

North America's Opioid Crisis Death from Above

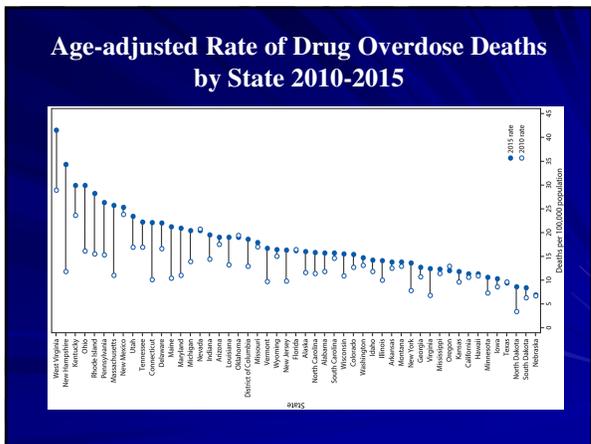
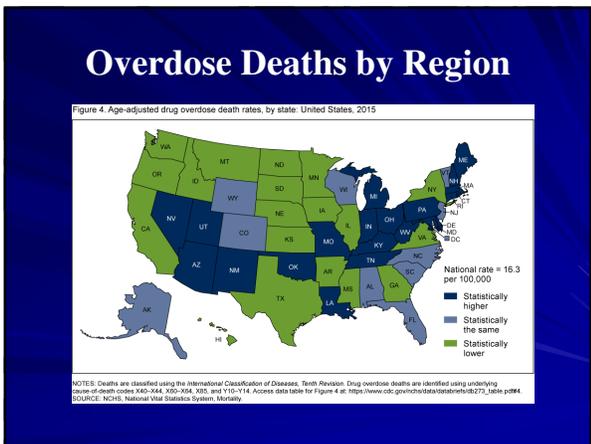
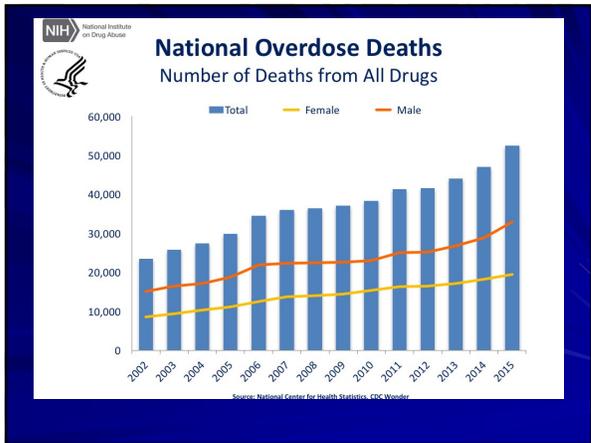
New Jersey Dental Society of Anesthesia
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Objectives

- Statistics
- Where are these drugs coming from?
 - ☞ Global drug trafficking
- Why do people take drugs?
 - ☞ Understanding addiction & treatment
 - ☞ Chronic pain management
- What does this mean to us as clinicians?
- The 'fentanyl crisis'
- Other street drugs

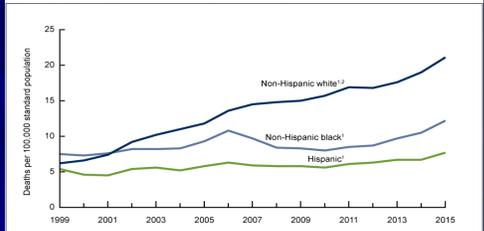
Drug & Opioid Overdose Deaths United States 2000-2014

- 2011: 41,340
- 2012: 41,502
- 2013: 43,982
- 2014: 47,055
- 2015: 52,404
- 2016: ?



Overdose Deaths by Race

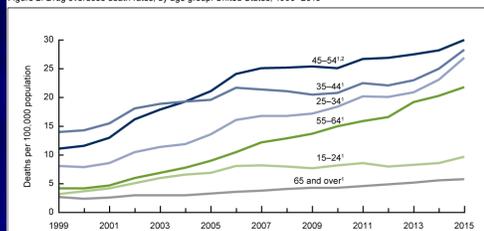
Figure 3. Age-adjusted drug overdose death rates, by race and ethnicity, United States, 1999–2015



Significant increasing trend, $p < 0.005$.
 Note: For non-Hispanic white persons was significantly higher than for non-Hispanic black and Hispanic persons, $p < 0.001$.
 NOTES: Deaths are classified using the International Classification of Diseases, Tenth Revision. Drug overdose deaths are identified using underlying cause-of-death codes X40–X44, X50–X54, X60, and Y10–Y14. Deaths for Hispanic persons may be underreported by about 5%. Access data table for Figure 3 at http://www.cdc.gov/nchs/data/tables/drugs/0273_table.pdf#.
 SOURCE: NCHS, National Vital Statistics System, Mortality.

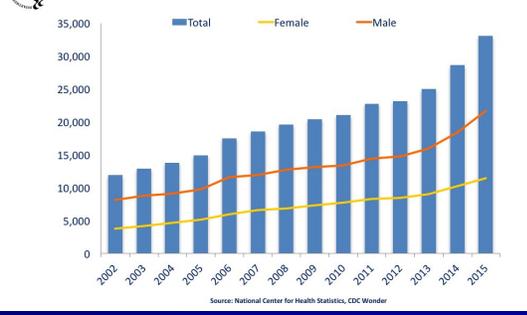
Overdose Deaths by Age Group

Figure 2. Drug overdose death rates, by age group, United States, 1999–2015



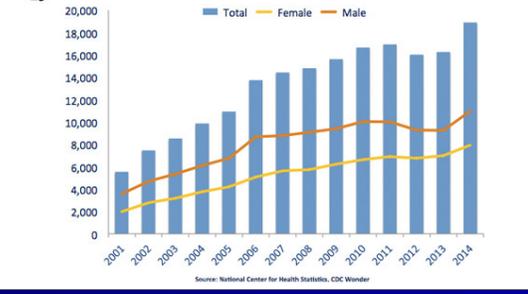
Significant increasing trend, $p < 0.005$.
 Note: For age group 45–54 in 2015 was significantly higher than for any other age group, $p < 0.001$.
 NOTES: Deaths are classified using the International Classification of Diseases, Tenth Revision. Drug overdose deaths are identified using underlying cause-of-death codes X40–X44, X50–X54, X60, and Y10–Y14. Access data table for Figure 2 at http://www.cdc.gov/nchs/data/tables/drugs/0273_table.pdf#.
 SOURCE: NCHS, National Vital Statistics System, Mortality.

