The Science of Addiction

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Addiction is a Disease
Not a Sign of Weakness

Definition of Addiction (ASAM, 2014):

Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors.

Addiction is characterized by inability to consistently abstain, impairment in behavioral control, craving, diminished recognition of significant problems with one’s behaviors and interpersonal relationships, and a dysfunctional emotional response. Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment or engagement in recovery activities, addiction is progressive and can result in disability or premature death.
How the Brain and Behavior Change
Dopamine Pathways

Frontal cortex

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

Nucleus accumbens

VTA

Hippocampus

Raphe nucleus

Serotonin Pathways

Striatum

Substantia nigra

Functions
- Mood
- Memory processing
- Sleep
- Cognition
A Common Pathway

- Experimentation, Recreational Use
- More Regular Use
- Daily Preoccupation
- Dependency and Addiction
Social Experimentation, Recreational Use

- Drug is often used with friends, user likes the “high” and good feeling produced – positive reinforcement

- No tolerance yet so high is easy to obtain, use may be unplanned and usually with peers, involves excitement of risk taking, life continues to be normal otherwise

- Adverse effects of use are minimal and/or may not be evident
Activation of the reward pathway by addictive drugs

cocaine
heroin
nicotine

alcohol

heroin
cocaine
Daily Preoccupation

• Increasing amounts of time, energy, and money spent on thinking about and obtaining drugs, becomes the “new normal”

• Being high becomes normal, unsuccessful attempts to quit on own, increase in use while alone, engaging in risky behaviors to support use, user denies there is a problem

• Family, health, financial, and/or legal problems magnify and multiply, increase in physical and emotional pain, user often feels stuck without alternatives
More Regular Drug Use

• User begins to seek the high, use is more regular and may be scheduled

• Use increases in frequency becoming more a part of regular activities, beginning of tolerance, may be using alone in addition to using with friends, negative behavior starts to develop

• Negative emotional states begin regarding use – guilt, loss of self-respect, anxiety, fear as drug takes more time and attention away from healthy activities
Dependency and Addiction

- Loss of control, daily use, denial increases in face of overwhelming evidence of problems
- Family and friends may be alienated, user needs drug to feel normal - negative reinforcement
- Increasing guilt, shame, and self-hatred; worsening legal, financial, physical, and mental problems; professional treatment usually needed to return to health
Withdrawal

- APA – the development of a substance-specific maladaptive behavioral change, usually with uncomfortable physiological and cognitive consequences, that is the result of a cessation of, or reduction in, heavy and prolonged substance use.
- May be superimposed on an organic syndrome
- “Detox” – management of the withdrawal syndrome, NEVER should be a stand-alone intervention
- Neurophysiology – generally, a disturbance/change in the balance of inhibitory and stimulating neurotransmitters
# Neurotransmitters in Withdrawal

<table>
<thead>
<tr>
<th>Neurotransmitter</th>
<th>Effect</th>
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<tbody>
<tr>
<td>Dopamine</td>
<td>Dysphoria</td>
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<tr>
<td>Serotonin</td>
<td>Dysphoria</td>
</tr>
<tr>
<td>GABA</td>
<td>Anxiety, Panic</td>
</tr>
<tr>
<td>Dynorphin</td>
<td>Dysphoria</td>
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<tr>
<td>CRF</td>
<td>Stress</td>
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<tr>
<td>Norepinephrine</td>
<td>Stress</td>
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Withdrawal Management

• Must first be on your differential!!

• Triage the potential substances, then assess for risk.

• Use a validated assessment tool if one exists – e.g., COWS, CIWA-Ar, CIWA-B

• Consider co-morbid medical, psychiatric, and psychosocial conditions – risk of withdrawal as well as risk of treatment
Withdrawal Management - Opioids

• Use a withdrawal scale like COWS to assess

• Most opioid withdrawal may be managed as an outpatient, with consideration of medical and psychiatric co-morbidities

• Medication options include:
  
  • Opioid Agonists: Methadone (only in an OTP) and Buprenorphine, usually a brief taper when used for withdrawal management vs maintenance therapy
  
  • Symptomatic Medications: used alone or with opioid agonist; includes antiemetic, antidiarrheals, alpha-adrenergic agonist (newly approved Lucemyra (lofexidine) and off-label clonidine); some off-label use of anticonvulsants

• Have a strategy for continued care following acute withdrawal

Questions?