The Science of Addiction: What Clergy Need to Know

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SUD Definition

• ASAM defines SUD as primary chronic brain disorder with genetic, psychosocial and environmental factors influencing its course

• Chronic relapsing disease characterized by impaired control, preoccupation with use, use despite adverse consequences, and distorted thinking, most notably denial
Three of the following:

• Tolerance
• Withdrawal
• Substance taken in larger quantity than intended
• Persistent desire to cut down or control use
• Time spent in obtaining, using, or recovering from the substance
• Social, occupational activities given up
• Continued use despite recognized physical and psychological problems
DSM-IV-Abuse

One or more of the following and dependence criteria not met

• Recurrent use leading to failure to fulfill major role obligations at work, school, or home

• Use that puts individual in danger

• Legal problems related to use

• Continued use despite social and interpersonal consequences
NIAAA Risk Categories

- “Standard drink” – 12 g of ETOH (12 oz beer, 5 oz wine, 1.5 oz 80 proof distilled spirit)
- Moderate – low risk:
  Women: 1 drink/day
  Men: 2 drinks < age 65, 1 drink > age 65
- Heavy – at risk:
  Women > 7 drinks/week or 3 per episode
  Men > 14 drinks/week or 4 per occasion
- Binge – Women > 4, men > 5 in a row
Biopsychosocial Model

- Biological/Neurological - genetics
- Psychological – psychiatric disorders, self medication, learned behavior
- Social - family, relationships, environment
Addiction is a PRIMARY Neurologic Disease

Neurologic=Brain and spinal cord

PRIMARY=not due to something else (anxiety, depression, ADD/ADHD, Bipolar Disorder)

Sometimes difficult to differentiate Primary vs. Substance induced (secondary) Psychiatric disorder

Take Home Message

- Addiction is a PRIMARY Neurologic Disease
Primary Neurologic Disorder

- Example-Parkinson’s Disease – Michael J. Fox is spokesperson
- Both addiction and Parkinson’s are diseases of dopamine deficiency
Why is This Important?

- Scientific explanation for irrational behavior in an otherwise rational person
- Helps in developing new strategies for behavioral and pharmacological treatments
- Answers the big question: What is addiction? Disease, self inflicted vice, moral/emotional weakness, lack of will power?
- Helps reduce stigma, shame, guilt and anger experienced by patient and family
Reluctance to Accept Disease Model of Addiction

• Appears to involve behaviors of choice
• Other behavior disorders with irrational compulsive behavior:
  • OCD
  • Tourette's
  • Eating Disorders
• Similar areas of the brain are disrupted
How Common are Substance Disorders?

- 85-90% of adult US population uses alcohol or other mood altering chemicals at any one time
- What percent have a substance use disorder?
  10-12%
- What makes these 10-12% different (why me)?
Different Cultures

- Asian population  1- 3%
- US population       10-12%
- Native American  50- 80%

- Why such large differences??
Genetics

FAMILY STUDIES

- Children of Alcoholics are 3-4 times more likely to be alcoholic than the general population
Genetics

ADOPTION STUDIES

• Biological children of alcoholics have a much higher risk of alcoholism REGARDLESS of WHO PARENTS THEM

• Studies involved monozygotic twins separated at birth- same results by age 30
Genetics

MESSAGE from Adoption Studies

• YOU CAN’T “OUTPARENT” A GENETIC ALCOHOLIC

• Bad parenting does not cause alcoholism/addiction and good/great parenting can’t fix it.
Genetic Predisposition

- Accounts for 50-60% of vulnerability for addiction
- Higher vulnerability than other family related illnesses
- DM II
- Hypertension
- Breast cancer
Alcoholics Have Pre-existing Abnormalities

- EEG studies
  -- EEG shows P300 decreased in alcohol-naïve sons of alcoholics
  -- Decrease in theta waves prior to first drink.