National Overdose Deaths Number of Deaths from Opioid Drugs



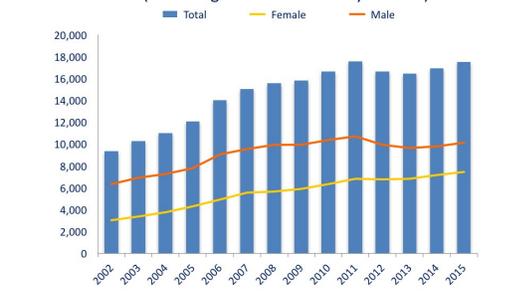
Source: National Center for Health Statistics, CDC Wondar

National Overdose Deaths Number of Deaths from Prescription Opioid Pain Relievers



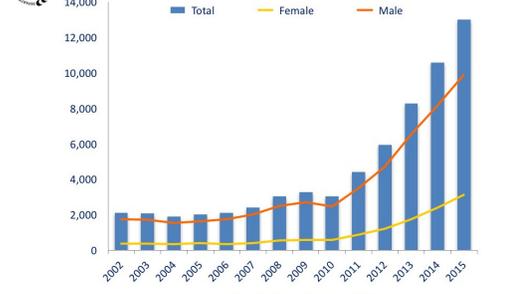
Source: National Center for Health Statistics, CDC Wondar

National Overdose Deaths Number of Deaths from Prescription Opioid Pain Relievers (excluding non-methadone synthetics)

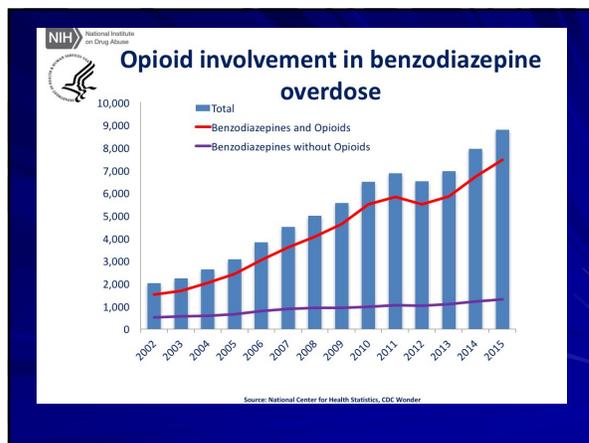
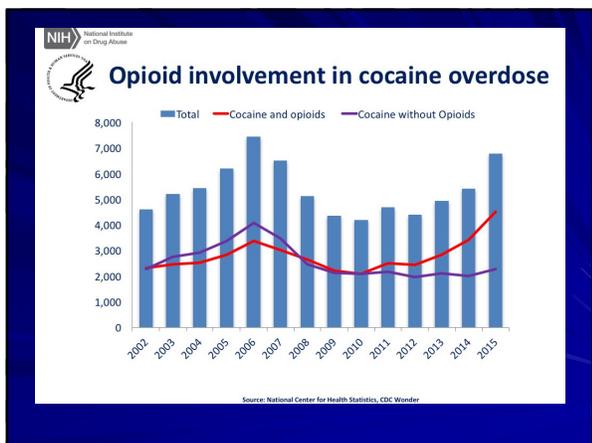
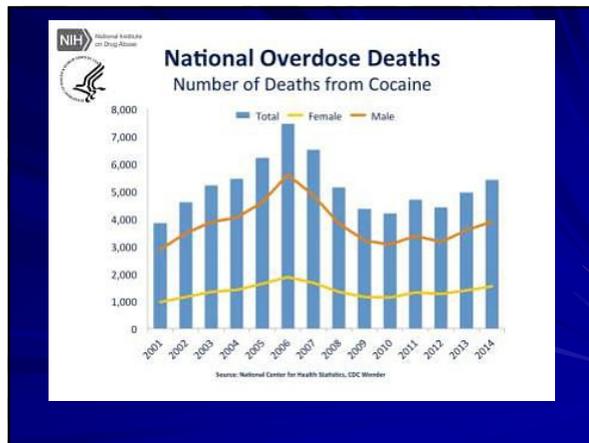
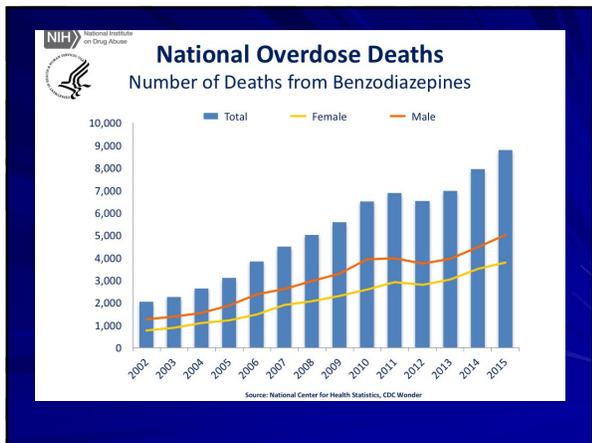
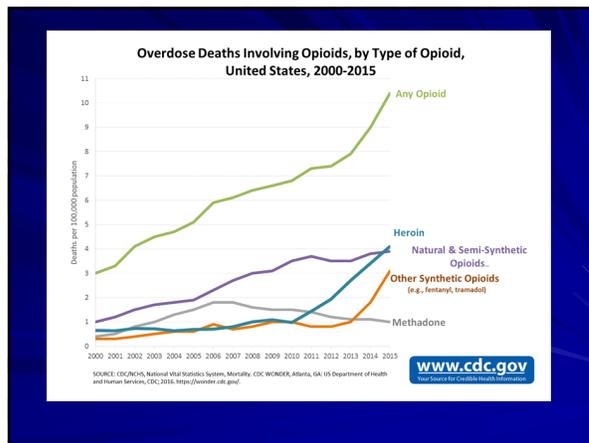
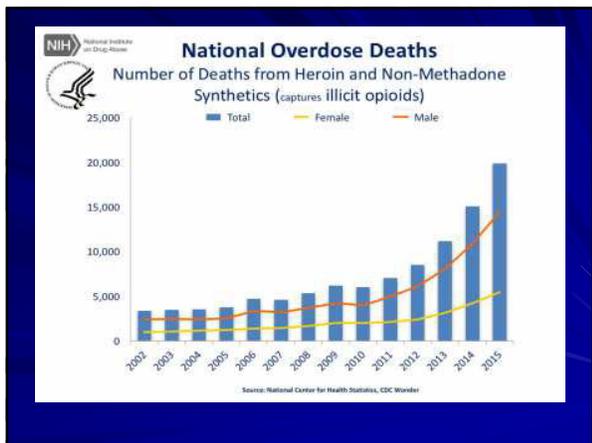


