



Community Health
Partnership Services



Neuroscience of Addiction and Medication Assisted Treatment

October 14, 2026

Today's Speaker



Bren Manaugh, LCSW

Principal, HMA

bmanaugh@healthmanagement.com



Join us in the session!

- **Please put your name, position and agency/facility in the chat**
- Please turn on your camera if you can
- Ask questions and share comments:
 - Raise your hand
 - Come off mute to speak
 - Use the chat

Agenda

The brain-based nature of addiction

The role of dopamine in the reward system and addiction

How Medication Assisted Treatment (MAT) works in the brain to address cravings

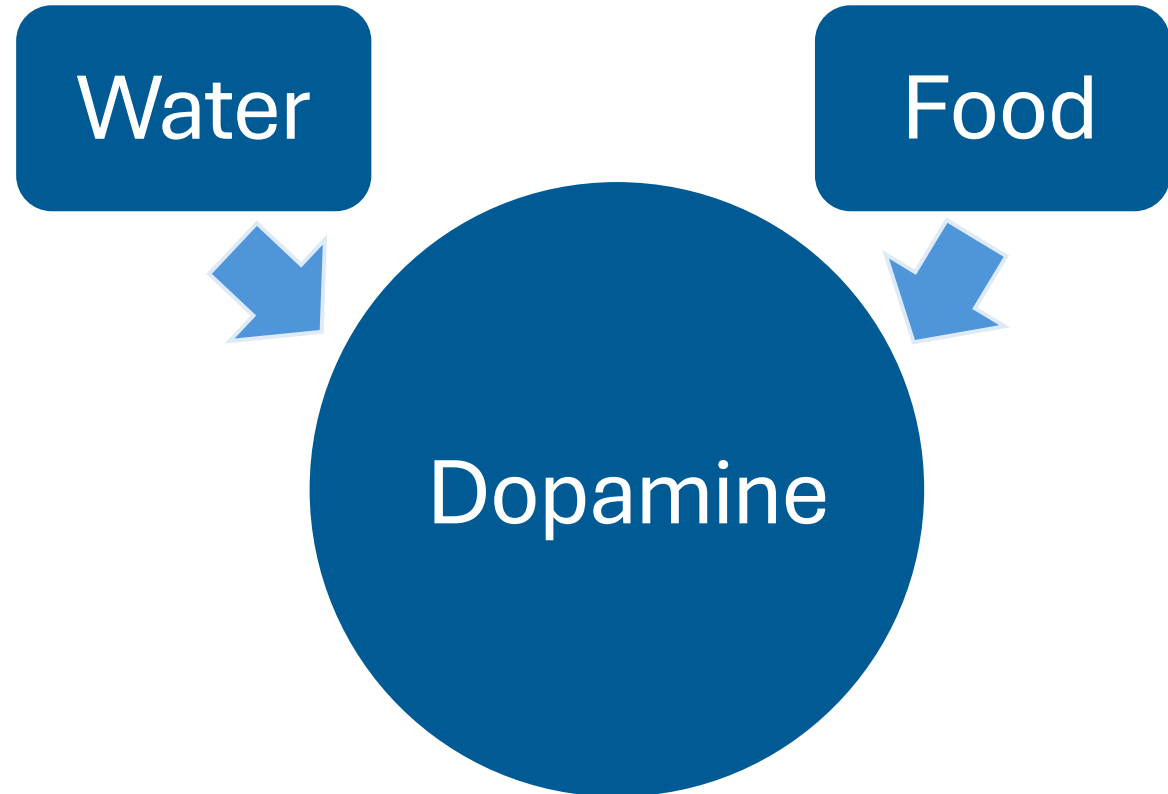
Medications for opioid use disorder (MOUD)

Storage of MOUD in corrections facilities

Natural Rewards Release Dopamine



Dopamine: Often referred to as the "feel good" chemical contributing to feelings of pleasure and motivation

