Addiction is a Brain Disease

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Back to the Future

AN INQUIRY
INTO THE
Effects of Ardent Spirits
UPON THE
HUMAN BODY AND MIND,
WITH AN
Account of the Means of preventing,
AND OF THE
REMEDIES FOR CURING THEM.

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This evil is confined to no class or occupation. It numbers among its victims some of the best women and men of all classes. Prompt action is then demanded, lest our land should become... stupefied by the direful effects of narcotics and thus diseased physically, mentally, and morally, the love of liberty swallowed up by the love of opium, whilst the masses of our people would become fit subjects for a despot.

—Dr. W. G. Rogers, writing in The Daily Dispatch (Richmond, VA), January 25, 1884
American Society of Addiction Medicine
2011 Public Policy Statement

• 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

• Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment, addiction is progressive and can result in disability or premature death.
ADDITION IS A DISEASE OF THE BRAIN as other diseases it affects the tissue function

Decreased Brain Metabolism in Drug Abuse Patient

Control

Cocaine Abuser

Decreased Heart Metabolism in Heart Disease Patient

Healthy Heart

Diseased Heart

Sources: From the laboratories of Drs. N. Volkow and H. Schelbert
The brain is modified by the drug in such a way that absence of the drug makes a signal to their brain that is equivalent to the signal of starving. It is as if the individual was in a state of deprivation, where taking the drug is indispensable for survival.”
Brain’s Survival Reward Pathway

- Eating, Hydrating, Attaching
- Drives us toward survival with a reward
- Reward is dopamine (DA)
- Brain learns to do automatically
- Little consistently gets in the way
- Consequences outweighed by reward
Dopamine – Reward of Pleasure
Glutamate – Drug Seeking, Drug Memory

Non Addicted Brain

- Control
- Reward
- Drive
- Memory

Addicted Brain

- Control
- Reward
- Drive
- Memory

VTA Dopamine Cell Before LTP

- NMDA Receptors
- AMPA Receptors
- Currents
- Released Dopamine

VTA Dopamine Cell With LTP

- NMDA Receptors
- AMPA Receptors
- Currents
- Released Dopamine
Stress Hormone and Withdrawal

CNS Actions of Corticotropin-Releasing Factor (CRF)

Withdrawal Symptoms

Psychological
- Anxiety
- Restlessness
- Irritability
- Insomnia
- Headaches
- Poor concentration
- Depression
- Social isolation

Physical
- Sweating
- Heart Palpitations
- Muscle tension
- Tightness in the chest
- Difficulty breathing
- Tremors
- Nausea
- Vomiting, or diarrhea
Chronic Use: Hedonic Homeostatic Dysregulation

Hedonic Set Point is Altered with Chronic Drug Use

“Feel good”  Normal Affective Response to Drugs/Alcohol

“Feel bad”  Altered Dysregulated Set-Point following chronic drug use

Initially use to get high…
Now use to “get normal”
The Disease Deepens As Time Goes On
Dopamine D2 Receptors Are Lower in Addiction

Obese

Control
ABCDE of Addiction

- Abstaining – inability to consistently abstain
- Behavioral control impaired
- Craving like you need it to survive
- Diminished consequence recognition
- Emotional dysfunctional response
Biological

Physiologic tolerance develops to the high but not to the low
Psychological

- Do behaviors not like you to get substance
  - Perfect manipulation /lying
- Only aware of the substance
- Lose ability to tolerate feelings
- Increased anxiety sensitivity to stressors
- Pursue rewards/relief despite consequences
  - Brake is not consistently working
- SHAME, SHAME, SHAME
Social

- Exclusion
- Not reliable or trustworthy while using
- Social network connected by the substance
- Chaotic and unstable
  - Housing
  - Income
  - Relationships
- Increased Legal Involvement
- Lose social skills - Do not keep up with peers
Spiritual

• Focus is moment to moment survival
• External connections lose importance
• Self – Centered
• Disconnected from life
• Lose values
• Hate their place in the world
Adolescent Stage of Brain Development

Adopted child with bio-parent who did not raise with SUD doubles risk

Adopted child with adoptive sibling with whom no genetics are shared having SUD doubles the adopted child’s risk
Genetics

As a group, subjects with low receptor levels found MP pleasant while those with high levels found MP unpleasant.

Adapted from Volter et al., Am. J. Psychiatry, 1999.
Environment

- Stress can turn on genes
- Adverse childhood events (ACEs) – 5 or > Aces =10 x risk for SUD
- Modeling use and not modeling healthy coping skill development
- Peers
- Drug availability
- Community Attitude
- Low Expectations
- Low Opportunity
Developmental Disease - Begins in Adolescence
Other Brain Diseases Increase Risk

- “Self Medication”
- Causal – increase vulnerability to other mental illnesses
- Common causes and risk factors
Addiction Increases Risk for Addiction

Nearly all people who used heroin also used at least 1 other drug.