Source: National Center for Health Statistics, CDC Wondar

National Overdose Deaths Number of Deaths from Heroin

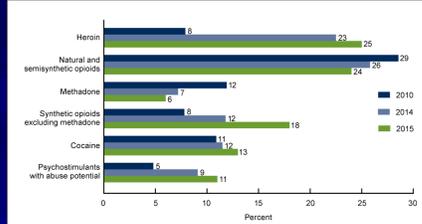


Source: National Center for Health Statistics, CDC Wondar



Overdose Death Trends by Specific Drug Category

Figure 5. Percentage of drug overdose deaths involving selected drug categories, United States, 2010, 2014, and 2015



NOTES: Deaths are classified using the International Classification of Diseases, Tenth Revision. Drug overdose deaths are identified using underlying cause-of-death codes 485-502, 591-595, and 710-714. The total number of drug overdose deaths was 32,220 in 2010, 47,750 in 2014, and 52,454 in 2015. Drug overdose deaths involving selected drug categories are identified by specific chapter-cause-of-death codes: heroin, 1A01; natural and semisynthetic opioids, 1A02; methadone, 1A03; synthetic opioids excluding methadone, 1A04; cocaine, 1A05; and psychostimulants with abuse potential, 1A06. Categories are not mutually exclusive because deaths may involve more than one drug. The percentage of drug overdose deaths lacking information on the specific drug involved varied by year: 21% in 2010, 18% in 2014, and 17% in 2015. Access data here for Figure 5 at: http://www.cdc.gov/nchs/data/hestats/ostd07_08a.pdf. SOURCE: NCHS, National Vital Statistics System Mortality.

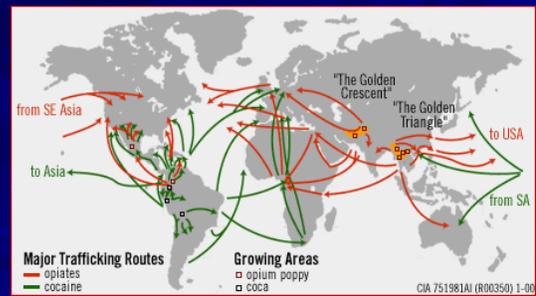
Where are these drugs coming from?

And where are the precursors coming from?

Drug Producing & Transit Countries that affect the U.S.A

- Southwest Asia: Afghanistan, Pakistan, India
- Southeast Asia: Burma, Laos
- Central America:
 - Bahamas, Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama
- South America
 - Bolivia, Colombia, Peru, Ecuador, Venezuela

Global Drug Trafficking Routes



Most Drug Addicted Countries

- Mexico — Meth, 3.9% (per Capita)
- Brazil — Oxi, 4.3%
- France — Prescription pills, 13.2%
- United States — Prescription pills, 6.2%
- Canada — Marijuana, 6.4%
- Iran — Heroin, 14.3%
- Afghanistan — Heroin, 6.9%
- Russia — Alcohol, 7.1%
- United Kingdom — Alcohol, 13.6%
- Slovakia — Inhalants, 13.0%

Major Precursor Source Countries that affect the U.S.A.

- Europe:
 - Belgium, Germany, Switzerland, U.K., Netherlands
- Asia:
 - China, Bangladesh, India, Burma, Iraq, Indonesia, Pakistan, Korea, Singapore, Thailand, Taiwan
- Africa:
 - Egypt, Nigeria, South Africa

Major Precursor Source Countries that affect the U.S.A.

- North America:
 - Canada, U.S.A
- Central America:
 - Mexico, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras
- South America:
 - Argentina, Colombia, Bolivia, Brazil, Chile, Venezuela

Suppliers of Precursor Chemicals

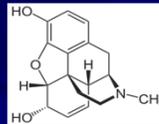
- Legitimate purchases by licensed & registered companies
- Diverted by rogue importers, chemical companies, criminal organizations, individual violators
 - Coercion

Suppliers of Precursor Chemicals

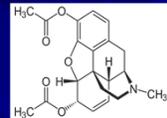
- Mislabeling containers
- Forging documents
- Front companies
- Circuitous routing
- Hijacking shipments
- Bribery
- Smuggling across borders



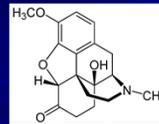
Opioid Structures



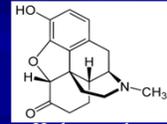
Morphine



Diacetyl morphine - Heroin

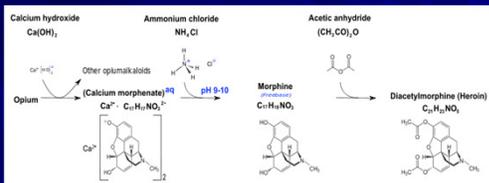


Oxycodone



Hydromorphone

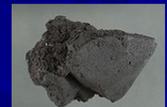
Heroin Chemistry



<http://flipper.diff.org/app/items/info/5475>

Acetic anhydride virtually irreplaceable
(Industrial purposes (eg. to make cellulose acetate))

Precursor Chemicals



- Where supplies of precursors are cut
 - Cocaine: lime, ammonia
 - Heroin: acetic anhydride
- Inferior substitutes are used
 - Cement, sodium bicarbonate
 - Acetic acid
- Poor quality or impure end product
- Exception: methamphetamine
 - Ephedrine & pseudoephedrine or phenylacetone

Southwest Asia



Afghanistan

- ~ 211,000 hectares of poppy cultivation
- Taliban & other anti-government groups profit
- Acetic anhydride smuggled into country
 - From China, South Korea, Europe, central Asian states, India, Mexico
- Limited police & administrative capacity
- 2013: Government seized 14.4 metric tons of precursors

India

- World's largest producer of licit opium
- Undetermined quantity diverted to illicit drug trade

Southeast Asia



Golden Triangle



China

- Large producer of precursor chemicals
- Large producer of acetic anhydride
 - Trafficked to Afghanistan & Mexico
- Ephedrine & pseudoephedrine
 - Exported to Mexico
- Large producer of illicit fentanyl
- More people convicted of drug related offenses than anywhere else in the world