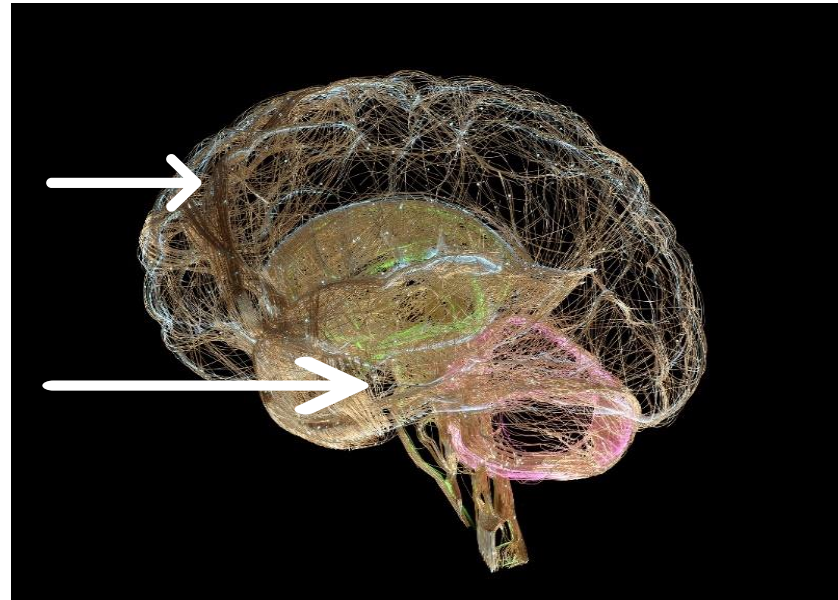


How Addictive Substances Affect the Brain

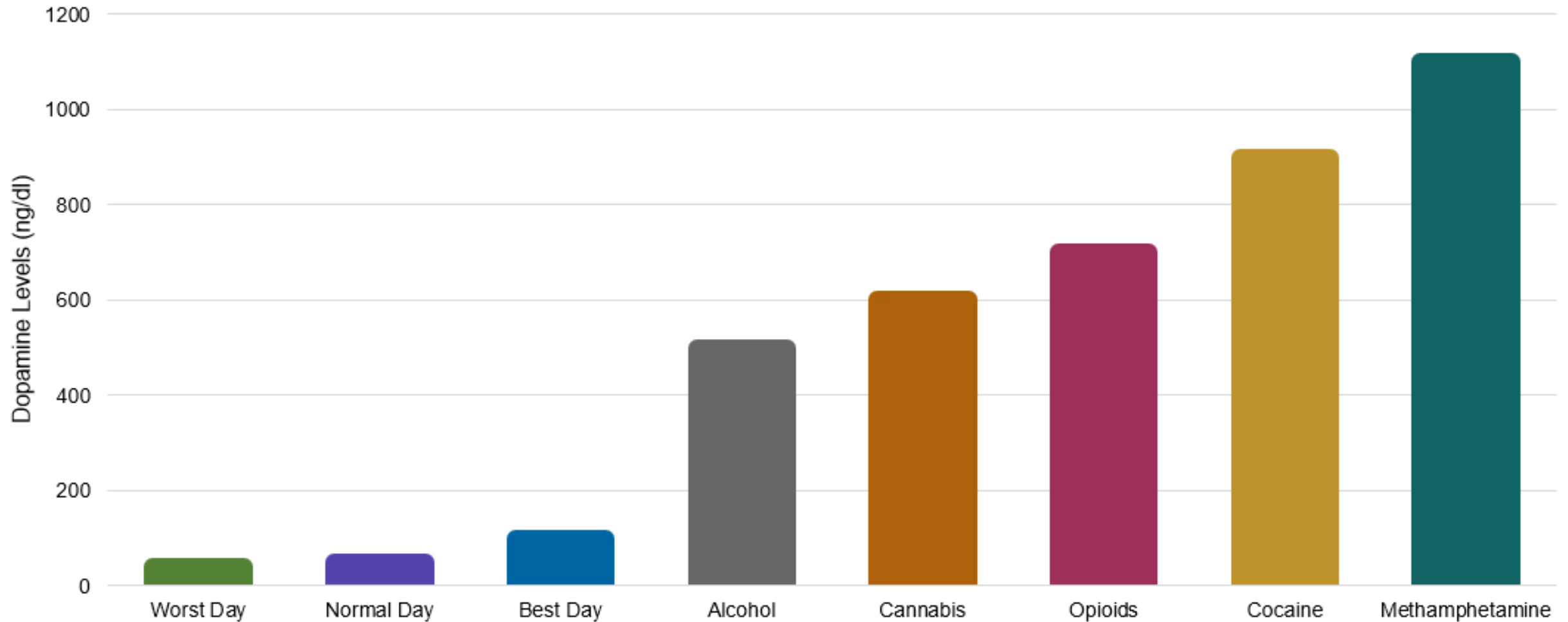
- All addictive substances result in the activation of the reward pathway.
- The same pathway activated by naturally rewarding substances and events.

