body's natural pain control mechanisms. Within the dorsal horn of the spinal cord, the peripheral pain neurons meet the central nervous system (CNS) neurons. At the synapse, the pain neurons release substance P (a pain neurotransmitter). This agent helps transfer pain impulses to the CNS neurons that

carry those impulses to the brain. The spinal interneurons respond to stimulation from the descending neurons of the CNS by releasing endogenous opiates. These opiates bind to the peripheral pain neurons to inhibit release of substance P and to slow the transmission of pain impulses. Synthetic opiates supplement this pain blocking effect by binding with free opiate receptors to inhibit the release of substance P.[2]

Opioid Addiction and overdose

National vital statistic system presents provisional counts for drug overdose deaths occurring within the 50 states and the district of Columbia. **T**hey collect and share critical information on deaths from drug overdose, such as what substance were used and where deaths are happening in America.

Nearly 645, 000 people died from overdoses involving any opioid, including prescription and illicit opioids, from 1999 - 2021.

This rise in opioid overdose deaths can be outlined in three distinct waves.

1) The first wave began with increased prescribing of opioids in the 1990s, with overdose deaths involving prescription opioids (natural and semi - synthetic opioids and methadone) increasing since at least 1999.
2) The second wave began in 2010, with rapid increases in overdose deaths involving heroin.
3) The third wave began in 2013, with significant increases in overdose deaths involving synthetic opioids, particularly those involving illicitly manufactured fentanyl.
4) The market for illicitly manufactured fentanyl continues to change, and it can be found in combination with heroin, counterfeit pills, and cocaine.[3]

2. Treatment

Effective medications exist to treat opioid use disorder: methadone, buprenorphine, and naltrexone. These medications could help many people recover from opioid use disorder, but they remain highly underutilized. Fewer than half of private - sector treatment programs offer medications for opioid use disorders, and of patients in those programs who might benefit, only a third receive it.[4]

Now, let'sdelve deeper into these drugs.

1) Methadone: Methadone is a long - acting full opioid agonist approved by the Food and Drug Administration (FDA) to treat opioid use disorder (OUD) as well as for pain management. When taken as prescribed, methadone is safe and effective. Methadone helps individuals achieve and sustain recovery and to reclaim active and meaningful lives.

Patients taking methadone to treat OUD must receive the medication under the supervision of a practitioner. After a period of stability (based on progress and proven, consistent compliance with the medication dosage), patients may be allowed to take methadone at home between program visits.

Adult at first, 20 to 30 milligrams (mg) taken as a single dose per day. Your doctor may adjust your dose as needed. However, the dose is usually not more than 40 mg per day. Do not take more than your prescribed dose in 24 hours. The length of time a person receives methadone treatment varies. According to the National Institute on Drug Abuse publication the length of methadone treatment should be a minimum of 12 months. Some patients may require long - term maintenance. Patients must work with their practitioner to gradually reduce their methadone dosage to prevent withdrawal. 5

Common side effects include restlessness, nausea & vomiting, slow breathing, itchy skin, heavy sweating, constipation, and sexual problem whereas the serious side effects include difficulty breathing or shallow breathing, hives, or a rash, swelling of the face, lips, tongue or throat, chest pain or pounding heartbeat, hallucination, or confusion.

2) Buprenorphine: It is a partial agonist; it produces effect such as euphoria or respiratory depression at low to moderate doses. Buprenorphine works to reduce feelings of pain by interrupting the way nerves signal pain between the brain and the body. When buprenorphine replaces other opioids, it helps reduce the negative effects of withdrawal, and reduces the harm associated with drug use.

Common side effect includes dry mouth, tooth decay, muscle aches and cramps, inability to sleep, tremors, palpitation whereas the serious side effect include respiratory distress, overdose. Adrenal insufficiency, neonatal abstinence syndrome (in newborns).

Buprenorphine Misuse Potential
Because of buprenorphine's opioid effects, it can be misused, particularly by people who do not have an opioid dependency. Naloxone is added to buprenorphine to decrease the likelihood of diversion and misuse of the combination drug product.

The following buprenorphine products are FDA approved for the treatment of OUD:

- Generic Buprenorphine/naloxone sublingual tablets
- Buprenorphine sublingual tablets (Subutex)
- Buprenorphine/naloxone sublingual films (Suboxone)
- Buprenorphine/naloxone) sublingual tablets (Zubsolv)
- Buprenorphine/naloxone buccal film (Bunavail)
- Buprenorphine implants (Probuphine)
- Buprenorphine extended - release injection (Sublocade)

3. Interventions

Today there are a few ideas, procedure, and strict protocol in place to fight opioid use disorder.

1) Improve opioidprescribing: opioids prescribed through clinical practice guidelines ensure patients have access to safer, more effective pain treatment while reducing the number of people who potentially misuse or overuse these drugs. CDC published guidelines for prescribing pain medication, its recommendation focusses on the use of opioids in treating chronic pain (pain lasting longer

than 3 months or past the time of normal tissue healing) outside of active cancer treatment, palliative care, and end - of - life care.
2) Prescription drug monitoring programs (PDMPs): A prescription drug monitoring program (PDMP) is an electronic database that tracks controlled substance prescriptions. PDMPs can help identify patients who may be at risk for overdose.
3) Naloxone: It's a lifesaving medication that reverses an overdose from opioids, including heroin, fentanyl, and prescription opioids medication. It is available is 2 formulations firstly an injectable mostly used in hospital setting and the prepacked nasal spray (generic naloxone, Narcan®, Kloxxado®) [6].

The access to naloxone is expanded by the government through standing order at pharmacies, distribution through local, community - based organization, access and use by law enforcement and training for basic emergency medical service staff on how to administer the drug.

In conclusion, addressing opioid use disorder is a multifaceted approach. It is evident that OUD is a public crisis affecting individuals, families, and communities. Effective intervention strategies include educational initiatives, responsible prescribing practice, and medication - assisted therapies. Eradicating stigma and fostering environment supportive of recovery are crucial in combating this health issue.

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