The brain is different before the first drink.
Alcoholics are born different

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The brain is different before the first drink.
Pre-Morbid Differences

• Euphoria - First time drinkers report of intensity of euphoria

• FHP report MUCH greater euphoria with alcohol exposure than FHN (family history negative)
Pre-Morbid Differences

• First time drinkers report of negative effects of acute alcohol exposure

• FHP report less negative effects than FHN
  --less body sway
  --less nausea
  --less disorientation
  --better cognitive abilities and physical performance such as driving tests
  --WEAKER WARNING SYSTEM
A decrease in endogenous neurotransmitters leads to a sense of incompleteness, decreased pain tolerance, uneasiness, and anxiety. Since 85-90% of the US population is exposed to alcohol or drugs during their lifetime, the person genetically predisposed to addiction is very likely to find what replaces or “fixes” their ‘reward deficiency’.
Pre-Morbid Difference

• PET Scans demonstrate compromised dopamine D2 receptor activity
• Lack of dopamine activity increases risk
• PET Scans reveal low D2 receptors in obese patients – inverse relation to BMI
Relapse and Conditioning

- Repeated alcohol use has caused "conditioning" to occur in related circuits.
- Now "cues" associated with alcohol use can activate the reward and withdrawal circuit.
- This can evoke anticipation of alcohol or feelings similar to withdrawal that can precipitate relapse in an abstinent patient.

Reward Circuits

- Limbic region rewards life sustaining behaviors with a spike in dopamine
- Food
- Liquid
- Procreation
- Shelter
- Brain registers these activities so we will repeat them
Limbic Region

- Pleasurable life sustaining activities increase DA in the limbic region
- Alcohol and Drugs increase DA 3-5 times that of normal rewarding behaviors
Why Do We Use Drugs?

BRAIN REWARD PATHWAY

- Food
- Water
- Sex
- Child Rearing
- DRUG of CHOICE
Neuroadaptation

• Repeated exposure causes a blunted response to everyday activities
• Normal pleasures (food, sex, relationships) can not compete – lose relative value
• Normal drives hierarchy is disrupted and replaced with new priorities concerned with obtaining and using drugs
Neurochemistry of Addiction

Neuroadaptation

- 2 changes occur once a drug is abused and these are permanent = ‘neuroadaptation’.

- 10 8
Dopamine deprivation produces chronic unpleasant feelings, depression and a loss of motivation, which leads to the urge/need to take the drug to feel better.
Memory and Control Circuits

As the reward circuits become blunted the addict also loses ability to curb the need to seek and use drugs.

Memory of the drug becomes more powerful than the drug itself.

Frontal brain regions required to exert inhibitory control over desires and emotions are affected.
Conditioned Learning

• Pavlov’s Dog
• Experiences a learned or conditioned response to the substance and starts to anchor the drug use with the associated activity/environment
• These triggers or cues increase DA and glutamate and increase cravings and withdrawal symptoms
• These memories and responses become hardwired or implanted into the brain
  – Long Term potentiation, Emotional Memory Formation, Synaptic Plasticity
Pathological Learning

- 1\textsuperscript{st} STAGE
- Occasional use becomes chronic and uncontrolled secondary to the disregulation of the brain’s reward system
- Increase in dopamine in the ventral striatal or nucleus accumbens
Pathological Learning

- 2nd STAGE
- Withdrawal
- Persistent risk of relapse
- Alterations in decision making and other cognitive processes
**Synaptic Plasticity**

- Drugs induce alterations in signals carried by glutamate from the prefrontal cortex to the Nac (region involved with judgment and control) – Glutamate also involved in OCD
- Drugs can reshape neuropathways which may account for the formation and persistence of drug stimulus associations
- Drugs also impair ability to learn new behaviors required for sobriety
Prefrontal Cortex (PFC)

- Hypofrontality
- Top down failure
- Unhealthy PFC unable to choose less dominant but healthier behaviors
- Emotional memory of drug use over powers the rational memory regarding consequences
- Weakened braking system
Orbitofrontal Cortex

• Addiction also involves disruption of circuits involving compulsive behavior and drive
• Intermittent dopamine release results in OFC dysfunction via the striato-thalamo-orbitofrontal circuit
• Hyperactivity in the OFC associated with craving
• Pathology in the OFC has been observed in patients with OCD, Tourette’s Syndrome, impulsivity – Glutamate also involved in these disorders
Relapse and Conditioning

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Brain Development

• Adolescents and emerging adult’s brains are still developing in areas involved with judgment, risk taking, immediate gratification
• Just when they are more likely to be exposed to drugs is when their brain is more susceptible
Epigenetic Changes