Thinking part of brain

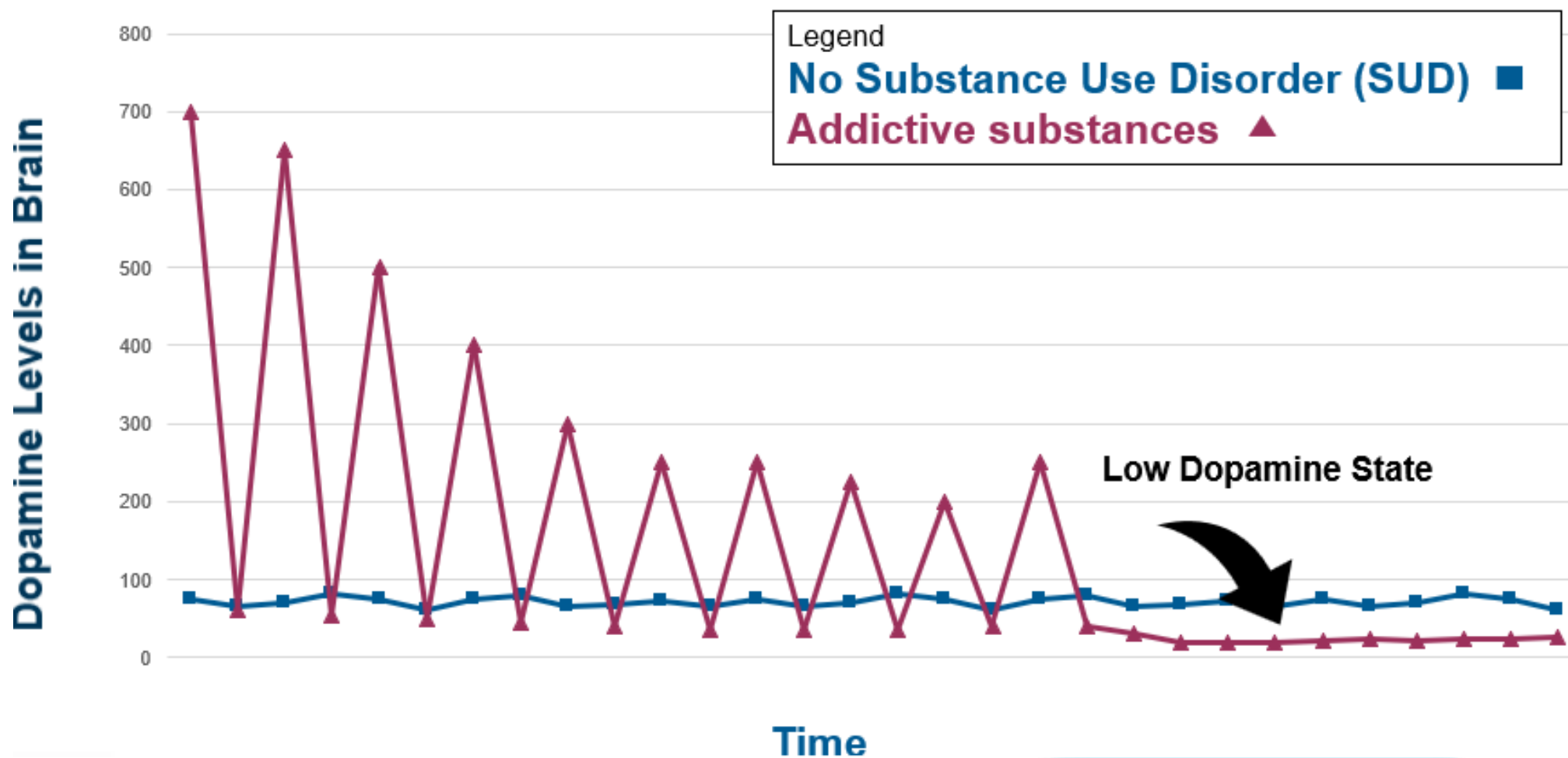
Primitive parts of brain



Dopamine Response



Brain Changes with Episodes of Substance Use

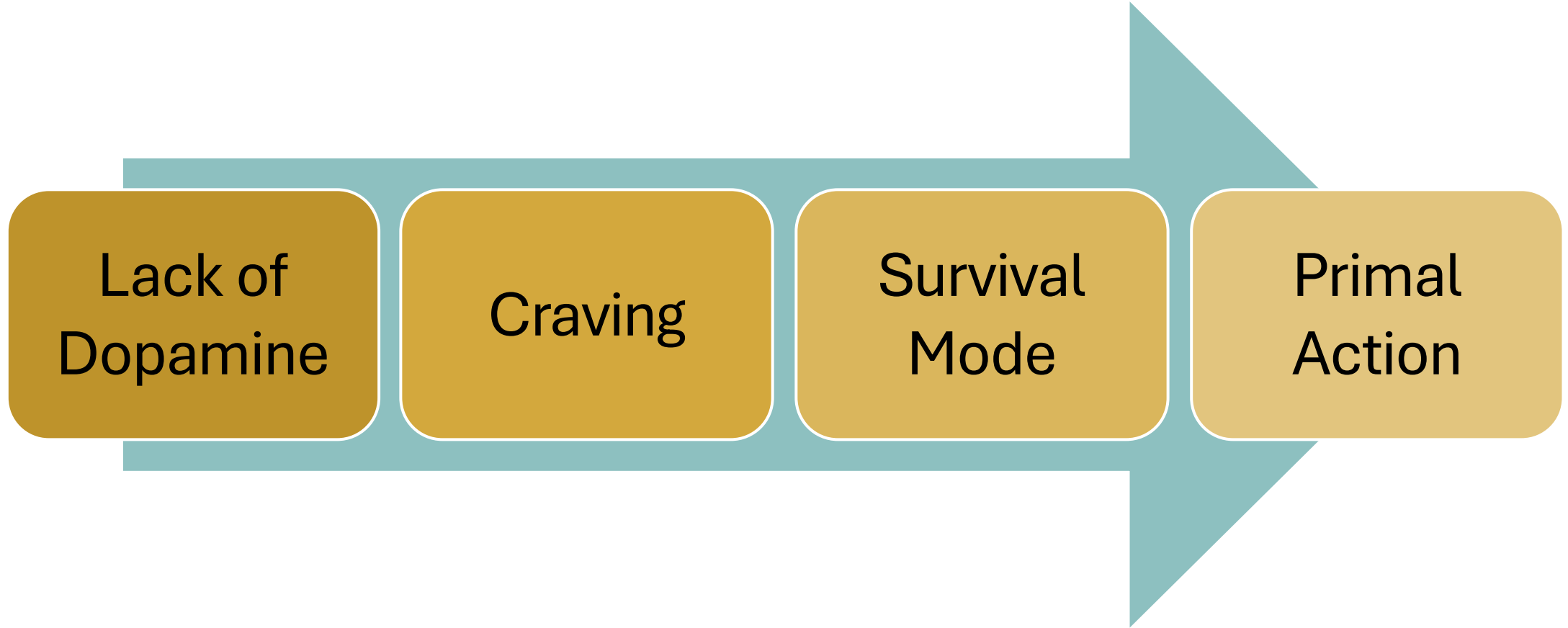


Intensity of Cravings

A direct, or indirect, force pulling someone towards a substance or behavior



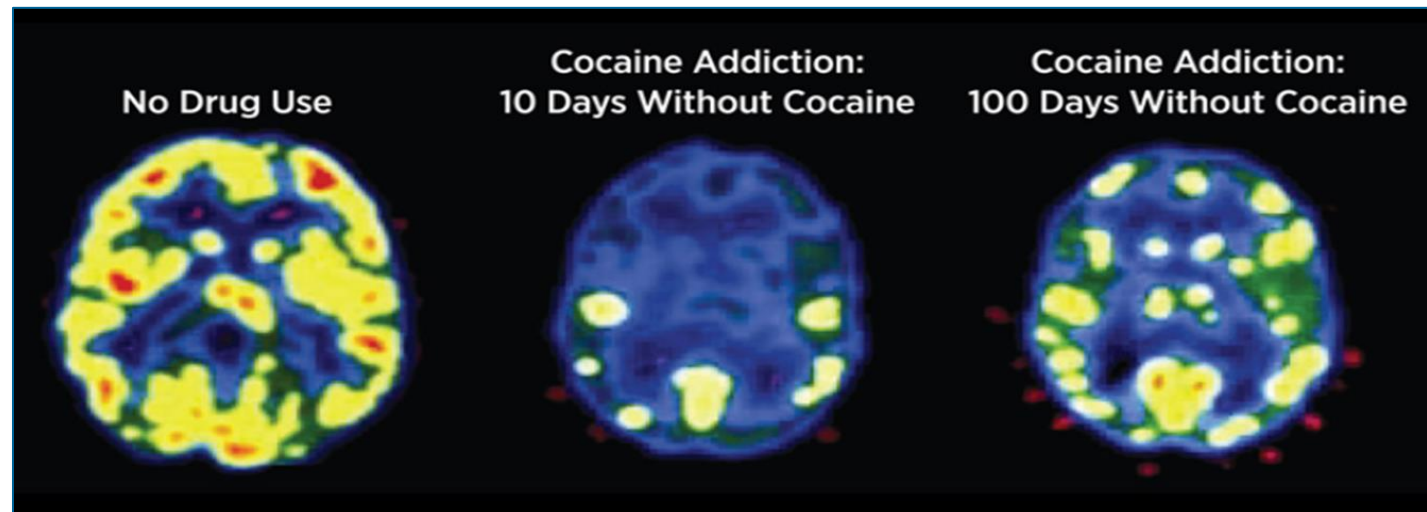
Understanding Addiction to Inform Treatment