Burma (Myanmar)

- 3rd largest producer of opium
- Methamphetamine producer
- Precursors smuggled across its borders with Bangladesh, China, Laos, India & Thailand
- Produced in lightly policed areas and in the Shan state that is controlled by armed militia
- Lack of government will to control illicit drugs

Indonesia

- Legally imports pseudoephedrine and ephedrine for cough & cold remedies
- Some gets diverted for production of methamphetamine / ecstasy
- Precursors from China, Taiwan, India,

Laos & Malaysia

- Laos
 - Significant producer of opium
 - Transit point for heroin, amphetamine-type stimulants and precursors
 - Criminal gangs with international links
- Malaysia
 - Large producer of crystal methamphetamine & ecstasy
 - Transit for heroin, ketamine & above drugs

Central & South America



Argentina

- Transshipment country for cocaine headed to Europe
- Source of precursor chemicals shipped to Mexico
- Law enforcement corruption

Bolivia

- 3rd largest producer of cocaine
- 2015: Government destroyed 4,232 cocaine laboratories
- 2015: Government authorities seized 600 metric tons of solid, 1.1 million liters of liquid precursors

Colombia

- Largest producer of cocaine
- Heroin producer
- 4500 chemical companies authorized to handle regulated chemicals for legitimate use
- Burden is on police to regulate & investigate these companies
- 2013: Government authorities seized 456 metric tons of solid & 230 metric tons of liquid precursors

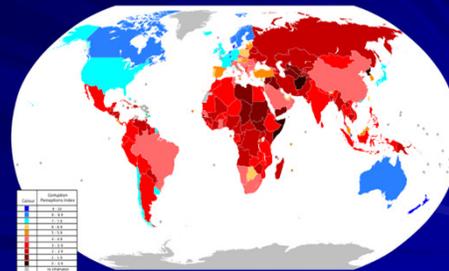
Peru

- 2nd largest producer of cocaine in the world
- Major importer of acetone, sulfuric acid, hydrochloric acid & calcium oxide
- Government authorities seized 1,632 metric tons of precursor chemicals & 2 tons of potassium permanganate
- In the tri-border region with Colombia, joint Brazilian & Peruvian authorities seized 28,860 liters of gasoline, 54.2 tons of precursors & 30.5 tons of cement; destroyed 28 laboratories; seized 2.1 tons of cocaine base

Mexico

- 2nd largest producer of opium & heroin
- Large producer of crystal methamphetamine & ecstasy from 'superlabs'
- Government conducts largest crop eradication in the world
- Significant source of acetic anhydride to Afghanistan
- Largest volume of internationally seized chemicals

Global Government Corruption



Money Laundering

Money Laundering by Location

This map shows the global locations of individuals and entities, contained in the Thomson Reuters World-Check risk intelligence database, identified as connected to money laundering. Where connections have been identified, lines demonstrate the link.



Money Laundering

Afghanistan, Antigua and Barbuda, Argentina, Australia, Austria, Bahamas, Belize, Bolivia, Brazil, British Virgin Islands, Burma, Cambodia, Canada, Cayman Islands, China, Colombia, Costa Rica, Curacao, Cyprus, Dominican Republic, France, Germany, Greece, Guatemala, Guernsey, Guinea-Bissau, Haiti, Hong Kong, India, Indonesia, Iran, Iraq, Isle of Man, Israel, Italy, Japan, Jersey, Kenya, Latvia, Lebanon, Liechtenstein, Luxembourg, Macau, Mexico, Netherlands, Nigeria, Pakistan, Panama, Paraguay, Philippines, Russia, Singapore, St. Maarten, Somalia, Spain, Switzerland, Taiwan, Thailand, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, West Bank and Gaza, and Zimbabwe

Why Do People Take Drugs?

Why do People Take Drugs?

- Feel Good:
 - Intense feelings of pleasure
- Feel Better
 - Suffer from pain or social anxiety, stress, depression
- To do Better
 - Enhance cognitive or athletic performance
- Curiosity / Peers
 - Impress or acceptance by friends

Understanding Addiction

Consequences of Addiction

- Old school:
 - Addicts were morally flawed, lacking in will power
 - ‘Let them die – it’s their fault’
 - Leads to punishment
- New school:
 - A disease just like hypertension or diabetes
 - Treatment and prevention
 - No punishment for reporting by individual or others

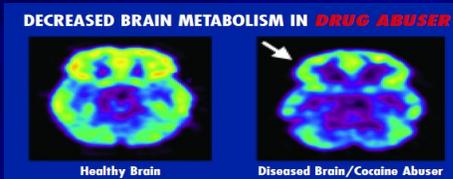
- Neonates & Infants
 - Premature and underweight
- Adolescents
 - Act out, poor academic performance, violence
 - Unplanned pregnancies, infectious diseases
- Adults
 - Difficulty with focus, thinking, memory
 - Poor work performance and social relationships
- Parents
 - Chaotic, stress filled homes, child abuse & neglect

What is Addiction?

Addiction

- Chronic relapsing brain disease

- A state characterized by compulsive engagement in rewarding stimuli, despite adverse consequences
- Time spent acquiring the drug
- Abandonment of occupational, family or social commitments



Brain glucose metabolism



Common Street Drugs

■ Alcohol	■ Stimulants
■ Cannabis (Marijuana)	■ Cocaine
– Hashish	■ Amphetamines
■ Sedatives	■ Ecstasy (MDMA)
■ Rohypnol	■ Crystal meth (methamphetamine)
■ GHB	■ Opioids
■ Hallucinogens	– Heroin
– Lysergic acid (LSD)	– Oxycodone
– Salvia divinorum	– Fentanyl
– Ketamine	■ Inhalants

Risk of Addiction

■ Heroin	■ Marijuana
■ Crack cocaine/cocaine	■ Nicotine
■ Crystal methamphetamine	■ Alcohol
■ Amphetamines	■ Benzodiazepines
■ Prescription pain killers	■ GHB
■ Methadone	■ Caffeine

Dependence

- **Physiological Dependence**
 - The body has adjusted by incorporating the substance into its "normal" functioning
 - Withdrawal symptoms upon cessation
- **Behavioural (often called Psychological)**
 - Craving or desire for repeated administration to provide a desired effect or to avoid discomfort
 - Despite adverse consequences

Tolerance

- Increasing doses of a drug are needed to produce a desired effect (effect intensity decreases with repeated use)
- Metabolic – drug deposition or enzyme induction
- Pharmacodynamic – ↓ decrease receptors
- Behavioural – learned or conditioned

Who is at Risk?