• Stress and drug exposure can cause lasting changes to genes and their function which can result in long-term changes to brain circuits
• Genes may increase vulnerability or mitigate the effect of the environment
Dysregulation

• Continued use leads to changes (adaptations)
• These changes reach a threshold
• This leads to compulsive use with impaired control
• Type I alcoholic
• Type II alcoholic
Stress: The Anti-reward System

- Stress increases Corticotrophin Releasing Factor (CRF)
- CRF causes increase in DA and glutamate in the addict’s limbic region
- Elevated CRF increases craving and relapse
- CRF interaction with DA resets hedonic set point
- CRF is activated for several months after withdrawal (PAWS)
- Early Childhood Trauma changes brain’s response to stress and increases vulnerability for addiction later in life
Addiction: Effects On Learning

• The brain circuits involved in declarative memory ("knowing what") are distinct from those involved in non-declarative or procedural ("knowing how") memory.

• Procedural learning is rigid, life-long and partially unconscious.

• Addiction stereotypes important procurement skills through Procedural Learning.
Addiction and Procedural Learning

• Dopamine and frontal activation primes the striatum and basal ganglia to record behaviors that result in drug procurement.
• Repeated use over years perfects alcohol and drug procurement.
• When stimulated by related cues, automatic and partially automatic relapse behaviors ensue.
• Like all procedural learning, the knowledge is automated, rigid, life-long and partially unconscious.
Addict Brain Circuits

- Activation of neural circuits that produce compulsion (or “wanting”).

- Hijacking motivation, focusing on drug procurement and use at the expense of other basic drives.

- Production of repetitive automatic behaviors that ensure continued use.
Denial

• DENIAL - reengineers the conscious interpretation of reality to ensure addiction runs in stealth mode.
• Insight deficient
• VTA & Nac, Prefrontal Cortex, Hippocampus
• Brain is hardwired for denial – Addiction hijacks denial system
• Interferes with seeking treatment and leads to relapse
Treatment

• DENIAL
  – patient and family members
• MET, MI,
• Al-Anon
• Allow patient to experience consequences
Avoid Spikes in DA

• Avoid situations that cause spikes in DA
• Relapse Prevention Therapy – avoid triggers and cues – people, places and things
• External Cues: cash, Friday night, using buddy
• Internal Cues: loneliness, celebration, anger
• Smoking Cessation
Stress

- Learn new ways to handle and manage stress
- CBT
- Relaxation Therapy
- Yoga
- Meditation
- Prayer
- Coping Strategies
- Exercise
- Medications
Allow Brain to Heal

• Time without DA spikes allows brain to heal
• Hypofrontality resolves – regains control over behavior and choice
• Hedonic set point returns to baseline – normal pleasures become pleasurable again
• Mood, energy and sleep improve
Addiction as a Chronically Remitting and Relapsing Disease

Highest risk of relapse is 1\textsuperscript{st} 12-18 months

People, Places, and things - the Amygdala and cravings
--Pet Scans and Crack addicts
--Champagne glasses and orange juice
--O'Doul's
Summary

• Addiction is a primary chronic brain disorder
• Addiction affects the brain’s reward circuitry (RDS)
• Addiction affects brain circuits involving memory, impulse control, and judgment resulting in nonsensical pursuit of “rewards”
• Addiction is NOT a choice
• Addiction must be treated as a chronic disease similar to HTN, diabetes, asthma, CAD, OCD
Early Stages: Living and Abusing

- Self-diagnosing, self-medicating
- Use of another person’s prescription medication
- Growing preoccupation with alcohol/drug use
- Growing need for a drink in times of stress
- Uncomfortable in situation without alcohol
- Drinks before or after social occasions
- Hides and protects alcohol/drug supply
- Growing tolerance to a substance
- Projects blame for drinking/use on to others
Middle Stage: Living to Abuse

- Use of drugs that can cause harm or injury to the abuser and other people
- Tries to control drinking/drug use by forced abstinence
- Binge drinking
- Drinking/using alone
- Grandiose or aggressive behavior
- Job, family or legal problems
- Guilt about behavior when drinking or using drugs
Late Stage: Abusing to Live

- Tremors and/or shakes
- Impaired thinking
- Early morning drinking
- Physical health deteriorates
- Loss of family and friends
- May be unable to work
- Hospitalizations
Chronic Stage