It Takes Time for your Brain to Recover

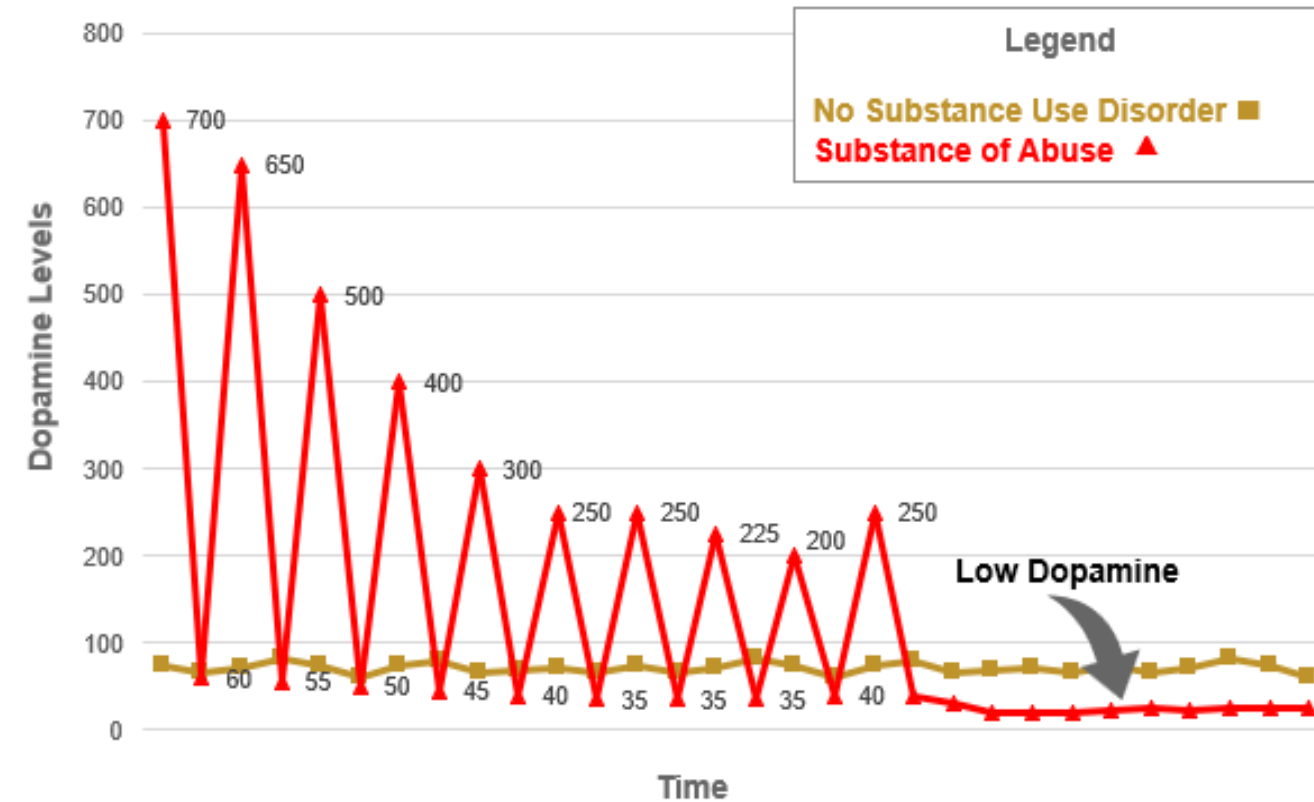
- Brain function takes ***at least 1 year*** to return to prior level of functioning after use of addictive substance(s) stops.
- If treatment is stopped before a year, medication benefits may be lost.

How the Brain Changes and Recovers from Drug Use



Source: https://nida.nih.gov/sites/default/files/cardsmod6_45_color_1.pdf

Low Dopamine State at the Same Time as Opioid Withdrawal

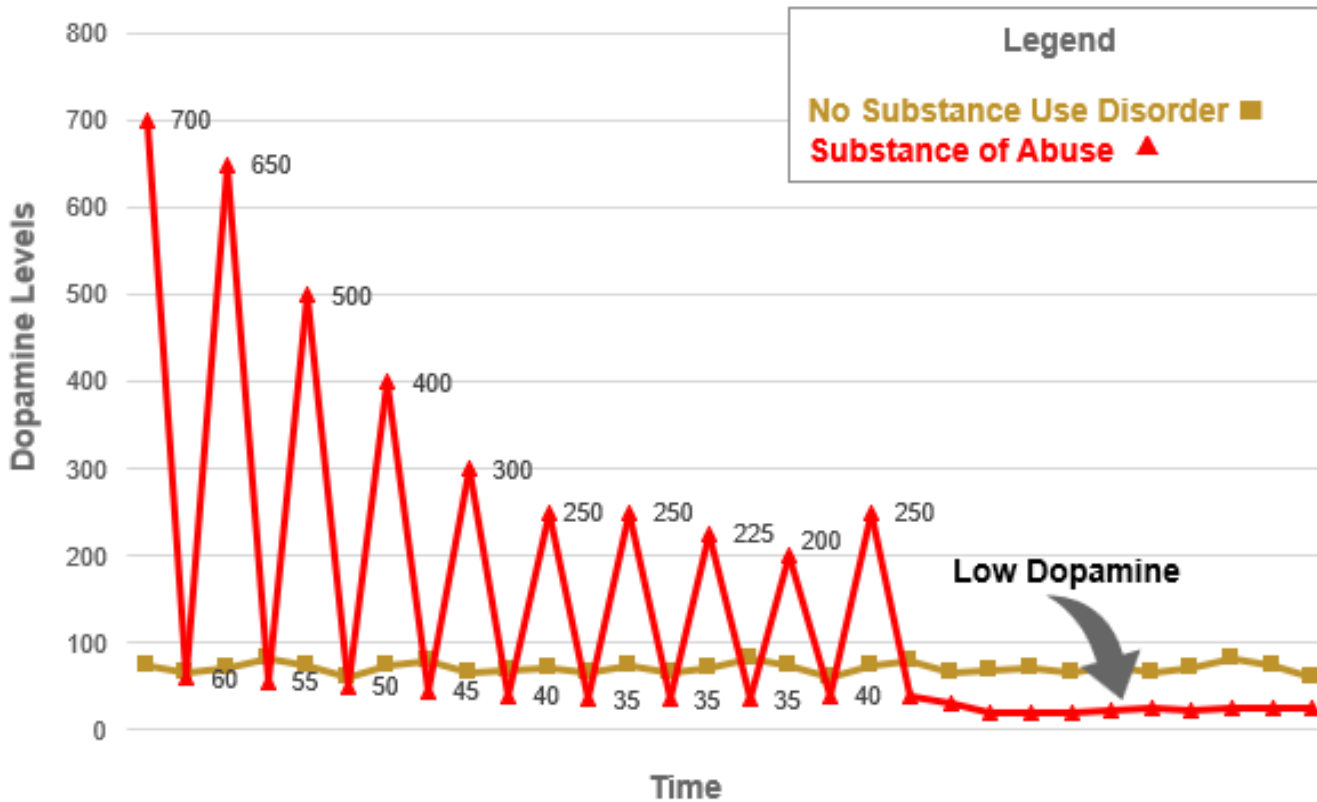


Withdrawal Symptoms Last 3-10 days:

- Muscle, joint pain
- Restless
- Anxiety/irritability
- Runny nose
- Nausea
- Diarrhea
- Cramping
- Shaking
- Sweating
- Rapid Heart Rate
- Yawning
- Goosebumps
- Dilated pupils

Methadone or buprenorphine reduces risk of relapse, overdose, and death compared to other medication or no medications.

Address Low Dopamine



Low Dopamine State

- No motivation
- Focus on increasing dopamine:
 - Heroin/fentanyl.
 - Methadone.
 - Buprenorphine.
- While dopamine is being stabilized, use harm reduction/stabilization interventions.
- **Once dopamine is stabilized**, use psychotherapy/cognitive-based interventions.

