Substance Use Disorders: brains, behavior, and diagnosis

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Disclosures

Nothing to disclose
Objectives

1. Review the diagnostic criteria for substance use disorders

2. Understand how and why substance use disorders develop

3. Discuss the gray zone between opioid use disorder and pain
Objective 1

Review the Diagnostic Criteria for Substance Use Disorders
Not Just Use
Disordered Use
DSM V
Diagnostic and Statistical Manual of Mental Disorders
DSM V: Substance Use Disorder
11 criteria
DSM V: Substance Use Disorder
Craving / Compulsion
DSM V: Substance Use Disorder

- Taking in larger amounts or for longer than intended
- Unsuccessful efforts to cut down
- Spending a lot of time obtaining the substance
- Craving or a strong desire to use the substance
DSM V: Substance Use Disorder
Consequences
Loss of Control
DSM V: Substance Use Disorder

- Continued use despite recurring social or interpersonal problems due to use
- Important activities given up or reduced
- Recurrent use in physically hazardous situations
- Persistent / Recurrent physical or psychological difficulties from use
- Recurrent use resulting in a failure to fulfill major role obligations
Sadly, Mothman allows another criminal to escape.
DSM V: Substance Use Disorder

- Tolerance*
- Withdrawal*
Substance Use Disorder

2—3 mild disorder
4—5 moderate disorder
6+ severe disorder
Craving
Compulsion
Consequences
Loss of Control
Objective 2

Understand how and why substance use disorders develop
Dopamine
Desire, Drive, Motivation
• Mediate responses to food, sex, social interactions

• Connects with memory and emotional centers
• All addictive drugs activate this pathway

• Drug experience is deeply linked to memory and emotion

• People, places, things associated with drug use can trigger cravings
Liking

- Opioids: Activate DA receptors
- Also activate opioid receptors in NA and produce feeling of satiety, soothing, comfort.
Dysregulation

Dysregulation: impaired ability of the front of the brain, to regulate what is going on in the older regions of the brain.

Prefrontal cortex helps him determine the risks and benefits of behaviors and make rational choices.

Repeated activation of the VTA to NAC track slowly strengthens those connections and weakens the connections between the front and the back.
• Habits get hard wired, fast and automatic

• Connections to the prefrontal cortex slow down

• Decreased ability to inhibit disadvantageous behaviors
How Permanent Was Vietnam Drug Addiction?

LEE N. ROBINS, PhD
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In 1971, drug use by U.S. servicemen in Vietnam had, by all estimates, reached epidemic proportions. A follow-up study of returning Army enlisted men was carried out in order to facilitate planning of programs for these soldiers and to gain insight concerning the natural history of drug use and abuse when drugs are readily available to young men from all types of social backgrounds. Findings on the permanence of Vietnam drug addiction are presented.

Background

During the summer and fall of 1971, drug use by United States servicemen in Vietnam had, by all estimates, reached epidemic proportions. Starting in June, 1971, the military screened urines of returning servicemen for drugs just prior to their scheduled departure from Vietnam. In September, 1971, the U.S. Department of Defense estimated that 5 percent of all urines of Army servicemen tested indicated drug use in the period immediately preceding, despite common knowledge that such testing would be done and would result, if positive, in a six or seven day delay in departure from Vietnam.

At this time, American troop strength in Vietnam was being reduced rapidly—returning to the United States each month thousands of men, of whom about 40 percent were due for immediate release from military service. The Armed Forces, the Veterans Administration, and civilian drug treatment facilities were concerned that the arrival of these men might tax existing drug treatment programs. There was also concern about how drug use might affect veterans' ability to get and hold jobs, as well as their chances of becoming involved in criminal activities if they continued heroin use in the United States, where the price of heroin was many times its price in Vietnam. If the men designated as "drug positives" at DEROS (Date Eligible for Return from Overseas) were actually heroin addicts and if heroin addiction among these soldiers was as chronic and unresponsive to treatment as it had been found to be in the heroin addicts seen in the U.S. Public Health Hospitals at Lexington and Fort Worth, there was reason for concern.

