

# Neurological Components of Addiction or "What is Your Substance of No Choice"

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## Objectives

- Explain the impact of stigma on treatment for substance use disorders
- Describe neurobiological responses to substances
- Assess existing theories regarding treatment of substance use disorders

Some slides courtesy of Beth Howell, MD, University of Utah



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A Person's Risk of Becoming Addicted to Drugs Depends on Genes.



50% One study suggests that up to half the risk is due to genetics



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Medical School



33%



90%



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Opioids

- Alcohol



ANGER

Grief

Fear

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It is not OK to NOT be OK!

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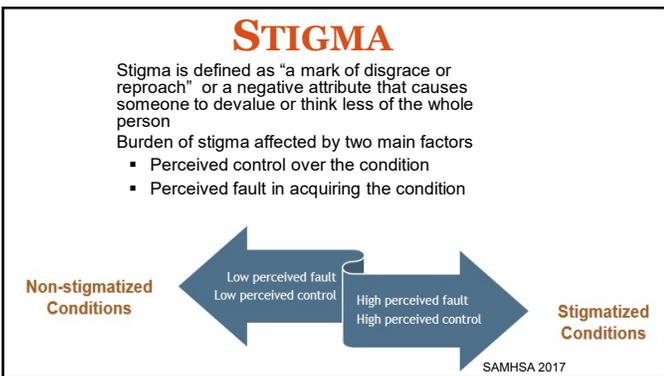
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## Types of Stigma for SUD

- Stigma from within
  - Blame self, feel hopeless
- Stigma from recovery community
  - Medications versus "abstinence"
- Stigma from clinicians
  - Belief that treatment is ineffective
- Stigma from outside
  - Choice versus disease



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## Effects of Substance Use Disorder-Related Stigma

Exacerbates social alienation  
 Can worsen mental and physical health  
 Non-completion of substance use treatment, delayed recovery, increase in risk taking behaviors

Livingson JD et al 2011



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## Health Care Provider Attitudes

- Overuse system resources
- Not vested in their own health
- Abuse the system through drug-seeking, diversion and failure to adhere to recommended care

Livingson JD et al 2011



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### Avoid Stigmatizing Words

Abuse	→	Substance Use or
Addict	→	Misuse
Rehab	→	Person with SUD
Relapse	→	Treatment for SUD
Dirty	→	Recurrence of use
Clean	→	Positive urine test
		In Recovery
		Negative Urine Test

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### Clean vs Dirty Urine



UDTs are Positive or Negative

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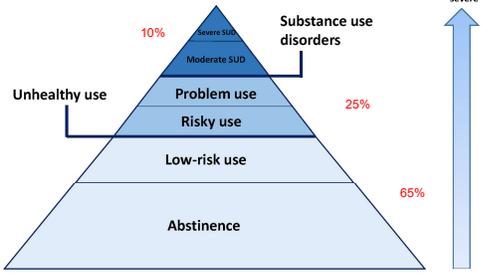
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### Substance Use Severity



Consumption heavy

Consequences severe

None

None

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### Resident Related Attitudes

Only seeing patients in ED, severely hospitalized, end stage substance users or repeat detoxification where they are more likely to have a negative experience with the patient and the possibility of recovery may feel remote

Should see patients succeeding in recovery and longitudinal care to develop an understanding of the recovery process

Greenberg WM et al 2002, Avery J et al 2017, Pahl D & Andry T 2016, Agrawal S et al 2016



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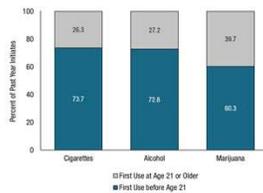
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### STARTS EARLY

Initiation of Use before Age 21 and at Age 21 or Older: Among People Aged 12 or Older Who Were Past Year Cigarette, Alcohol, and Marijuana Initiates; 2021



National Survey of Drug Use and Health (NSDUH) 2021



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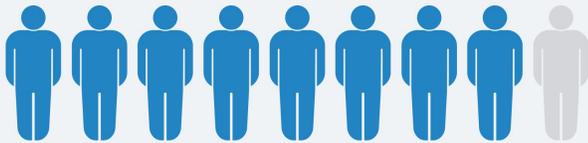
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## 9 OUT OF 10