Most used at least 3 other drugs.

Heroin is a highly addictive opioid drug with a high risk of overdose and death for users.

People who are addicted to...

- Alcohol: 2x
- Marijuana: 3x
- Cocaine: 15x
- Rx Opioid Painkillers: 40x

...more likely to be addicted to heroin.

2016 Substance Use Disorder (SUD = Addiction) – in US

- No Past Year Substance Use Disorder: 249.3 Million People (92.5%)
- Past Year Substance Use Disorder: 20.1 Million People (7.5%)

- Alcohol: 15.1 Million
- Illicit Drugs: 7.4 Million
- Marijuana: 4.0 Million
- Misuse of Prescription Pain Relievers: 1.8 Million
- Cocaine: 0.9 Million
- Methamphetamine: 0.7 Million
- Heroin: 0.6 Million
- Misuse of Prescription Stimulants: 0.5 Million

Source: https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR1-2016/NSDUH-FFR1-2016.htm
Past Year Alcohol Dependence or Abuse Among Individuals Aged 12 or Older in Maine and the United States (2010–2011 to 2013–2014)

Maine’s percentage of alcohol dependence or abuse among individuals aged 12 or older was similar to the national percentage in 2013–2014.

- Maine: 5.7%
- United States: 2.6%

Past Year Illicit Drug Dependence or Abuse Among Individuals Aged 12 or Older in Maine and the United States (2010–2011 to 2013–2014)

Maine’s percentage of illicit drug dependence or abuse among individuals aged 12 or older was similar to the national percentage in 2013–2014.

- Maine: 2.6%
- United States: 2.6%
Figure 4. Age-adjusted drug overdose death rates, by state: United States, 2015

Total U.S. Drug Deaths

More than 72,000 Americans died from drug overdoses in 2017


Drug deaths in Maine
The number of overdose deaths hit a record 418 in 2017. Opioids, both illicit and prescription, were responsible for the vast majority of fatal overdoses. In many cases, more than one drug was listed as a cause of death or significant contributing factor.
Surgeon General Report
Evidenced Based Interventions

• Children Under Age 10
  • 7 Programs

• Youth 10 to 18
  • 18 Programs

• Age 18 +
  • 7 programs

• Community Implementation Systems/Coalition Models and Environmental Interventions
  • 10 Programs

As discussed in our three chapters, the misuse of alcohol and drugs and substance use disorders has a huge impact on public health in the United States. In 2014, over 45,000 people died from a drug overdose, more than in any previous year on record and alcohol misuse accounts for about 88,000 deaths in the United States each year including 1 in 3 total deaths among working-age adults. The yearly economic impact of alcohol misuse and alcohol use disorders is estimated at $249 billion ($2.01 per drink) in 2010 and the impact of illicit drug use and drug use disorders is estimated at $333 billion—figures that include both direct and indirect costs related to crime, health, and lost productivity. Over half of these alcohol-related deaths and three-quarters of the alcohol-related economic costs were due to binge drinking. In addition, alcohol is involved in about 20 percent of the overdose deaths related to prescription opioid pain relievers.

Substance misuse is also associated with a wide range of health and social problems, including heart disease, stroke, high blood pressure, various cancers (e.g., breast cancer), mental disorders, neurodevelopmental abnormalities, and viral infections (e.g., human immunodeficiency virus (HIV), hepatitis B and C, and sexually transmitted infections). Substance misuse is a major public health problem that affects individuals, families, communities, and society at large. It is a complex and chronic disease that requires a comprehensive approach to prevention, treatment, and recovery support. This chapter will provide an overview of the evidence-based prevention and treatment options available, as well as the role of public health and policy in addressing these issues.

For more on this topic, see Chapter 7: Preventing, Treating, and Managing Substance Use Disorders.
Increase Protective Factors
Decrease Modifiable Risk Factors

- Reduce ACEs
- Instill Sense of Purpose
- High Expectations
- High Opportunities
- Teach Coping Skills
- Change Culture of Comfort
Effectiveness of a Selective, Personality-Targeted Prevention Program for Adolescent Alcohol Use and Misuse: A Cluster Randomized Controlled Trial
Patricia J. Conrod, PhD;

