ADDICTION & THE BRAIN
A LONG STORY...

Governor’s Opioid Coordination Council
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ADDICTION & THE BRAIN
A LONG STORY...

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Humans have been using mind altering substances since prehistoric time...
ADDICTION & THE BRAIN
A LONG STORY…

- **Alcohol:** The earliest alcoholic drink dates back to 7,000-6,600 B.C.
- **Hallucinogens:** The earliest fossil remains of the hallucinogenic San Pedro cactus, found in a cave in Peru, date back to between 8,600 and 5,600 B.C.
- **Opium:** Remains of poppy seed capsules and traces of opiates have been discovered in the plaque and bones of human skeletons dating back to the 4th millennium B.C., along with prehistoric art showing parts of the poppy being used in religious ceremonies.
- **Coca leaves:** The earliest evidence of humans chewing coca dates back to South America around 8,000 years ago.
- **Tobacco:** Smoking pipes dating back to around 2,000 B.C. have been found in northwestern Argentina.
Drug addiction is a complex illness

- Characterized by intense and, at times, uncontrollable drug craving along with compulsive drug seeking
- Wide variety of drugs nicotine, alcohol and illicit and prescription drugs
- **Addiction is a brain disease** because it affects multiple brain circuits including
  - Reward & motivation
  - Learning & memory
  - Inhibitory control over behavior (i.e. judgement)
- Some people are more vulnerable than others
DRUG ADDICTION IS A COMPLEX ILLNESS

- Addiction is more than compulsive drug taking
  - Often produces far-reaching health and social consequences
    - Mental & physical illnesses related to a drug-abusing lifestyle
    - Toxic effects of the drugs themselves (or adulterants)
    - Dysfunctional behaviors and altered priorities affecting
      - Family
      - Workplace
      - Other aspects of a person’s life
Drug Abuse is a preventable behavior
&
Drug Addiction is a treatable disease
<table>
<thead>
<tr>
<th>JUST CAN’T SAY NO</th>
<th>ILLICIT SUBSTANCES OF NOTE</th>
<th>HOW TREATMENT WORKS</th>
<th>ODDS &amp; ENDS</th>
<th>PUBLIC HEALTH FOR $20</th>
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JUST CAN’T SAY NO

Why do drug-addicted persons keep using drugs?

Long-term drug use results in significant changes in brain function that can persist long after the individual stops using drugs.
The Reward Pathway and Addiction
Addiction

A state in which an organism engages in a compulsive behavior

- behavior is reinforcing (rewarding or pleasurable)

- loss of control in limiting intake
The Action of Heroin (Morphine)
Tolerance

A state in which an organism no longer responds to a drug.

- A higher dose is required to achieve the same effect.
Dependence

A state in which an organism functions normally only in the presence of a drug

- manifested as a physical disturbance when the drug is removed (withdrawal)
KEY IDEAS FOR THE BRAIN

• The brain is an organ comprised of nerve cells (neurons) which communicate through electricity and chemicals (neurotransmitters)

• Neurons are organized into systems that are responsible for different brain functions

• One of these systems is the reward system; it helps us to survive but can be hijacked by activities and substances leading to…

• Maladaptive behavior, addiction, tolerance and dependence
Positron Emission Tomography (PET)
Your Brain on Drugs
Your Brain After Drugs

Normal

Cocaine Abuser (10 days)

Cocaine Abuser (100 days)
Drugs Have Long-term Consequences
The Memory of Drugs

Front of Brain

Amygdala not lit up

Back of Brain

Nature Video

Cocaine Video

Amygdala activated
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ILLICIT SUBSTANCES OF NOTE

• Opioids
• Fentanyl
• Alcohol
• Marijuana
• Methamphetamine
• Cocaine
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13 PRINCIPLES OF EFFECTIVE DRUG TREATMENT
1. DRUG ADDICTION IS A CHRONIC BRAIN DISEASE THAT AFFECTS BEHAVIOR