5 Cs of Chronic Addiction



- **C**hronic Disease
- Loss of **C**ontrol
- Use despite negative **C**onsequences
- **C**ompulsive Use
- **C**ravings

Addiction 101: Treatment

Lack of
dopamine &
cravings

Aberrant behaviors
(symptoms) are an
expected outcome
of low dopamine &
cravings

MAT normalizes
dopamine and
stabilizes cravings

Allowing for
behavioral therapy
and other
interventions to be
effective

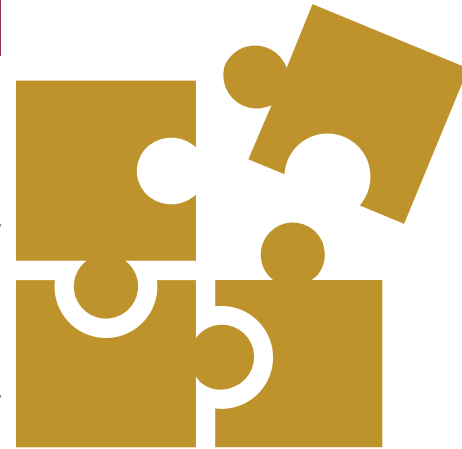
Chronic Diseases

Substance Use Disorder (SUD) and Diabetes Type II

Cause: Genes, Surroundings and Behavior

Prevention: Change Surroundings and Behavior

Treatment: Long Term Medicine and Lifestyle Changes



Features of Chronic Disease

Features	SUD	Hypertension	Diabetes Type II
Gradual onset	Yes	Yes	Yes
All racial, ethnic, IQ & income	Yes	Yes	Yes
Use despite negative effects	Yes	Yes	Yes
Can present as life threatening	Yes	Yes	Yes
Percent of people who take medication as prescribed	50%	50%	50%
Lifestyle changes needed & help	Yes	Yes	Yes
Recurrence of symptoms after a period without symptoms	50%	60%	60%

Diabetes and Addiction: You make a mistake... what could you lose?

Life Aspects	Diabetes	Addiction
Treatment	No	YES
Custody of Children	No	YES
Freedom (Probation, Incarceration)	No	YES
Housing	No	YES
Family	No	YES
Work Identity	No	YES

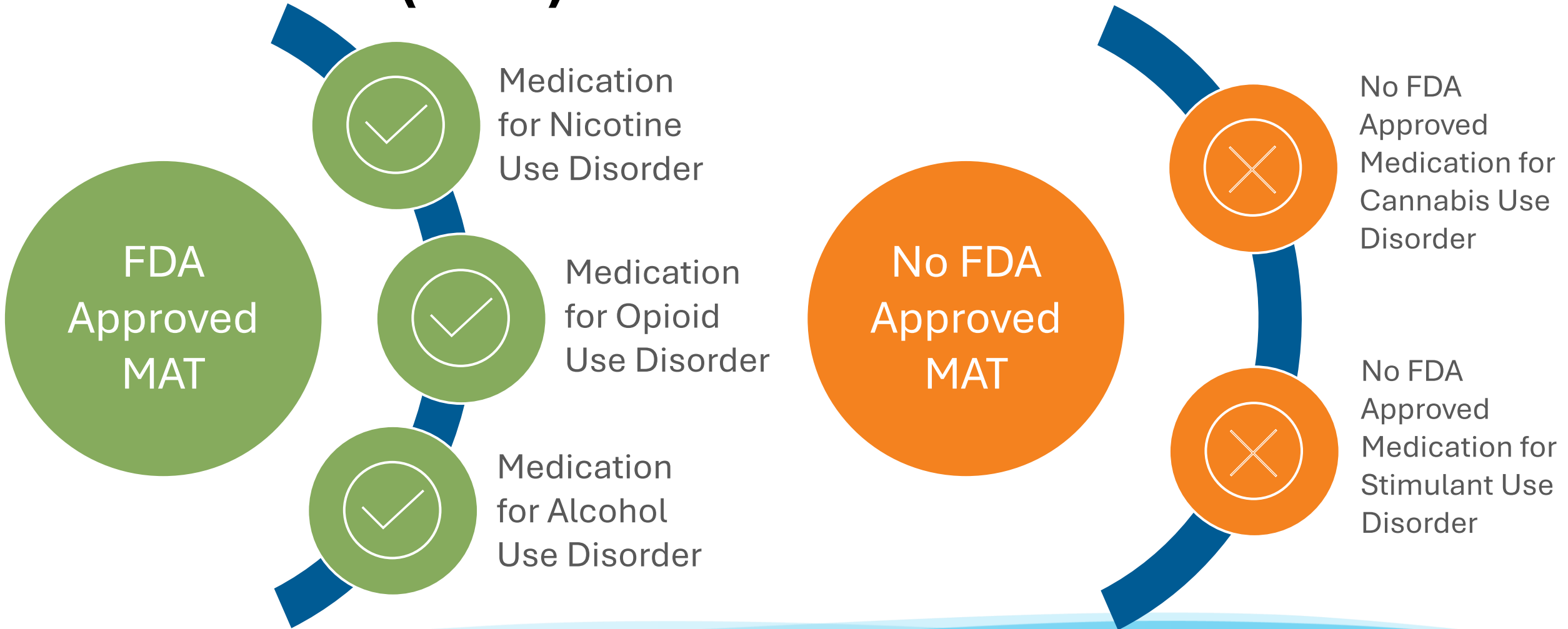


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Medications for Opioid Use Disorder (MOUD)

FDA-Approved Medications for Substance Use Disorders (SUD)



Why is Medication for Opioid Use Disorder (MOUD) Important?