29% reduced odds of drinking

**Personality-Targeted Interventions:**
Conrod et al., *Psych Addictive Beh*, 2000

- Psychoeducational Component
- Motivational Component
  - Motivational interviewing techniques
  - Goal setting exercises (for prevention trials; Conrod et al., 2010)
- Cognitive-Behavioral Component
  - Personality-specific cognitive distortions
  - Anxiety sensitivity:
    - 
  - Hopeless:
  - 
  - Impulsive:
    - Response inhibition "stop", "focus", "choose" (Kendell & Braswell, 1985)
  - Negative attribution biases
- Sensation seeking:
  - thought challenging for boredom & need for stimulation
  - Reward sensitivity

**PERSONALITY TRAITS**
- Impulsivity
- Sensation Seeking
- Hopelessness
- Anxiety Sensitivity

**DISINHIBITED TRAITS**

**INHIBITED / NEUROTIC TRAITS**
Responding to the Heroin Epidemic

PREVENT People From Starting Heroin
Reduce prescription opioid painkiller abuse.
Improve opioid painkiller prescribing practices and identify high-risk individuals early.

REDUCE Heroin Addiction
Ensure access to Medication-Assisted Treatment (MAT).
Treat people addicted to heroin or prescription opioid painkillers with MAT which combines the use of medications (methadone, buprenorphine, or naltrexone) with counseling and behavioral therapies.

REVERSE Heroin Overdose
Expand the use of naloxone.
Use naloxone, a life-saving drug that can reverse the effects of an opioid overdose when administered in time.

Opioid Agonist Treatments Decreased Heroin Overdose Deaths

Baltimore, Maryland, 1995-2009

1. Biopsychosocialspiritual
2. No same brain
3. No same environment
4. No same path
5. Stay with recovery plan
6. Treat other brain disorders
7. Does not need to be voluntary
8. Rock bottom is not necessary
Continuum of Care – Chronic Illness Treatment

- Brief education/intervention
- Risky use counseling (“pre diabetes”)
- Outpatient counseling
- Medication assisted treatment
- Intensive outpatient
- Partial hospitalization
- Hospitalization
- Intensive long term care
Chronic Care

- Combines:
  1. Self-management
  2. Social support
  3. Professional care

- Must be monitored and managed over time
  1. Decrease the frequency and intensity of relapses
  2. Optimize functioning during periods of remission
Medications cannot take the place of an individual’s willpower, but they aid addicted individuals in resisting the constant challenges to their resolve.”

—DR. NORA VOLKOW
Figure 1
How OUD Medications Work in the Brain

- Methadone: Full agonist, generates effect
- Buprenorphine: Partial agonist, generates limited effect
- Naltrexone: Antagonist, blocks effect

![Graph showing Opioid Effect vs Log Dose]

- Full Agonist (Methadone)
- Partial Agonist (Buprenorphine)
- Antagonist (Naloxone)
Methadone and Buprenorphine are Medicines

- Monitored RX
- Suppresses the euphoric effects of other opioids
- Blocks withdrawal
- Allows patients to:
  - Hold jobs
  - Avoid street crime and violence
  - Reduce their exposure to HIV/Hepatitis
  - Engage in counseling/essential interventions
  - Find wellness and recovery
    - Care for biopsychosocialspiritual health
    - Stable housing
    - Strong community connectedness
    - Healthy purpose
How Long on MAR? As Long as Needed

42 month follow up
- 375 Patients followed
- 61% were abstinent from illicit opioids, including 29% on buprenorphine-naloxone


- Tapering unlikely to be effective until 4 pillars of recovery are firmly in place
  - Health, Community, Housing, Purpose
Outcomes

- 33% remission
- 30-40% substantial improvement
- 20-30% little to no improvement

Outcome challenges

- Done on those with most severe illnesses
- Disease is undiagnosed most of the time
- Recovery is a social secret
Outcomes - good as other chronic diseases

Addiction Treatment Does Work

Percent of Patients Who Relapse

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

If you stop your treatment plan, addiction returns – just like other chronic diseases.
Some features of the brain may recover.

Figure 2. Partial Recovery of Brain Dopamine Transporters in Methamphetamine (METH) Abuser After Protracted Abstinence

ADDICTION RECOVERY > 10 years

- 93% vote vs 58% of the public
- 89% volunteer vs 25% of the public
- 93% take care of their health
- 96% participate in family activities
- 89% are steadily employed
- 94% get positive job evaluations
- 88% have furthered their education
- 39% have own their business.
Penobscot Community Health Care offers Medication Assisted Treatment (MAT) integrated with psychotherapy and social work support services at our health centers in Old Town, Bangor, Brewer, Belfast.

To learn more
Please call (207) 404-8000 or go to www.pchc.com/recovery

To request a prescription for Naloxone (Narcan) for yourself or a loved one
Please call 207-404-8000 ext 2232 or 1157