Risk Factors	Protective Factors
■ Aggressive behavior in childhood	■ Good self-control
■ Lack of parental supervision	■ Parental monitoring and support
■ Poor social skills	■ Positive relationships
■ Drug experimentation	■ Academic competence
■ Availability of drugs at school	■ School anti-drug policies
■ Community poverty	■ Neighborhood pride

Genetic, Medical & Environmental Factors

- Addiction is permanent & life long
- Genetics
 - 40-60% of a person's vulnerability
- Medical
 - Mental disorders lead to greater risk of drug abuse
 - E.g. depression

Genetic, Medical & Environmental Factors

- Environmental
 - Parents that abuse drugs or engage in criminal behavior
 - Drug exposure: peer pressure to try drugs for the first time
 - Poor academic performance

Other Risk Factors

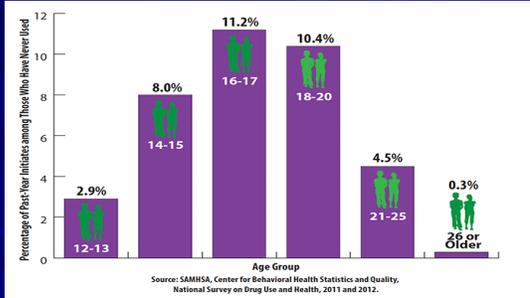


- Early use
 - Earlier use – more likely to have a serious problem
- Method of administration
 - Smoking or injecting increases addictive potential
 - Intense pleasure instantly and then fading to lower than normal levels
 - Repeated drug use to re-capture the pleasurable state

When Does Addiction Start?

- Childhood or adolescence
- Prefrontal cortex enables us to assess situations, decision making, control of emotions and desires
- Still maturing during adolescence
 - Puts them at greater risk
- Profound & long-lasting consequences

The Danger Zone: Most Illicit Drug User Starts in the Teenage Years



Age Group	Percentage of Past-Year Initiators among Those Who Have Never Used
12-13	2.9%
14-15	8.0%
16-17	11.2%
18-20	10.4%
21-25	4.5%
26 or older	0.3%

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2011 and 2012.

Trends in Prevalence of Various Drugs Among Students

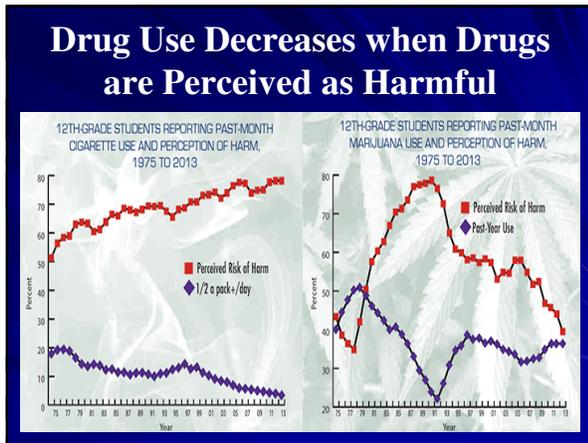
Top Drugs among 8th and 12th Graders, Past Year Use

Drug Category	8 th Graders	12 th Graders
Marijuana/Hashish	11.7%	35.1%
Inhalants	5.3%	6.8%
Synthetic Marijuana	3.3%	5.8%
Cough Medicine	2.0%	4.8%
Tranquilizers	1.7%	4.7%
Adderall	1.3%	4.3%
Hallucinogens	1.3%	4.0%
OxyContin	1.0%	3.6%
Vicodin	1.0%	3.3%
Cocaine (any form)	1.0%	2.6%
MDMA (Ecstasy)	0.9%	1.9%
Ritalin	0.9%	1.8%
Salvia	-	1.8%

* Only 12th graders surveyed about sedatives use
Source: University of Michigan, 2014 Monitoring the Future Study

Prevention

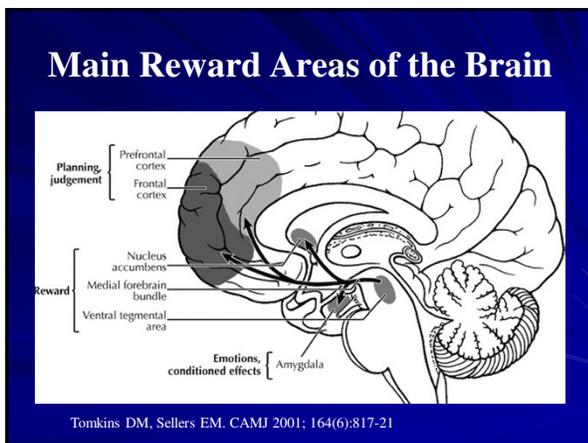
- Education of youths
 - Risks and harms of substance abuse
 - Perception that drugs are dangerous
- By teachers, parents, health care professionals
- Programs in schools and communities
- Reduction in level of use



- ### Brain Areas Affected by Drug Abuse
- Brain stem
 - Critical life functions – heart rate, breathing, sleeping
 - Cerebral cortex
 - Processing information from our senses
 - Frontal cortex – think, plan, problem-solve, decision making
 - Limbic system
 - Ability to feel pleasure
 - Motivates us to repeat behaviors
 - Emotions & mood

- ### How do the Drugs Work?
- Mimic natural neurotransmitters
 - Heroin
 - Cause release of large amounts of neurotransmitters
 - Methamphetamine
 - Prevent recycling of neurotransmitters
 - Cocaine

- ### Which Neurotransmitters?
- Dopamine
 - Involved in movement, emotion, motivation, feelings of pleasure
 - Rewards our natural behaviors



- ### Other Neurotransmitters Involved in the Reward Pathways
- Indirect modulation of mesolimbic dopamine activity by:
- Serotonin
 - GABA
 - Glutamate
 - Acamprosate
 - Opioid
 - Naltrexone

Drug Abuse

- Overstimulation results in euphoria
 - Can release 2-10 times the amount of dopamine than eating or sex
- Reinforces drug use
- Teaches user to repeat it
 - Drug abusers learn to do this very well
- Withdrawal effects – ‘crash’
 - User takes another ‘hit’ to feel the euphoria again

Abuse

- Umbrella term
- Acute or chronic intake of any substance that has no recognized medical use or is used inappropriately in terms of medical indications or its dose
- Harm to user and to society