PEOPLE WITH SUBSTANCE PROBLEMS  
STARTED USING BY AGE 18

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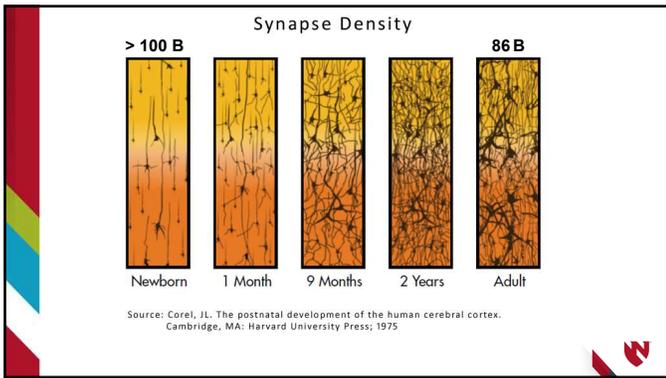
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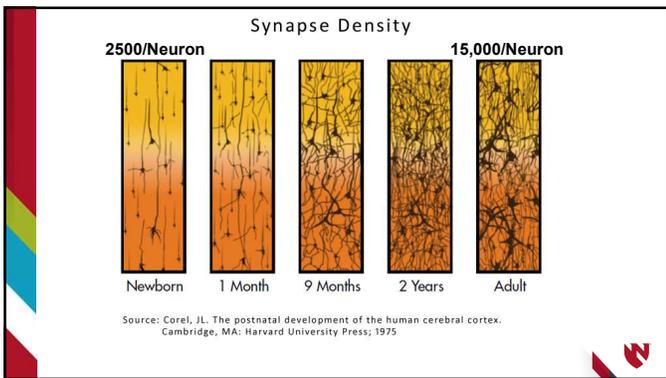
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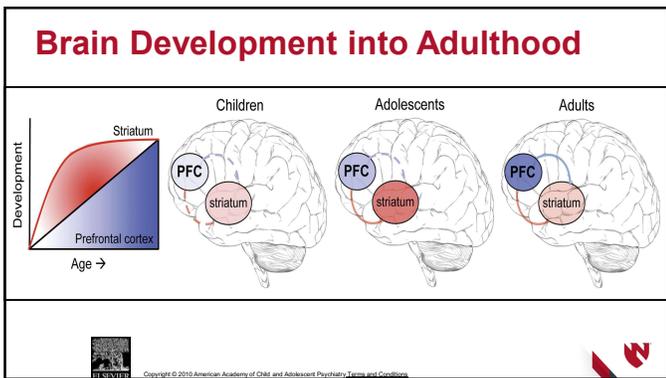
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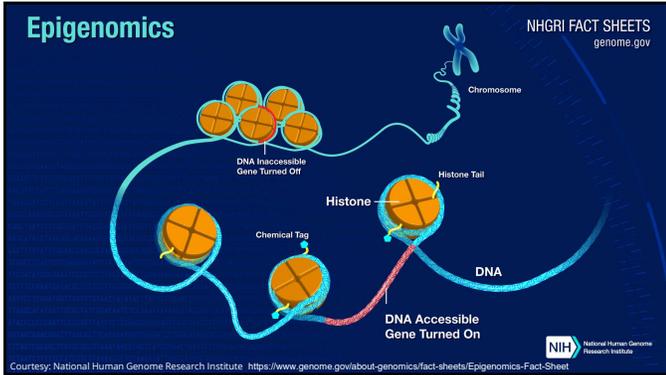
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### Physiologic Brain Changes Occur with Early Reading!

- Children experience stronger parent relationships
- Learn valuable language and literacy skills
- Stimulates language and cognitive development
- Stimulates Optimal Patterns of brain development

COUNCIL ON EARLY CHILDHOOD: Pamela C. High, Perri Klass, Elaine Donoghue, Danette Glavy, Beth DeCristo, Marian Earis, Gina Lopez, Fern McFadden, Alan Mendelsohn, Seth Scholer, Elaine S. Schultz, Jennifer Takagishi, Douglas Vanderbilt, P. Gail Williams. *Literacy Promotion: An Essential Component of Primary Care Pediatric Practice. Pediatrics* August 2014; 134 (2): 404-409. 10.1542/peds.2014-1384

Image from Pixabay

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### The Molecular Basis of Drug Addiction: Linking Epigenetic to Synaptic and Circuit Mechanisms

Eric J. Nestler<sup>1</sup> and Christian Lüscher<sup>1,2</sup>

<sup>1</sup>Department of Neuroscience and Friedman Brain Institute, Icahn School of Medicine at Mount Sinai, New York, NY, USA  
<sup>2</sup>Department of Basic Neuroscience, Faculty of Medicine, University of Geneva, Switzerland  
<sup>3</sup>Unit of Neurology, Department of Clinical Neuroscience, Geneva University Hospital, Geneva, Switzerland  
 \*Correspondence: christian.luscher@unige.ch  
<https://doi.org/10.1093/mnras/000/000/000>