Life threatening problems are evident. If the disease is not arrested at this stage, it can be fatal through accidents, medical illnesses related to use, accidental overdoses and suicides.
Stages of Change

- Precontemplation
- Contemplation
- Preparation
- Action
- Maintenance
- Relapse
Stages of Change

• Precontemplation (Not yet acknowledging that there is a problem behavior that needs to be changed)
• Contemplation (Acknowledging that there is a problem but not yet ready or sure of wanting to make a change)
• Preparation/Determination (Getting ready to change)
• Action/Willpower (Changing behavior)
• Maintenance (Maintaining the behavior change)
• Relapse (Returning to older behaviors and abandoning the new changes)
Enabling

- Family member’s behavior that allow individuals with a SUD to avoid consequences of their behavior
- Making excuses
- Covering for them
- Bailing out of legal consequences
- Defending
- Ignoring destructive behavior
ETOH Withdrawal

- Usually present within 6 hours
- May develop with high BAL
- Peak 24-36 hours
- Insomnia
- Tremulousness
- Mild anxiety
- GI symptoms
- Diaphoresis
- Palpitations
- Hyper DTR’s
Seizures

- Generalized tonic-clonic convulsions
- Usually occur within 12-48 hours
- Seizures occurring after 48 hours or with focal neurological deficits, CHI require imaging
- Usually singular or brief flurry
- Recurrent, prolonged or status epilepticus require imaging
- Benzodiazepines or phenobarbital may be used for status
- Phenytoin is ineffective
- Long term anticonvulsant not recommended
Delirium Tremens

- Approximately 5% may have DT’s
- Onset is usually 2-4 days
- Frequently precipitated by other illnesses
- 80% resolve within 72 hours
- 5% may die
- Hallucinations, disorientation, tachycardia, hypertension, fever, agitation, diaphoresis, waxing and waning
Opiate Withdrawal

Time course depends on $1/2$ life of drug

- Heroin, short acting narcotics:
  - Begins within 3-5 hours after last use
  - Typically peaks at day 3
  - Greatly reduced by day 5 and disappearing in 7-10 days

- Methadone:
  - Begins within 2-4 days, peaks at day 7-10 and resolves in 2-3 weeks
8 -10 hours:
• Tearing
• Runny nose
• Yawning
• Sweating
12 - 14 hours:

• Restless sleep
• Dilated pupils
• Gooseflesh
• Tremor
48-72 hours:

- Insomnia
- GI symptoms – N/V, cramping, diarrhea
- Chills
- Muscle aches or spasm
- Jerks or twitches
- Ejaculation
- Fatigue
Cocaine

• May experience anxiety, panic attacks or psychosis, repetitive behaviors
• Tachycardia, pupil dilation, diaphoresis
Cocaine Withdrawal

- Depression, fatigue, anxiety, anhedonia, poor focus, increased appetite, increased sleep, increased dreaming
- Duration – 2-5 days
Cannabinoids

- Pulmonary – 3 times the tar and 50% more carcinogens than tobacco
- Possible lung cancer
- Poor memory, attention, executive functioning, psychomotor speed (no evidence for long term effects)
- Reduced volume of hippocampus and amygdala
- Psychosis- onset occurred significantly earlier with use
- Reproductive- low testosterone, lower sperm count and motility, lower libido, increase prolactin in women
Withdrawal

- Possible anxiety, irritability, tachycardia
Synthetic Cannabinoids

- Spice
- K2
Glues, Solvents, Aerosols

- Respiratory depression
- Cardiac arrhythmias
- Suffocation
- Sudden death
Hallucinogens

• Psychosis
• Anxiety, panic, palpitations, elevated blood pressure
• Serotonin syndrome
Designer Drugs

- MDMA (methyleneoxymethamphetamine-Ecstasy: psychosis, reduced serotonin neurons, hyperthermia, hypertension, hyponatremia

- Bath Salts – synthetic stimulants MDPV (methyleneoxypyrovalerone), mephedrone, methylone)
PCP/ketamine

- Dissociative effects
- Psychosis
- Hyperthermia
- Seizures
- Agitation
Methamphetamine

- Crank, speed, meth, crystal meth
- Similar complications as other stimulants
Post Acute Withdrawal

• Post acute withdrawal- 6 to 18 months to go from 1 back to 8 (never a 10). However, 8 feels like a 10 with a program of recovery. This includes on-going participation in 12 step program, CBT, exercise and good nutrition.