Fentanyl Tweets

- man if I could marry fentanyl I would but fentanyl has nothing interesting to say. Just kinda sit there and agrees with me about everything
- Love me, love me, that fentanyl it numb me
- Hubs & daughter are watching the most annoying show EVER. I put my Fentanyl patches on with hopes they'll knock me right the fxxx out.
- I found true love yall. Im going steady, no more hundreds of girlfriends, she was there for me when no one else was. Ima marry you fentanyl

In the Mind of a User

- Her eyes wouldn't stay open. Her legs were wobbly. She felt great. "I was so damn high, I couldn't keep my mind straight," she said. "So I started telling people about it."
- What's crazy about us dope fiends is that when we figure out someone fell out, the first thing's like, "Hey, where'd they get that at?"
- People ODing is a sign you might be able to get really high off \$5 of heroin, which is a luxury, no matter what the stuff is cut with

In the Mind of a User

- Perverse market logic to providing heroin users with fentanyl and extra-strong heroin
 - The more people who OD, the better the heroin is
 - Word spreads fast, and before you know it, you have people lining up to try the super-strength stuff

Impairment of Brain Function from Long-term Drug Abuse

- Decrease in dopamine production
- Down regulation of dopamine receptors
- Flat, lifeless & depressed
- Drug abuse continues repeatedly to feel 'normal' again (bring the dopamine level back to normal)
- Vicious cycle
- Larger amounts are taken - tolerance

Impairment of Brain Function from Long-term Drug Abuse

- Disrupts structures involved self-control, decision-making & inhibition
- Producing intense impulses to take drugs

Medical Consequences of Addiction

- Central and/or peripheral nervous system damage
- Cardiovascular disease
- Stroke
- Cancer
- HIV/AIDS
- Hepatitis B & C
- Lung disease
- Mental disorders

Mental Disorders

- Disorders such as depression, anxiety or schizophrenia can precede addiction

OR

- Drug abuse may trigger or exacerbate those mental disorders



Infectious Diseases

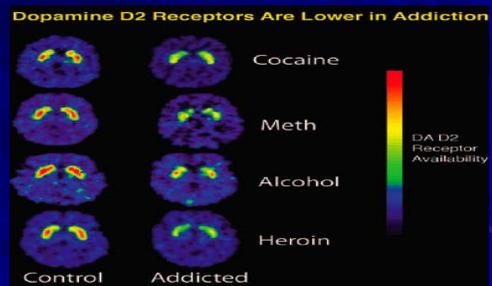
- Sharing needles accounts for 12% of new AIDS cases
- Major factor in the spread of hepatitis C
- Impairment in judgment can lead to risky sexual behaviors
 - HIV, Hepatitis B & C
 - Syphilis, HPV, gonorrhea, etc.
- Unplanned pregnancy

Prenatal Drug Exposure

- Can cause neonatal abstinence syndrome (a withdrawal syndrome)
- Some kids will require educational support in the classroom
- Deficits in behavior, attention & thinking



Impairment of Brain Function from Long-term Drug Abuse



Long-Term Drug Abuse and Conditioning

- Adaptations in habits
- Non-conscious memory systems
 - Tie shoes, riding a bike
- Conditioning
 - Cues in a person’s daily routine or environment become associated with the drug experience & can trigger uncontrollable cravings even if the drug is not available
- Can last many years after abstinence or lifelong

Rock Bottom

Rehabilitation

Death

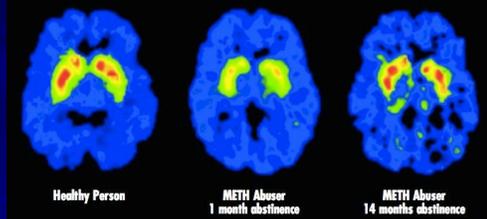


Treatment & Recovery

- Addiction is a treatable disease
- Managed but not cured
- Relapse can occur but therapy then needs to be modified
- Combining treatment medications with behavioral therapy best approach

Brain Recovery with Abstinence

BRAIN RECOVERY WITH PROLONGED ABSTINENCE



Dopamine receptors in the striatum

Treating Withdrawal

- Initial withdrawal symptoms
- Restlessness, sleeplessness, stress
- Depression, anxiety, mood disorder
- Avoid cues or triggers

Medication-Assisted Treatment (MAT)



- Opioid
 - methadone, buprenorphine, naltrexone
- Tobacco
 - nicotine replacement, bupropion, varenicline
- Alcohol
 - Naltrexone, acamprosate, disulfiram

MAT – Buprenorphine



- Replacement therapy
 - similar to methadone
- Advantage of being only a partial agonist
- Negates the potential for life-threatening respiratory depression in cases of abuse
 - Despite this, naloxone is added
- Blocks effects other opioids by itself and especially with naloxone

MAT

- Methadone
 - Used as replacement therapy
 - Dose slowly weaned
- Naltrexone available as tablet or long-acting injection



MAT

- Far fewer people receive MAT than could benefit from it
- Hospital admissions data show that only 18% of patients admitted were receiving MAT
- Limited resources (physicians & facilities) for MAT
 - Efforts to expand are currently underway
- For incarcerated individuals, MAT improves post-release outcomes

Behavioral Therapy

- Cognitive behavioral therapy
 - Recognize, avoid and cope
- Motivational therapy & positive reinforcement
 - New life, career
 - Treatment / therapy rewards
- Family therapy
 - Family dynamics at home that may contribute to drug abuse

Why Do People Take Drugs?

Chronic Pain and Getting
'Hooked'

Prescription Drugs

- Perceived by the public to be safer than illicit drugs
- Manufactured by drug companies with GMP
- Prescribed by physicians



Prescription Drug Misuse

- Opioids, CNS depressants & stimulants
- 2014: 2.1 million Americans misused prescription drugs at least once
- Adolescents & young adults:
 - 2.6 % of youths aged 12-17
 - 1 in 13 high school seniors used Adderall® & Vicodin®
 - Bought from friend or relative not internet

Emergency Department Visits

- Drug Abuse Warning Network 2011
 - Selected areas across the U.S.
- 1.2 million visits due to nonmedical use of prescription drugs
 - Half of all ED visits related to drug abuse
 - Over half of the visits involved multiple drugs
- 488,000 visits (40%) for opioid pain relievers
- 41,000 visits for stimulants
- 422,000 for depressants – benzodiazepines

Prescription Opioids

- Opioids used to treat acute pain
- Late 1990s, used to treat chronic pain
 - Despite little evidence
- In addition to relieving pain, reward regions are activated
 - Leading to euphoria & then addiction
- Slow release medications such as OxyContin® are crushed then snorted or injected
 - Leading to overdose