Pharmacogenomics. Author manuscript, available in PMC 2013 May 1. PMCID: PMC3463407  
 Published in final edited form as: NIHMSID: NIHMS406057  
 Pharmacogenomics. 2012 Jul; 13(10): 1149-1160. PMID: 22909205  
 doi: 10.2217/pgs.12.94

Epigenetics of drug abuse: predisposition or response

David A Nielsen<sup>1</sup>, Amol Utrankar<sup>2</sup>, Jennifer A Reyes<sup>2</sup>, Daniel D Simons<sup>2</sup> and Thomas R Kosten<sup>1</sup>

Science News

From research organizations Frontiers in Genetics Sections Articles Research Topics Editorial Board About journal

Epigenetics of addiction: Epigenetic study untangles addiction and relapse in the brain

Date: September 27, 2017  
 Source: Medical University of South Carolina

Summary: New research uncovers an epigenetic reason why drug users who attempt to quit are prone to relapse despite negative consequences to their health and livelihood. The findings help to explain how casual drug use can produce long-lasting brain changes that increase vulnerability to relapse in individuals suffering from substance use disorders.

**DNA Epigenetics in Addiction Susceptibility**

Grubm-Kaplan, Haiyang Fu, Kristen Almer and Jan Tang

Department of Biological Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI, United States

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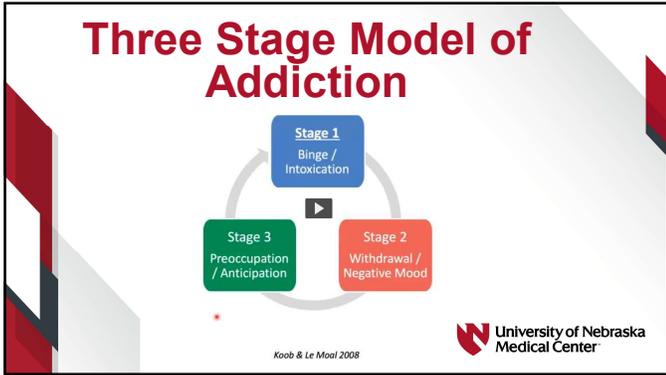
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### Three Stage Model of Addiction

**Stage 1**  
Binge / Intoxication

**1. Binge / Intoxication**

- Associated with positive reinforcement & motivational learning
- Associating cues with reward delivery

e.g., Cat on Catnip

NAc  
VTA

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Nucleus Accumbens    Ventral Tegmental Area

What does ↑ dopamine signal

- ↑ Value of future reward / of work to gain the reward
- ↑ Motivation to obtain reward
- ↑ WANT