Disruption in Brain Circuits Involved in Reward and Punishment

Control

Cocaine Abuser
THE RELAPSE RATES FOR DRUG ADDICTIONS ARE SIMILAR TO OTHER CHRONIC MEDICAL CONDITIONS

Percent of Patients Who Relapse

- Drug Dependence: 40 to 60%
- Type I Diabetes: 30 to 50%
- Hypertension: 50 to 70%
- Asthma: 50 to 70%

2. RECOVERY FROM DRUG ADDICTION REQUIRES EFFECTIVE TREATMENT FOLLOWED BY MANAGEMENT OF THE DISORDER OVER TIME

A Chronic Care Approach to Drug Treatment

- Screening and Brief Intervention
- Recovery/Chronic Care Management
- Initial Services
- Clinical Practices
- Assessment
- Therapeutic Interventions
- Sustain & Manage
- Behavioral Counseling and Medications

“Prescription” for Services
3. TREATMENT MUST LAST LONG ENOUGH TO PRODUCE STABLE BEHAVIORAL CHANGES

- Cocaine (Any Use)*
  - < 90 Days: 55
  - 90+ Days: 28

- UA+ (Any Drug)*
  - < 90 Days: 53
  - 90+ Days: 19

- Alcohol (Daily Use)*
  - < 90 Days: 15
  - 90+ Days: 9

- Any Jail*
  - < 90 Days: 54
  - 90+ Days: 24
4. ASSESSMENT IS THE FIRST STEP IN TREATMENT

• Nature & extent of drug problem
• Strengths:
  - Family support
  - Employment history
  - Motivation
• Threats to recovery:
  - Criminal behavior
  - Mental health
  - General health
  - Family influences
  - Employment
  - Homelessness
  - HIV/AIDS
5. Matching services to needs is critical for treatment to be successful.
6. **DRUG USE DURING TREATMENT SHOULD BE CAREFULLY MONITORED**

- Know that lapses can occur
- Conduct Urinalyses
- Provide *immediate* feedback
- Intensify treatment as needed
7. TREATMENT SHOULD TARGET FACTORS ASSOCIATED WITH CRIMINAL BEHAVIOR

- Criminal thinking
- Antisocial values
- Anger & hostility
- Problem solving skills
- Conflict resolution skills
- Attitudes toward school & work
- Mental health factors
- Family functioning
- Barriers to care
- Alcohol & drug problems
### INTERVENTIONS FOR DRUG ABUSING OFFENDERS

<table>
<thead>
<tr>
<th>NOT Effective</th>
<th>Effective</th>
<th>Promising</th>
<th>Research Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot Camp</td>
<td>Residential Substance Abuse Treatment</td>
<td>Drug Courts</td>
<td>Reentry Programming</td>
</tr>
<tr>
<td>Intensive Supervision</td>
<td>Cognitive Behavioral Treatment (CBT)</td>
<td>Diversion to Treatment</td>
<td>Serious Violent Offender Reentry Initiative (SVORI)</td>
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<tr>
<td>Generic Case Management</td>
<td>Contingency Management</td>
<td>Moral Reasoning</td>
<td>Strengths-Based Case Management</td>
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<td></td>
<td>Medications</td>
<td>Motivational Interviewing</td>
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8. TREATMENT PLANNING SHOULD INVOLVE TREATMENT & CRIMINAL JUSTICE PERSONNEL

- Public Health Approach
  - disease
  - treatment

- Public Safety Approach
  - illegal behavior
  - punish

- High Attrition
- High Recidivism
8. TREATMENT PLANNING SHOULD INVOLVE TREATMENT & CRIMINAL JUSTICE PERSONNEL
9. CONTINUITY OF CARE IS ESSENTIAL
9. CONTINUITY OF CARE IS ESSENTIAL