Chronic Pain

- 3-26% of patients on long term opioid treatment for chronic pain can become addicted
 - Wide range due to differing study populations, differences in treatment duration
- Dilemma for physicians
- Limited research on alternative treatments for chronic pain

Prescription Opioid Abuse

- Own prescriptions 27%
- Friends or relatives for free 26%
- Buying from friends or relatives 23%
- Buying from a drug dealer 15%
 - Highest risk from overdose are those that buy from a drug dealer

Prescription Opioid Abuse

- Nearly half of all U.S. opioid deaths involve a prescription opioid
- 2015: more than 15,000 people died
- 2014: 2 million Americans were dependent
- Every day 1,000 people are treated in the ER for misuse

Prescription Opioid Abuse

- Most common: methadone, oxycodone, hydrocodone
- Overdose rates highest among 25-54 age
- Non-Hispanic whites & American Indian or Alaskan Natives highest
- Men more than women (but gap is closing)

Prescription Opioids

- Short-term use (a few days) for acute pain rarely leads to addiction
 - E.g. oral surgery
- Several times/day for several weeks can lead to dependence, tolerance and in some cases addiction
 - This can then transition to heroin use
 - Or fentanyl use depending on availability
- Use for cancer or palliative care accepted

Prescription Opioid Abuse Heroin

- Strongest risk factor for starting heroin
 - 3 out of 4 users have abused prescription opioids prior to using heroin
- Increasing use by men, women, most age groups & all income levels
- Deaths quadrupled since 2010
- 2014-2015 death rate increased by ~21%

Prescription Opioid Abuse Heroin

- Cheaper than prescription opioids
- Higher purity
- Heroin confiscation at the southwest border:
 - ≤ 500 kg 2000-2008
 - 2,196 kg in 2013



Heroin (Diacetylmorphine)



- H, horse, white horse, junk, snow, poppy, scag, smack, brown sugar
- Injected, smoked, snorted
- CNS effects:
 - Euphoria, analgesia
 - Drowsiness, confusion, staggering gait
 - Nausea, vomiting
- Addiction: 'Chasing the first high'

Heroin

- Physical dependence & tolerance
- Physical effects:
 - Itchy, dry mouth, constipation
 - Collapsed veins, abscesses
 - Bradycardia, respiratory depression, coma
- Death: purity and/or overdose
 - Incremental increases to achieve previous effect
- Infectious diseases
 - HIV, Hepatitis, Endocarditis

Other Opioids - Kratom

- Tropical deciduous tree in southeast Asia
- Leaves are chewed, brewed as tea, smoked
- Mood-lifting & pain relief, increased energy
- Long-term: anorexia, insomnia, dry mouth, constipation, hallucination & paranoia

Other Opioids



- Morphine
 - M, dreamer, sweet Jesus, morph, Miss Emma, monkey
 - Effects similar to heroin less potent
- Methadone
 - The kick pill, dolly
 - Usually ingested at the site of dispensing to avoid abuse by injection

Other Opioids

- Hydrocodone
 - Vike
 - Analgesic: Combined with ibuprofen to make Vicoprofen or acetaminophen to make Vicodin
- Hydromorphone (Dilaudid)
 - Juice, dillies
- Opium
 - Big O, black stuff, block, gum, hop
 - Oral, smoked





Other Opioids

- Meperidine / Pethidine (Demerol)
 - Demmies
 - Normeperidine metabolite toxic
 - Dilated pupils (mydriasis)
- Oxycodone (Percocet, OxyContin → Oxy Neo)
 - Percs, oxy
 - Tablets chewed, crushed then snorted or boiled for injection
 - Very difficult with OxyNeo




Dextromethorphan

- Robotripping, Robo, Triple C.
- Swallowed
- CNS effects:
 - Euphoria, slurred speech, altered visual perception
 - Numbness, dizziness, confusion, paranoia
 - Nausea & vomiting
- Physical effects:
 - Tachycardia, hypertension, hyperthermia
 - Breathing problems

Other Opioids

- Pentazocine (Talwin)
 - T's, big T
 - Agonist & antagonist properties
 - Tablets contain naloxone - prevents abuse by injection
- Codeine
 - 3's, 4's, Captain Cody, Cody
 - Found in Fiorinal C, Tylenol#1
 - Poor metabolizers – little effect





Opioid Withdrawal Syndrome

- Bone pain
- Restlessness
- Tremor
- Chills
- Piloerection
- Anorexia
- Anxiety
- Irritability
- Insomnia
- Runny nose, sneezing
- Lacrimation
- Dilated pupils
- Vasodilation
- Tachycardia
- Elevated BP
- Vomiting, diarrhea
- Abdominal pain & cramps



Prescription CNS Depressants

- Anxiety & sleep disorders
- Benzodiazepines
 - Long-term use can result in tolerance, dependence or addiction
- Non-benzodiazepine sleep medications
 - Zolpidem, eszopiclone, zaleplon
 - Less side effects & less risk of dependence
- Barbiturates
 - Less commonly used - higher risk of overdose

Prescription CNS Depressants

- Withdrawal symptoms can be severe & potentially life threatening
- Research is sparse for CNS depressant addiction treatment
- Medically supervised detoxification
- Tapered gradually
- Counseling
- Cognitive behavioral therapy

Prescription Stimulants

- Increase alertness, attention & energy
- Elevate heart rate, blood pressure & respiration
- Now used for ADHD, narcolepsy & treatment-resistant depression
- Dextroamphetamine (Dexedrine®, Adderall®)
- Methylphenidate (Ritalin®, Concerta®)
- Increase neural dopamine & norepinephrine
- Dependence or addiction possible

Prescription Stimulants

- Withdrawal can occur
 - Fatigue, depression, disturbed sleep
- Repeated use
 - Hostility, paranoia or psychosis
- High doses
 - High body temperature, arrhythmia, cardiovascular failure or seizures

Prescription Stimulants

- Large increases in stimulant prescriptions
 - Increased risk of diversion & nonmedical use
- Increased wakefulness, motivation, learning & memory
- Military use for certain operations
- Professionals to increase their productivity
- Older people for declining cognition
- High school & college students to increase academic performance

Stimulants & Multiple Addictions

- For prescription stimulants
 - Taper dosage to ease withdrawal symptoms
- For cocaine & methamphetamine
 - No proven drug treatment available
- Polydrug use addiction
 - Treatment should address each addiction
- Counseling
- Cognitive behavioral therapy