To evaluate these concerns and to learn how many men would require treatment, the kinds of treatment and social services they might need, and how to identify which men needed services, the White House Special Action Office for Drug Abuse Prevention (SAODAP) asked the first author to carry out a follow-up study of Army enlisted men who returned from Vietnam to the United States. The second author was the senior assistant on the project, and the third author served as SAODAP's representative as a consultant to the project and as liaison with the supporting governmental agencies: U.S. Departments of Defense and Labor, the National Institute of Mental Health, and the Veterans Administration.

This study promised not only to answer questions relevant to planning programs for these soldiers, but also to teach us something about the natural history of drug utilization and abuse when drugs were readily available to young men from all over the United States and from all kinds of social backgrounds. The present paper on the permanence of Vietnam drug addiction comes from this larger effort, and is the first paper to go beyond analyses included in the official reports.

The Study

Approximately 13,760 Army enlisted men returned to the United States from Vietnam in September 1971. From this population of returnees, a simple random sample of 470 was selected as the General Sample. Within the population of 13,760, approximately 1,400 had been found to have urines positive for narcotics at time of departure. From this subpopulation who had shown positive urines at departure from Vietnam, a simple random sample of 496 was selected, the Drug Positive sample.*

* While we believe that simple random samples were achieved of both general population and its subpopulation of men detected as positive at departure, there were some complications in identifying the populations from which to sample. These difficulties and their solutions are described in Appendix A of the Interim Final Report entitled "A Follow-Up of Vietnam Drug Users." There was an overlap of 22 between the General Sample and the Drug Positive Sample.
Dopamine Pathways

- Frontal cortex
- Nucleus accumbens
- VTA

Functions
- Reward (motivation)
- Pleasure, euphoria
- Motor function (fine tuning)
- Compulsion
- Perseveration

Serotonin Pathways

- Striatum
- Substantia nigra
- Hippocampus
- Raphe nuclei

Functions
- Mood
- Memory processing
- Sleep
- Cognition
D1: Activate the nucleus accumbens, cause us to act
Responsive to big pleasure surges.

D2: Slow down decision making, allow the frontal cortex to step in.
Responsive to smaller pleasures.
Objective 3

Discuss gray zone between opioid use disorder and pain
Drug Deaths in America Are Rising Faster Than Ever

BY JOSH KANTZ | JUNE 5, 2017

Few data compiled from hundreds of health agencies reveals the extent of the drug overdose epidemic last year.

AKRON, Ohio — Drug overdose deaths in 2016 most likely exceeded 59,000, the largest annual jump ever recorded in the United States, according to preliminary data compiled by The New York Times.

The death count is the latest consequence of an escalating public health crisis: opioid addiction, now made more deadly by an influx of illicitly manufactured fentanyl and similar drugs. Drug overdoses are now the leading cause of death among Americans under 50.

Although the data is preliminary, the Times’s best estimate is that deaths rose 13 percent over the 52,404 recorded in 2015. And all evidence suggests the problem has continued to worsen in 2017.
Table 1.2: Recommendations From the Centers for Disease Control and Prevention For Prescribing Opioids for Chronic Pain

