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Brain Pathology of Heroin Addiction

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Brain Pathology of Heroin Addiction

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Introduction

- Heroin is a highly addictive product of the opium poppy plant that is injected, snorted, or smoked in order to achieve a state of euphoria. Heroin uses places patients at risk for terrible short and long-term neurological, health, behavioral, social, and economic effects. (National Institute on Drug Abuse, 2019). Heroin has been shown to cause neurocognitive deficits due to white matter damage in the brain that impacts brain areas responsible for cognition, emotions, and executive function (Wollman et al., 2015).
- This student has cared for numerous patients in the emergency department who either overdosed or were intoxicated on heroin and has witnessed the devastation heroin addiction brings to patients, their friends, and their families.

Motivation

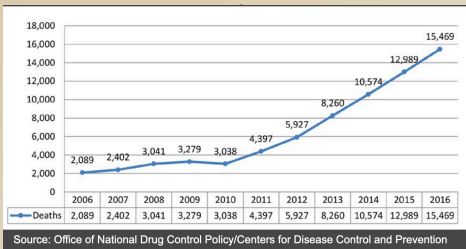
- The author chose this topic because although healthcare professionals understand that addiction is an illness, they may possess some innate bias or feelings of judgement towards patients with substance abuse disorder. Therefore, it may be beneficial for healthcare professionals to understand the short and long terms effects of heroin on the brain to overcome any innate bias and for the purpose of understanding cognitive challenges that patients may face on their road to recovery.
- The reality of the situation is that heroin use increases every year, and healthcare professionals need to be equipped with appropriate knowledge in order to care for those unfortunate enough to be addicted.

Physical & Neurological Symptoms

Short-Term

- Xerostomia
- Flushing
- Confusion
- Altered state of consciousness called "on the nod" where the user drifts in and out of being awake

Figure 1. Heroin related deaths in the United States, 2006-2016. The rate of heroin overdose deaths increased by 740% from 2006 to 2016



Long Term

- Depression, anxiety, personality disorders
- Insomnia
- Heart tissue damage and endocarditis
- Kidney disease
- Liver disease
- Impotence
- Menstrual cycle irregularity
- Collapsed veins and scarring
- Permanent brain damage due to hypoxia caused by overdose.
- Overdose and untimely death

Other Effects

- Potential infection with other illnesses such as HIV and hepatitis due to sharing of injection paraphernalia. (National Institute on Drug Abuse, 2019).

Figure 2. Inage of heroin paraphernalia. Source: www.stopdrugs.org



Presentation of Substance Abuse Disorder

- The Diagnostic and Statistical Manual of Mental Disorders define drug addiction as a substance use disorder (Koon & Volkow, 2016).

Substance use disorders characteristics

- Uncontrollable compulsion to take an addictive substance.
- Inability to control amount of drug that one takes.
- Development of irritability and anxiety when one is unable to obtain the drug.
- Chronic relapses
- May be mild, moderate, or severe. (Koon & Volkow, 2016)

Pathophysiology of Heroin Addiction

Neurobiology

- Neurobiological addiction research seeks to understand "changes at the molecular, cellular, and neurocircuitry levels that mediate the transition from occasional, controlled substance use to loss of control in drug intake and chronic addiction" (Koob & Volkow, 2016, p. 760).
- Addiction to drugs involves a recurring intoxication, withdrawal, and craving cycle that traps the addict into the addictive behavior by creating neuroplastic changes in the "brain reward, stress, and executive function systems" (Koob & Volkow, 2016, p. 761).

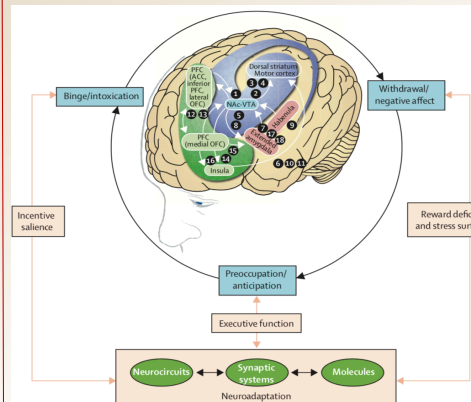


Figure 3. "Model of interacting circuits in which disruptions contribute to compulsive-like behaviors underlying drug addiction" (Koob & Volkow, 2016, p. 761).

Changes in three main brain areas include:

- The basal ganglia - associated with intoxication and bingeing.
- The amygdala - associated with withdrawal.
- The prefrontal cortex, which is where preoccupation with the addictive behavior occurs (Koob & Volkow, 2016).

Long-Term Brain Effects

Brain alterations

- The cingulate cortex which is involved in motivation and cognition and is part of the reward pathway suffers from reduced connectivity from heroin addiction resulting in increased drug craving and cognitive deficits (Wollman et al., 2015).
- Damage to brain white matter can take up to five years to occur (Wollman et al., 2015).
- Cerebral blood flow to the cingulate cortex has been shown to increase after long-term abstinence from heroin use, potentially restoring deficits in cognition (Wollman et al., 2015).

Episodic Foresight

- Episodic foresight is the ability of a person to envision themselves in the future and allows for "mental rehearsal of behaviors before selecting the action that will lead to a desired outcome" (Mercuri et al., 2014, p. 1337).
- Episodic foresight has been shown to be essential to independent living and a lack of this function may contribute to inability of chronic heroin users to function and affect their social and economical abilities (Mercuri et al., 2014).

Significance

- Research explained in this poster show that neurobiological changes in the brain make it difficult for the addict to function in many ways, but damage done to the brain may be undone with long term abstinence, and may be prevented with early intervention.
- Due to neurobiological changes in the brain, addicts become trapped in the addictive cycle (Koob & Volkow, 2016) and it may take multiple times for an addict to get clean.
- Wollman et al. (2015) explain that it may take up to five years for permanent white matter changes to occur in the brain, so early intervention is key to prevent long term brain changes.
- Changes in a person's ability to engage in episodic foresight (Mercuri et al., 2014) may affect their ability to envision their life without addiction and to engage in planning that may help them kick their addiction, so much support is needed for the addict who wants to recover.
- Physical effects and diseases secondary to the addiction as described by the National Institute on Drug Abuse (2019) may cause additional stress on an addict trying to recover and must be considered.

Implications for Nursing Care

- It is important for providers and clinicians to realize that addiction is a disease of the brain and not a measure of a person's value or abilities.
- Physically dependent persons who are attempting to withdrawal may benefit from medication assisted treatment (MAT) with medications such as methadone and buprenorphine. These drugs work by adhering to the same receptors in the body that heroin does and may help to wean the patient of off heroin (Bauer, Southard, and Kummerow, 2017).
- Bauer et al. (2017) explain that nurses may hold negative views of substance abusers and the negative attitudes affect patients by diminishing their empowerment and interfering with positive treatment outcomes. Also, nurses' attitudes towards patients with substance abuse issues may affect their ability to "engage in effective assessment of substance abuse issues and may disrupt caring behaviors, leading to decreased willingness for patients to utilize our healthcare systems" (Painter, 2017). Providers and nurses must be cognizant of their outward appearance and be careful not to appear judgmental towards patients.
- Treatment agreements have been helpful in helping heroin addicts by developing a signed contract between patients and their provider for goals of treatment (Bauer et al., 2017). This active signing of an agreement and creation of future goals may assist in overcoming deficits in episodic foresight as discussed in the previous section.

Conclusion

It is this author's hope that by understanding the pathophysiology will help nurses and providers to overcome any innate bias that we may possess towards heroin and other addicts in order to be as helpful as possible to our patients.

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