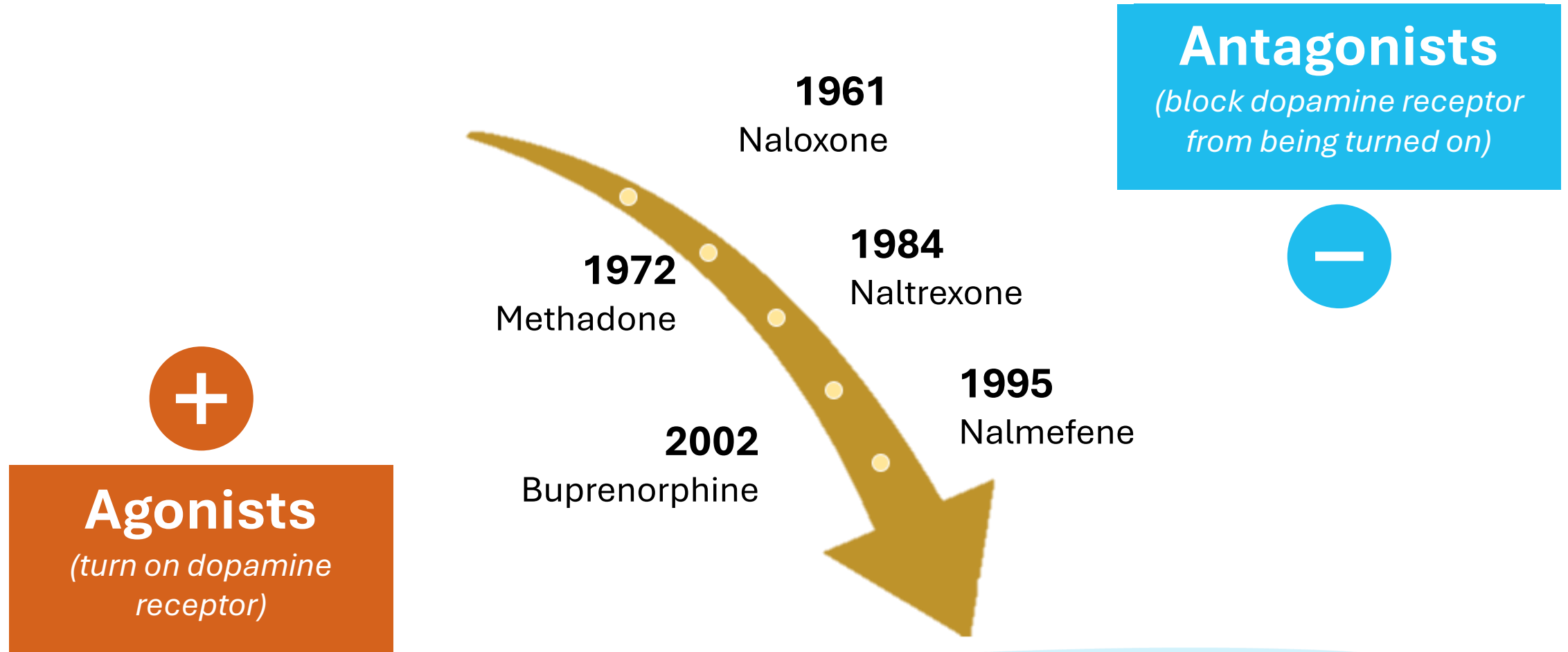
Treat Withdrawal	Address Dopamine Depletion	Treat OUD	Achieve Results
Symptoms include muscle pain, dilated pupils, nausea, diarrhea, abdominal cramping, piloerection. >> Lasts 3-14 days. >> Using methadone or buprenorphine is recommended over abrupt cessation due to risk of relapse, overdose & death.	Reward/motivation pathway. >> Depletion persists for months-years after people stop using. >> Treated with methadone or buprenorphine.	85% return to opioid use within 1 year with abstinence-based only treatment	>> Increase retention in treatment. >> Decreases: >> Cravings >> Opioid use >> Overdoses >> Deaths >> Complications of IV drug use >> Criminal behavior >> Recidivism >> Litigation

Sources:

1. Mattick, RP & Hall W (1996) Lancet 347: 8994, 97-100.
2. Lobmaier, P et al. (2008) Cochrane Systematic Review.
3. Kakko et al. (2003) Lancet 361(9358), 662-8.
4. ASAM, (2020) National Practice Guidelines for the Treatment of OUD.

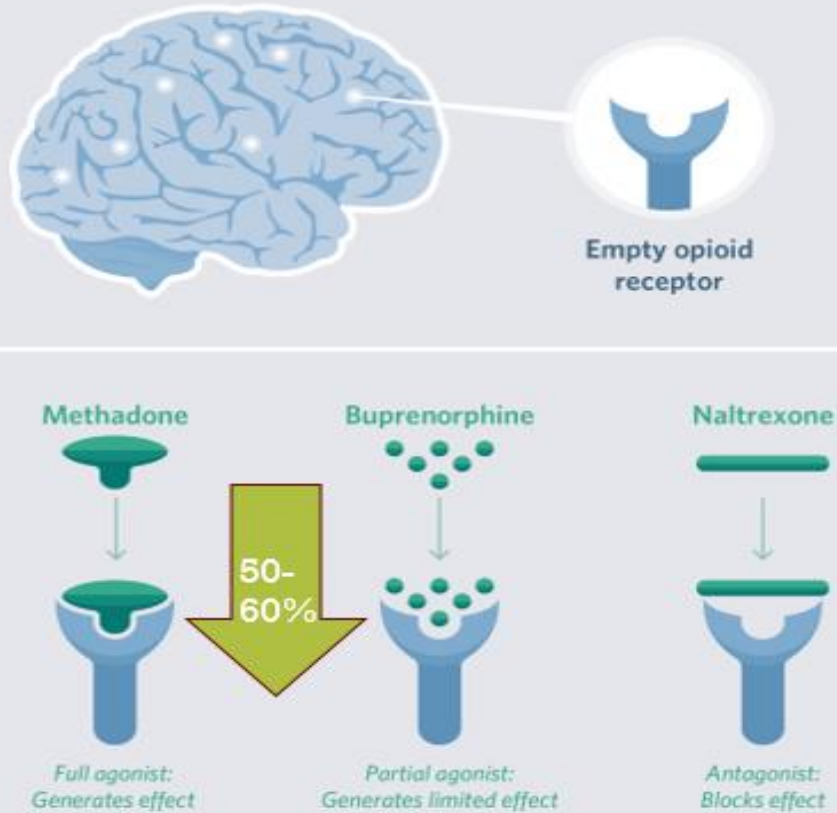
5. Mattick, RP, et al. (2009) Cochrane Systematic Review.
6. Krupitsky et al. (2011) Lancet 377, 1506-13.
7. Rich, JD, et al. (2015) Lancet