<table>
<thead>
<tr>
<th>Recommendation</th>
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<tbody>
<tr>
<td>Determining When to Initiate or Continue Opioids for Chronic Pain</td>
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<tr>
<td>1. Nonpharmacologic therapy and nonopioid pharmacologic therapy are preferred for chronic pain. Clinicians should consider opioid therapy only if expected benefits for both pain and function are anticipated to outweigh risks to the patient. If opioids are used, they should be combined with nonpharmacologic therapy and nonopioid pharmacologic therapy, if appropriate.</td>
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<td>2. Before starting opioid therapy for chronic pain, clinicians should establish treatment goals with all patients, including realistic goals for pain and function, and should consider how therapy will be discontinued if benefits do not outweigh risks. Clinicians should continue opioid therapy only if there is clinically meaningful improvement in pain and function that outweighs risks to patient safety.</td>
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<td>3. Before starting—and periodically during—opioid therapy, clinicians should discuss with patients known risks and realistic benefits of opioid therapy and patient and clinician responsibilities for managing therapy.</td>
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<td>Opioid Selection, Dosage, Duration, Follow-up, and Discontinuation</td>
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<td>4. When starting opioid therapy for chronic pain, clinicians should prescribe immediate-release opioids instead of extended-release/long-acting (ER/LA) opioids.</td>
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<td>5. When opioids are started, clinicians should prescribe the lowest effective dose. Clinicians should use caution when prescribing opioids at any dosage, should consistently reassess evidence of individual benefits and risks when increasing dosage to 50 morphine milligram equivalents (MME) or more per day, and should avoid increasing dosage to 90 MME or more per day or carefully justify a decision to increase dosage to 90 MME or more per day.</td>
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<tr>
<td>6. Long-term opioid use often begins with treatment of acute pain. When opioids are used for acute pain, clinicians should prescribe the lowest effective dose of immediate-release opioids and should prescribe no greater quantity than needed for the expected duration of pain severe enough to require opioids. Three days or less will often be sufficient; more than 7 days will rarely be needed.</td>
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<td>7. Clinicians should evaluate benefits and harms with patients within 1 to 4 weeks of starting opioid therapy for chronic pain or of dose escalation. Clinicians should evaluate benefits and harms of continued opioid therapy; clinicians should optimise therapies and work with patients to taper opioids to lower dosages or to taper and discontinue opioids.</td>
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<tr>
<td>Assessing Risk and Addressing Harms of Opioid Use</td>
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<tr>
<td>8. Before starting and periodically during continuation of opioid therapy, clinicians should evaluate risk factors for opioid-related harms. Clinicians should incorporate into the management plan strategies to mitigate risk, including considering starting naloxone when factors that increase risk for opioid overdose, such as history of overdose, history of substance use disorder, higher opioid dosages (≥50 MME/day), or concurrent benzodiazepine use are present.</td>
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<td>9. Clinicians should review the patient's history of controlled substance prescriptions using state prescription drug monitoring program (PDMP) data to determine whether the patient is receiving opioid dosages or dangerous combinations that put him or her at high risk for overdose. Clinicians should review PDMP data when starting opioid therapy for chronic pain and periodically during opioid therapy for chronic pain, ranging from every prescription to every 6 months.</td>
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<td>10. When prescribing opioids for chronic pain, clinicians should use urine drug testing before starting opioid therapy and consider urine drug testing at least annually to assess for prescribed medications as well as other controlled substances like illicit drugs.</td>
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<td>11. Clinicians should avoid prescribing opioid pain medication and benzodiazepines concurrently whenever possible.</td>
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<td>12. Clinicians should offer or arrange evidence-based treatment (usually medication-assisted treatment with naltrexone or methadone in combination with behavioural therapy) for patients with opioid use disorder.</td>
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Overdose Deaths Involving Opioids, by Type of Opioid, United States, 2000-2015

- Any Opioid
- Heroin
- Natural & Semi-Synthetic Opioids
- Other Synthetic Opioids (e.g., fentanyl, tramadol)
- Methadone

Drugs involved in U.S. overdose deaths, 2000 to 2016

- 20,100: Fentanyl and fentanyl analogues
- 15,400: Heroin
- 14,400: Prescription opioids
- 10,600: Cocaine
- 7,660: Methamphetamine
- 3,280: Methadone
Thank You
Questions?


Centers for Disease Control and Prevention, National Center for Injury and Prevention Control, Division of Unintentional Injury Prevention. “Opioid Overdose”


Lee JD et al. Extended-Release Naltrexone to Prevent Opioid Relapse in Criminal Justice Offenders NEJM 2016; 374:1232-1242


Szalavitz, M. Unbroken Brain: A Revolutionary New Way of Understanding Addiction St. Martin's Press (April 5, 2016)

Tanum, L et al. The Effectiveness of injectable extended-release naltrexone vs daily buprenorphine-naloxone for opioid dependence: a randomized clinical non-inferiority trial. JAMA Psychiatry 2017


Walley, AY et al. Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: interrupted time series analysis *BMJ* 2013; 346 doi: [https://doi.org/10.1136/bmj.f174](https://doi.org/10.1136/bmj.f174)