• 12 Step programs function like CBT; CBT has been shown to create new synapse formation. Thus a program of recovery literally ‘re-wires’ the brain.

• Practicing a program of Recovery IS the treatment!
PAWS Symptoms

- Poor short term memory and short attention span
- Exaggerated startle reflex
- Dysphoria
- Inability to solve simple problems/abstract reasoning impaired
- Rigid and repetitive thinking
- Sleep disturbances
- Stress sensitivity

Last 12-18 months after discontinuation of drug use and can look very much like ADD
Co-occurring Disorders

• 50-75 % will have a co-occurring mental health disorder
• Higher risk for relapse
• Higher risk for suicide
• Less compliant
• Worse outcomes
Pharmacological Therapy

- Naltrexone
- Vivitrol (IM injection)
- Acamprosate (Campral)
- Topiramate (Topamax)
- Baclofen
- Methadone
- Suboxone
- Disulfiram (Antabuse)
Screening

- CAGE
- AUDIT (Alcohol Use Disorder identification Test) World health Organization
- AUDIT - C
- Single question: “How many times in the past year have you had 5 (M) or 4(F) in a day”
- MAST
- T-ACE – pregnancy
- CUGE, CRAFFFT – adolescents, college
CAGE

- Cut down
- Annoyed
- Guilty
- Eye Opener
### AUDIT-C

#### Question #1: How often did you have a drink containing alcohol in the past year?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0</td>
</tr>
<tr>
<td>Monthly or less</td>
<td>1</td>
</tr>
<tr>
<td>Two to four times a month</td>
<td>2</td>
</tr>
<tr>
<td>Two to three times per week</td>
<td>3</td>
</tr>
<tr>
<td>Four or more times a week</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Question #2: How many drinks did you have on a typical day when you were drinking in the past year?

<table>
<thead>
<tr>
<th>Number of drinks</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 or 2</td>
<td>0</td>
</tr>
<tr>
<td>3 or 4</td>
<td>1</td>
</tr>
<tr>
<td>5 or 6</td>
<td>2</td>
</tr>
<tr>
<td>7 to 9</td>
<td>3</td>
</tr>
<tr>
<td>10 or more</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Question #3: How often did you have five or more drinks on one occasion in the past year?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0</td>
</tr>
<tr>
<td>Less than monthly</td>
<td>1</td>
</tr>
<tr>
<td>Monthly</td>
<td>2</td>
</tr>
<tr>
<td>Weekly</td>
<td>3</td>
</tr>
<tr>
<td>Daily or almost daily</td>
<td>4</td>
</tr>
</tbody>
</table>

The AUDIT-C is scored on a scale of 0-12 (scores of 0 reflect no alcohol use). In men, a score of 4 or more is considered positive; in women, a score of 3 or more is considered positive.
CRAFFT

- C(ar) – Have you ever ridden in a car driven by someone (including yourself) who was "high" or had been using alcohol or drugs?
- R(elax) – Do you ever use alcohol or drugs to relax, feel better about yourself, or fit in?
- A(lone) – Do you ever use alcohol or drugs while you are by yourself, alone?
- F(orget) – Do you ever forget things you did while using alcohol or drugs?
- F riends) – Do your family or friends ever tell you that you should cut down on your drinking or drug use?
- T(rouble) – Have you ever gotten into trouble while you were using alcohol or drugs?
Treatment Intervention

- Be aware of counter-transference
- Nonjudgmental approach
- Disease model
- Tie in addiction with presenting complaints (sleep, HTN, depression, GI symptoms)
- Explain how addiction accounts for symptoms, PE, labs
- Explain it will difficult to treat problems adequately until they stop using
- Suggest 2 drinks in 24 hour period
- Suggest they attend a 12 step meeting
- Continue to confront in follow up visits
- Educate family
Family Involvement

- Al-Anon
- Discuss enabling
- Educate family on disease of addiction and their role
- Formal intervention
Treatment Options

- 12 step program (AA, NA)
- Celebrate Recovery
- CBT
- Motivational Interviewing
- MET
- Individual therapy
- Intensive outpatient therapy
- Residential therapy
- Half way house
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