– Evolved out of survival –

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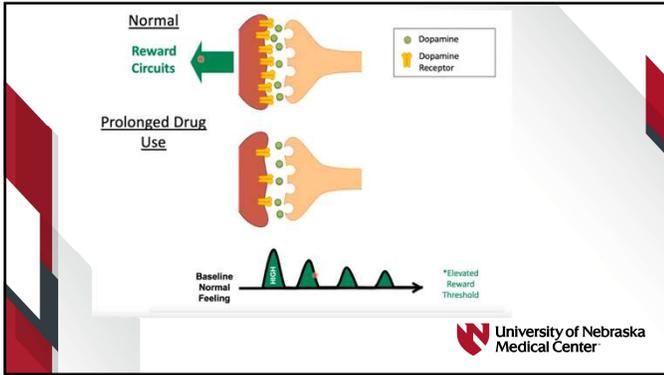
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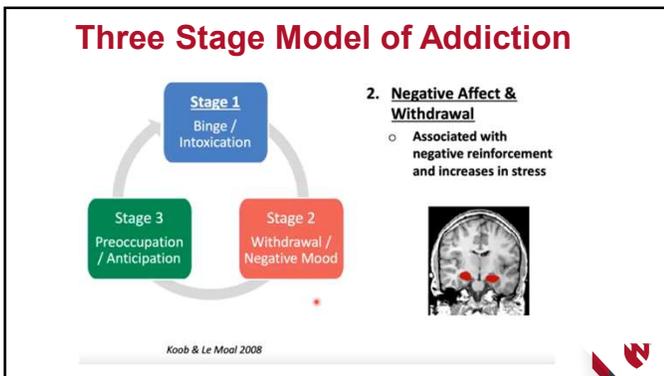
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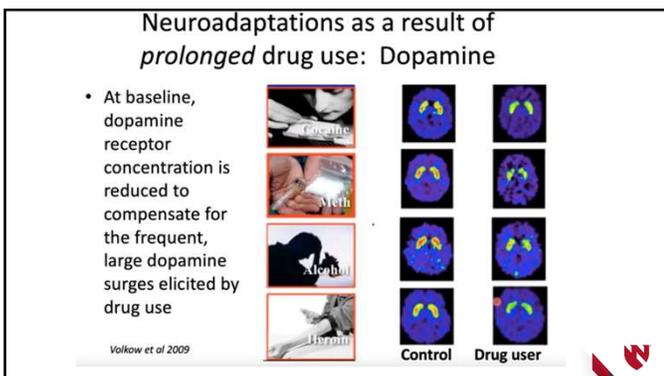
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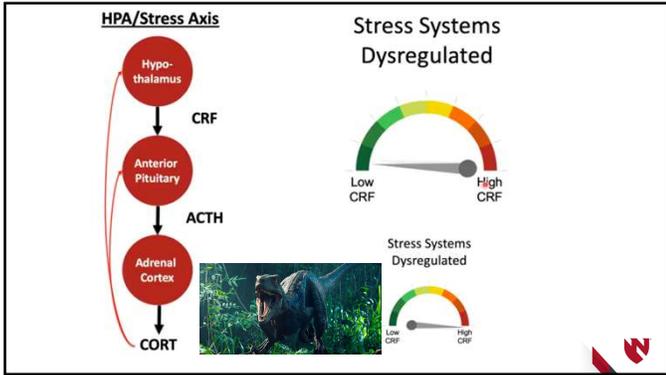
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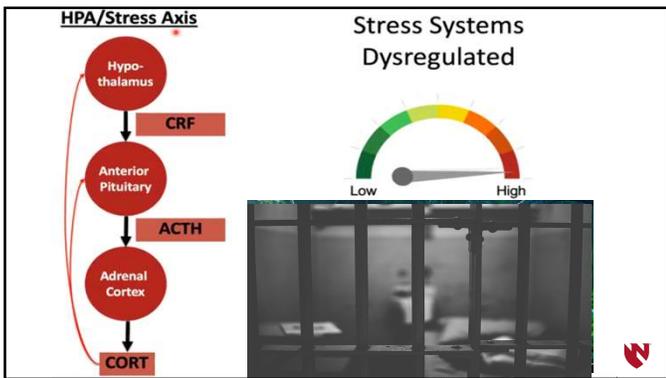
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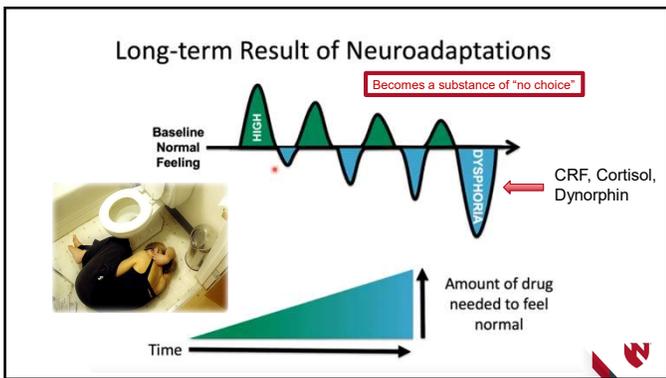
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**Exhibit 4. Possible Symptoms of Protracted Withdrawal**

- Anxiety
- Sleep difficulties
- Problems with short-term memory
- Persistent fatigue
- Difficulty concentrating and making decisions
- Alcohol or drug cravings
- Impaired executive control
- Anhedonia
- Difficulty focusing on tasks
- Dysphoria or depression
- Irritability
- Unexplained physical complaints
- Reduced interest in sex



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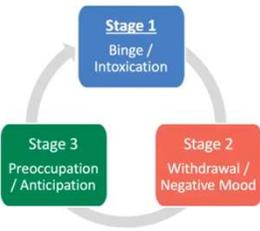
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**Three Stage Model of Addiction**



**3. Preoccupation & Anticipation**

- Associated with changes to executive functioning



Koob & Le Moal 2008



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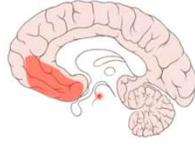
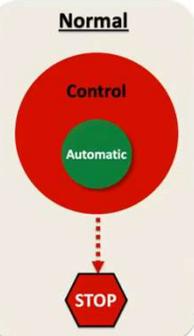
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**Normal**