FDA-Approved MOUD & Opioid Overdose



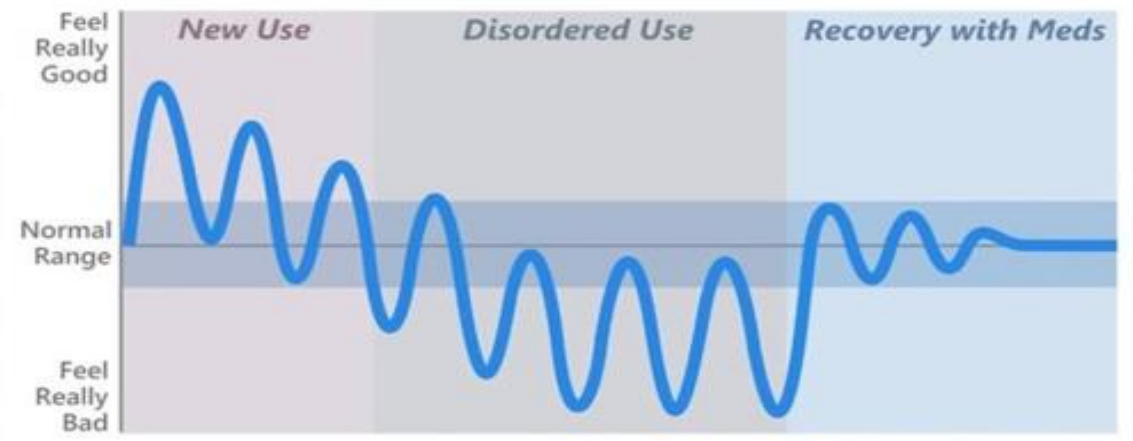
How OUD Medications Work in the Brain

Figure 1
How OUD Medications Work in the Brain

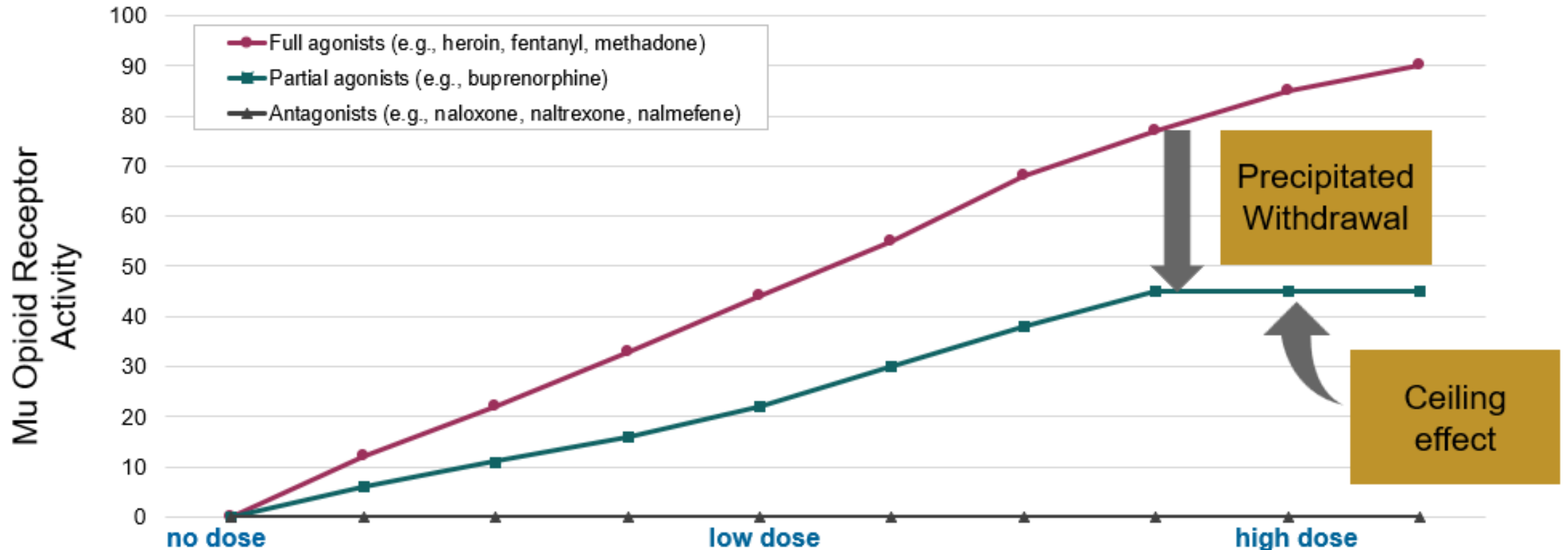


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Opioid Use Disorder



Full, Partial, or No Effect



Medications for Opioid Use Disorder (MOUD)

For withdrawal

After overdose reversal

For cravings

For high-risk situations, like release from incarceration

Methadone: What and for whom?

- Full *mu* opioid agonist without a “ceiling effect.”
- Can start before withdrawal symptoms.
- Reaching a therapeutic dose (60-120mg) takes time:
 - Increased frequency and daily dose required under some circumstances, e.g., pregnancy.
- Several significant drug-drug interactions.
- Can write prescription for methadone to treat OUD if:
 - Opioid treatment program (OTP).
 - Covering a gap of no more than 3 days.
 - Patient is in a DEA-registered hospital/clinic.
- Highly effective:
 - 33% fewer opioid positive toxicology tests.
 - 4.4 x more likely to stay in treatment.
 - Reduced crime, infectious disease and death.

Patients with a more severe OUD

Patients who would benefit from the services of an opioid treatment program (OTP)

Patients who were not successful with other MOUD

Buprenorphine: What and for whom?

- Partial *mu* opioid agonist with ceiling effect:
 - Available alone or in combination with naloxone.
 - Different formulations (sublingual and injectable).
- Greater binding affinity than full agonists:
 - Start buprenorphine when client is in moderate withdrawal.
 - Typical dose is 16-32 mg/day.
 - Some require higher & more frequent dosing.
- Fewer drug-drug interactions than methadone.
- Ceiling effect results in increased safety:
 - No greater high.
 - No greater respiratory depression.
- Highly effective:
 - Return to opioid use 100% for placebo versus 25% for buprenorphine.
 - 1.82 times more likely to stay in treatment
- Reduced crime, infectious disease and death.

OUD or opioid withdrawal;
patient desires agonist
treatment

Naltrexone: What and for whom?

- *Mu* opioid antagonist with high, competitive binding affinity – “blocker”
- Must be opioid free 7-10 days before starting to prevent precipitated withdrawal.
- Does not treat withdrawal.
- *Does not treat dopamine depletion.*
- Does not decrease mortality.
- Formulations:
 - 50mg pills approved for alcohol use disorder (AUD).
 - 380mg extended-release injectable approved for AUD and OUD every 28-30 days.

Patients with a high degrees of motivation (dopamine)

Patients who had poor results with methadone or buprenorphine

Can be useful as “back-up” after discontinuation of methadone or buprenorphine

Source: Larochelle, et al. Medication for opioid use disorder after nonfatal opioid overdose and association with mortality. A cohort study. *Annals of Internal Medicine*. 169:3 (2018) 137-45.

Treatment of Opioid Withdrawal and OUD

Medication	Treats Withdrawal	Treats OUD	Decreased Death
Methadone	Yes	Yes	Yes
Buprenorphine	Yes	Yes	Yes
Naltrexone	No	Yes	No

- Treatment of opioid withdrawal is NOT treatment of OUD.
- Withdrawal historically accomplished over 3-21 days.
 - The relapse rates with this approach is roughly 85% at one year.
- Ongoing treatment with medication decreases return to drug use.