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Acute Intoxication and/or Withdrawal Potential</td>
</tr>
<tr>
<td>2</td>
<td>Biomedical Conditions and Complications</td>
</tr>
<tr>
<td>3</td>
<td>Emotional, Behavioral, or Cognitive Conditions and Complications</td>
</tr>
<tr>
<td>4</td>
<td>Readiness to Change</td>
</tr>
<tr>
<td>5</td>
<td>Relapse, Continued Use, or Continued Problem Potential</td>
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<tr>
<td>6</td>
<td>Recovery/Living Environment</td>
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</table>

ASAM's criteria uses six dimensions to create a holistic, biopsychosocial assessment of an individual to be used for service planning and treatment across all services and levels of care. The six dimensions are:
9. CONTINUITY OF CARE IS ESSENTIAL

REFLECTING A CONTINUUM OF CARE

Note:
Within the five broad levels of care (0-5, 1, 2, 3, 4), decimal numbers are used to further express gradations of intensity of services. The decimals listed here represent benchmarks along a continuum, meaning patients can move up or down in terms of intensity without necessarily being placed in a new benchmark level of care.
10. A BALANCE OF REWARDS AND SANCTIONS CAN ENCOURAGE PRO-SOCIAL BEHAVIOR AND TREATMENT PROGRESS

**Rewards**

- Reinforce positive behavior
- Use awards (non-monetary) to recognize progress
- “Catch people doing things right”

**Sanctions**

- Graduated
  - Consistent, prediction, fair
  - Treatment not a sanction!

Most likely to have desired effect the closer they follow the targeted behavior.
III. TREAT CO-EXISTING MENTAL DISORDERS IN AN INTEGRATED WAY

- Attention Deficit Disorder
- Bipolar Disorder
- Conduct Disorders
- Depression
- Post-Traumatic Stress Disorder

DRUG ABUSE
12. Medications are an important element of treatment

- Methadone
- Naltrexone
- Buprenorphine (Suboxone)
13. ASSESS FOR RISK REDUCTION AND TREATMENT NEEDS FOR HIV/AIDS, HEPATITIS C AND OTHER INFECTIOUS DISEASES

- Prison-based AIDS cases are 5 times as high as in the general population

- Disproportionate impact on the poor & substance abusers
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The graph illustrates the concept of excess supply and demand in a market. At the equilibrium price (EP), the quantity supplied (S) equals the quantity demanded (D), indicating no excess supply or demand. If the price is below the equilibrium (P1), there is excess demand, and if it is above (P2), there is excess supply.
STATE-FUNDED HEROIN CLINICS

- Denmark, Holland & Switzerland
- Reduced the number of days spent on crimes by 70%
- Increased the number of addicts who find permanent housing by 30%
- Reduced side abuse (drink 50% less; benzos by 70%)
- Suboxone/buprenorphine
The costs of other substance abuse services for methadone maintenance (~$14,000) were 2-7 times higher than costs of maintenance with other strategies, reflecting the regulated intensity of methadone-based care. The sum of all two-year health care costs did not substantially differ across maintenance treatment strategies because even though methadone maintenance treatment costs are higher, this maintenance strategy keeps more patients in treatment, and treatment retention has been found to be associated with a 50% reduction in the costs of other health care services among patients with opioid dependence.

Of note, the two-year health care costs for relapse patients are estimated to be nearly $40,000, suggesting that the additional health care costs for substance abuse treatment, with any form of treatment, will be entirely offset within the first two years by reductions in other health care costs.

When the impact of maintenance therapy on broader social costs was added to the calculations, maintenance therapy options produced significant overall cost savings. The two-year social costs associated with opioid dependence are estimated to be over $200,000. All versions of opioid dependence treatment therefore reduced social costs substantially compared to no treatment. Methadone maintenance therapy is projected to produce the lowest average total costs over a two-year period, a sum approximately $100,000 less, per patient, than would be expected without treatment.