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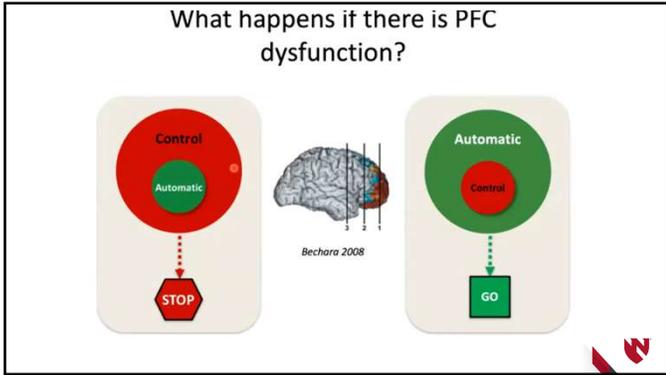
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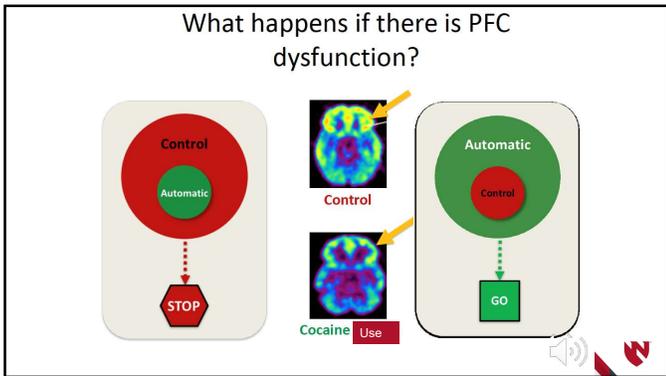
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**Exhibit 4. Possible Symptoms of Protracted Withdrawal**

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- Dysphoria or depression
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- Reduced interest in sex

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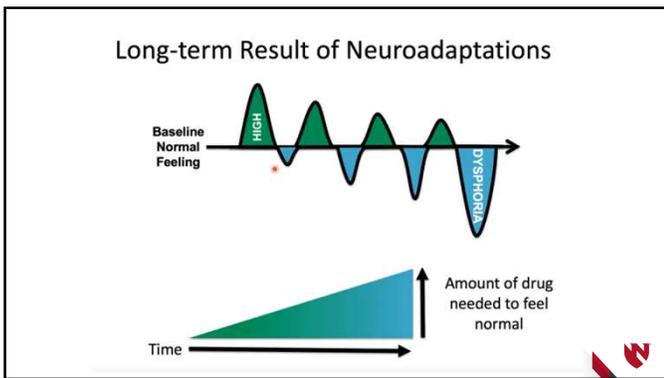
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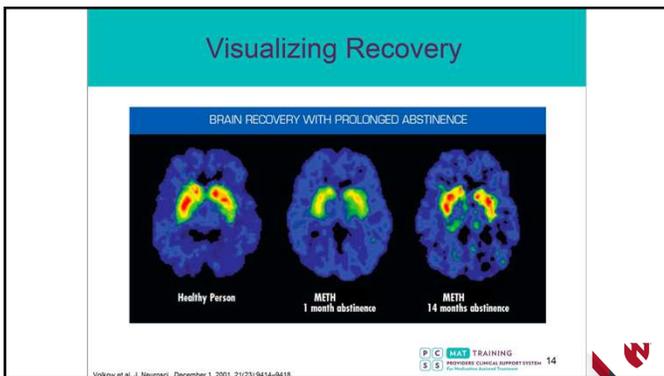
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### STRATEGIES TO IMPROVE ATTITUDES

- Education on the stigmatized attitudes that clinicians hold towards individuals with SUDs
- Exposure to maintenance pharmacotherapy (e.g. buprenorphine training)
- Exposure to patients in recovery
- Mentorship from senior clinicians trained in addiction
- Reflection exercises



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Behavioral Health is Essential To Health

Prevention Works

Treatment is Effective

People Recover

Keeping Youth DRUG FREE

Together We Can Do This But It Takes All Of Us!

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Questions?

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 Twitter: @DrKenZoucha

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[https://ndrcr.org/wp-content/uploads/2022/01/Principles\\_of\\_Drug\\_Abuse\\_Treatment\\_for\\_Criminal\\_Justice\\_Populations\\_A\\_Research-Based\\_Guide.pdf](https://ndrcr.org/wp-content/uploads/2022/01/Principles_of_Drug_Abuse_Treatment_for_Criminal_Justice_Populations_A_Research-Based_Guide.pdf)



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