Sources: American Society of Addiction Medicine (ASAM). (2020). The ASAM National Practice Guideline for the Treatment of Opioid Use Disorder: 2020 Focused Update. <https://www.asam.org/quality-care/clinical-guidelines/national-practice-guideline>. Bureau of Justice Assistance and National Institute on Corrections. (2023). Guidelines for Managing Substance Withdrawal in Jails. <https://www.cossup.org/Topics/CourtsCorrections/JailResources/Guidelines>. National Academies of Sciences, Engineering, and Medicine. (2019). Nosyk, B. et al. (2012). SAMHSA & the Office of the Surgeon General (2018).

Duration of Treatment

Evidence is clear that long-term or indefinite treatment for OUD is often required for effective and sustained outcomes

In practice, successful tapers from methadone or buprenorphine typically occur in only about 15 percent of cases

According to the U.S. Surgeon General, successful tapers typically occur, if at all, when individuals have been treated with MAT for at least 3 years

Sources: National Academies of Sciences, Engineering, and Medicine. (2019); Nosyk, B. et al. (2012); SAMHSA & the Office of the Surgeon General (2018).



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Storage of MOUD in Correctional Facilities

MOUD Federal Regulatory Categorization

Medication	Federal status	Storage consequence
Methadone	Schedule II controlled substance	Highest controlled-substance security and recordkeeping requirements
Buprenorphine	Schedule III controlled substance	Controlled-substance security and recordkeeping requirements, generally less stringent than Schedule II
Naltrexone	Not federally scheduled	Ordinary medication-security and manufacturer storage requirements; facility policy may still require locked storage

DEA Rules for Schedule II & Schedule III-IV Drugs

MOUD

- **Schedule II – methadone** - generally requires a qualifying safe or vault.
 - Unless a correctional facility is a certified OTP, methadone typically provided through courtesy/guest dosing from an OTP
- **Schedule III – buprenorphine** - kept in a qualifying safe or vault or in a secured building/storage area meeting the regulation's perimeter, door, alarm, and access-control requirements. Other regulations stipulate requirements for personnel access, inventory management, etc. (see next slide.)

MAUD (Medications for Alcohol Use Disorder)

- Naltrexone, acamprosate, and disulfiram: *not controlled substances*
- **Schedule IV** – Benzodiazepines such as lorazepam, diazepam, or chlordiazepoxide – sometimes used for acute alcohol withdrawal. They are not ongoing AUD treatments. Same storage and inventory management requirements as Schedule III.

References: 21 CFR § 1301.72; 21 CFR § 1301.75 21 CFR § 1304.4; 21 CFR § 1304.11 [DEA scheduling](#), [NIAAA](#)

Overall MOUD Storage Requirements

- A locked, substantially constructed safe, steel cabinet, vault, or other DEA-compliant secure storage area.
- Access restricted to authorized personnel whose duties require access.
- Physical security sufficient to prevent diversion, theft, unauthorized access, and removal.
- Written procedures for receipt, transfer, dispensing, administration, returns, destruction, discrepancy investigation, and emergency access.
- Accurate medication counts and controlled-substance records by drug, dosage form, strength, quantity, date, and person administering or dispensing.
- Separate or readily retrievable records for controlled substances.
- Routine reconciliation between physical stock, administration records, dispensing records, and inventory records.

MOUD Inventory Management Requirements

- DEA-controlled-substance records must be current and complete. A controlled-substance inventory is required initially and at least every two years; many correctional facilities use daily or per-shift counts as an operational safeguard, especially for methadone. [21 CFR §§ 1304.11, 1304.21–22](#)
- The facility must report theft or a significant loss of a controlled substance to the DEA field office in writing within one business day and submit DEA Form 106 within 45 days. State reporting deadlines may be shorter. [21 CFR § 1301.76](#)

Naltrexone Storage Requirements

Naltrexone is not a controlled substance under the federal Controlled Substances Act. However, the facility should:

- Store oral tablets and injectable product according to the current FDA-approved labeling.
- Keep medication in a secure medication room, automated dispensing cabinet, or locked cart.
- Limit access to authorized health-care staff.
- Track lot numbers, expiration dates, receipt, administration, returns, and disposal.
- Maintain refrigeration only if required by the particular product label; injectable extended-release naltrexone is generally stored according to its product labeling and should not be frozen.
- Follow ordinary pharmacy, nursing, infection-control, temperature-monitoring, and medication-administration rules.

Defensible Policy Components

A defensible policy should identify:

- Who owns and legally possesses the medication.
- Which DEA registration and registered location cover the stock.
- The approved storage container and alarm/access controls.
- Authorized staff and key/code management.
- Required count frequency and discrepancy escalation.
- Receipt and inter-facility transfer procedures.
- Diversion, theft, loss, and overdose-response procedures.
- Expired-medication and destruction procedures.
- Temperature and manufacturer-label requirements.
- State-specific pharmacy and correctional requirements.



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Q&A and Discussion

Resources

Policy element	Source
Secure storage for Schedule II and III substances	21 CFR §§ 1301.72
Minimum authorized access to storage areas	21 CFR §§ 1301.72(d)
Initial and biennial inventories	21 CFR §§ 1304.11
Continuing records of receipt, dispensing, transfer, and disposal	21 CFR §§ 1304.21-22
Theft or significant-loss reporting	21 CRF §§ 1301.76



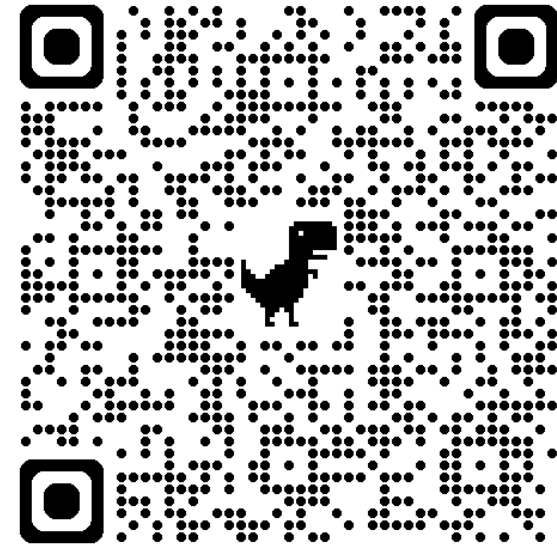
Addiction Overview, Corey Waller, M.D.

<https://vimeo.com/421261226/a2c9a21d7b>

Peer Learning Opportunity

Wednesday, October 21, 2026
10 – 11am PST

Register [here](#):





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HMA

Thank You



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