### Table ES2. Two-year costs among 1,000 hypothetical patients treated for opioid dependence.

<table>
<thead>
<tr>
<th>Outcome/Cost</th>
<th>MMT</th>
<th>BMT</th>
<th>SUB/VIV Taper</th>
<th>SUB/Oral NTX Taper</th>
<th>Vivitrol Alone</th>
<th>Oral NTX Alone</th>
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<tr>
<td>Treatment outcome (per 1,000):</td>
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<tr>
<td>In treatment</td>
<td>630</td>
<td>523</td>
<td>550</td>
<td>500</td>
<td>416</td>
<td>277</td>
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<td>Relapsed</td>
<td>185</td>
<td>292</td>
<td>265</td>
<td>315</td>
<td>400</td>
<td>538</td>
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<td>Drug –free</td>
<td>177</td>
<td>176</td>
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<td>Cost ($, per patient):</td>
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<tr>
<td>Drug therapy</td>
<td>699</td>
<td>3,655</td>
<td>8,553</td>
<td>1,249</td>
<td>6,585</td>
<td>665</td>
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<td>Other SA services</td>
<td>14,017</td>
<td>7,043</td>
<td>4,146</td>
<td>4,297</td>
<td>2,985</td>
<td>2,446</td>
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<td>Other health care</td>
<td>23,926</td>
<td>25,993</td>
<td>25,454</td>
<td>26,441</td>
<td>28,109</td>
<td>30,844</td>
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<td>SUBTOTAL</td>
<td>38,642</td>
<td>36,691</td>
<td>38,153</td>
<td>31,988</td>
<td>37,679</td>
<td>33,954</td>
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<tr>
<td>Social costs</td>
<td>92,068</td>
<td>102,337</td>
<td>98,033</td>
<td>105,917</td>
<td>119,239</td>
<td>141,076</td>
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<tr>
<td>TOTAL</td>
<td>130,710</td>
<td>139,028</td>
<td>136,187</td>
<td>137,905</td>
<td>156,918</td>
<td>175,030</td>
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MMT: methadone maintenance treatment; BMT: buprenorphine maintenance treatment; NTX: naltrexone; SUB: Suboxone; VIV: Vivitrol
NALOXONE/NARCAN

- Pure opioid antagonist

- Naloxone (Narcan) and Evzio (injectable form) used to counter the effects of opioid overdose

- Reverses depression of the CNS respiratory centers and counters hypotension

- Naloxone combined with opioids taken by mouth to decrease risk of misuse if injected (Suboxone)
STANDING ORDERS OR OPIATE ABUSE/OVERDOSE

EMTs:

- Routine Patient Care
- For suspected overdose with severe respiratory depression, administer naloxone 1mg (1ml) per nostril via atomizer for a total of 2mg.

Advanced EMTs:

- For severe respiratory depression administer naloxone 0.4–2mg IV/IM/IO/SQ/intranasal
- Establish IV access
- If no response, may repeat initial dose every 5 minutes for a total of 10mg

Paramedics:

- Beta blockers and Ca Channel Blockers for severe bradycardia
NALTREXONE/VIVITROL

• Opioid antagonist with less binding capacity than naloxone

• Used primarily in the management of alcohol & opioid dependence

• Also used for tobacco dependence, self-injurious behavior and various other addictions

• SHOULD NOT BE CONFUSED WITH NALOXONE IN CASES OF EMERGENCY OPIOID OVERDOSE
Adopted from Munetz & Griffin, Psychiatric Services, 2006
Drug Abuse is a preventable behavior

&

Drug Addiction is a treatable disease
Public Health as a Practical System

Use current knowledge for maximum impact

[Icons representing various aspects related to public health and systems]

Politics
Population Health

Experience of Care

Per Capita Cost

The IHI Triple Aim
Q & A
Q & A

“Progress might have been alright once, but it’s gone on for too long.”

–Ogden Nash

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