Prescription Drug Misuse Prevention - Physicians

- Evidence based screening tools for misuse
- Recovery goals
- Caution if rapid increases in medication amount or unscheduled refill requests
- Doctor ‘shopping’ or poly doctoring
- Prescription drug monitoring programs
- Delicate balance
 - medical needs vs. risk of misuse

Prescription Drug Misuse Prevention - Patients

- Follow directions & aware of interactions
 - E.g. alcohol
- Never change dose or stop without physician
- Never use another person’s medication
 - or give it away
- Safe storage
- Properly discard unused medications

Prescription Drug Misuse Prevention - Patients

- Some prescription drug users switch to heroin
- Or to counterfeit oxycodone pills
- Or fentanyl laced counterfeit pills
 - With or without knowledge of fentanyl
- Or counterfeit Xanax (alprazolam) pills

Prescription Drug Misuse Prevention - Pharmacists

- Medication counseling
- Recognizing problematic patterns
- Vigilant for prescription falsifications and alterations
- Alerting other pharmacies for fraudulent prescriptions
- Fentanyl patch exchange program
- Prescription Drug Monitoring Programs

Prescription Drug Misuse Prevention - Manufacturers

- Physical or chemical barriers
 - Prevent crushing, grinding or dissolving
 - OxyContin® to OxyNeo®
- Agonist/antagonist combinations
 - Antagonist to be released if the product is manipulated
 - Oxycodone/naloxone



What Does This Mean to Us?

“Codeine doesn’t work for me”

- Drug seeking to get Percocet®?

OR

- 10% of the population has a slow acting form of the hepatic isoenzyme CYP 2D6 that converts codeine to its active form morphine
 - ∴ codeine is ineffective



Prescribing to Opioid Abusers

- Best to plan ahead and work with family physician or pain specialist
- Avoid opioids to prevent relapse
 - VS.
- Prescribe opioids to prevent drug seeking (on the street)
 - Have a responsible family member dispense the medication



Paediatrics

- Acetaminophen
- Ibuprofen
- Codeine
- All available in liquid form
- OPIOIDS ARE NOT NEEDED IN KIDS FOR ROUTINE DENTISTRY INCLUDING EXTRACTIONS
- Avoid ASA
 - In the presence of a viral illness, risk of Reye’s syndrome: rash, vomiting, liver damage & encephalopathy



Elderly

- NSAIDs caution
 - Risk of GI bleeding increases
 - Consider gastric mucosal protection
 - Ibuprofen safer among the NSAIDs
 - May consider COX-2 inhibitors such as celecoxib
- Opioids caution
 - More profound adverse effects such as drowsiness
 - Reduce dose
- Multiple drug use and co-existing diseases
 - Check for drug-drug interactions and drug-disease interactions



Elderly

- Pharmacokinetics
 - ↓ hepatic & renal blood flow
 - ↓ drug metabolism & renal elimination
- Pharmacodynamics
 - ↓ cerebral blood flow
 - More gradual *but more magnified effect*
- Acetaminophen safest
- Local anaesthetics – no significant differences
 - In dose or effect



NSAIDs vs. Opioids

- 33 clinical trials with 5171 patients
- 3rd molar extraction model
- Diflunisal 500 & 1000mg > 2 Tylenol # 3
- Flurbiprofen 100mg > 2 Tylenol # 3
- Ibuprofen 400mg > 2 Tylenol # 3
- Ketorolac 10 or 20mg > 2 Tylenol # 3

Ahmad N, Grad H, Haas DA, Aronson KJ, Jokovic A, Locker D. The efficacy of nonopioid analgesics for postoperative dental pain: A meta-analysis. *Anesth Prog.* 44:119-126 1997.

Chronic Pain



- Avoid chronic use of NSAIDs and opioids
- Lyrica® (pregabalin)
- Neurontin® (gabapentin)
- Tricyclic antidepressants (e.g. amitriptyline)
- Cymbalta® (duloxetine)

The Fentanyl Crisis



The Fentanyl Crisis

- 2013-2015 U.S. law enforcement seized 239 kg of illicit fentanyl
- Lethal oral dose ~ 2mg for non-opioid users
- Law enforcement agents at risk through inhalation or skin exposure to fentanyl
- Often mixed into heroin or counterfeit pills
- Pills have also contained U-47700
 - Potent synthetic research opioid

Fentanyl Pharmacology

- Potency
 - 25-40 times more potent than heroin
 - 50-100 times more potent than morphine
- Most common intraoperative analgesic
- Minimal cardiovascular effects
- No plasma histamine release
- Short acting

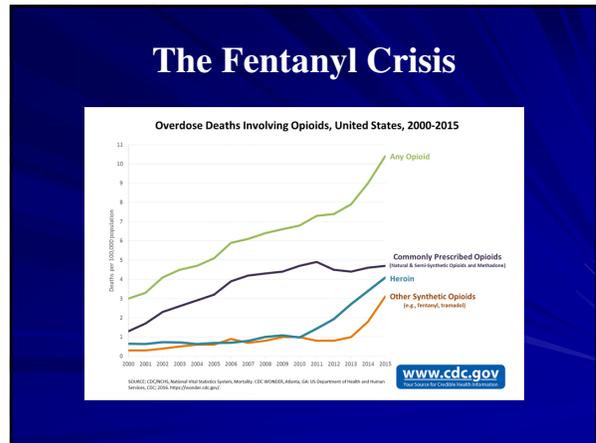
Fentanyl Pharmacology

- Noninvasive delivery systems enable its use for chronic pain
- Transdermal patches
- Transmucosal forms for acute pain
 - Buccal
 - Sublingual

The Fentanyl Crisis

Street Names for Fentanyl

- Apache
- China Girl
- China Town
- Dance Fever
- Drop Dead
- Flatline
- Friend
- Goodfellas
- Great Bear
- He-Man
- Jack Pot
- King Ivory
- Lethal Injection
- Murder
- Perk-a-Pop
- Poison
- TNT
- Tango & Cash



Fentanyl-Related Deaths

- 700 overdose deaths late 2013-2014
- Number likely higher since many coroners do not test for fentanyl
- Some deaths attributed to heroin
 - Fentanyl mixed with white powder heroin
- Mostly clandestinely-produced fentanyl but some diversion of pharmaceutical fentanyl

Fentanyls (fentanyl analogs)

- 3-methylfentanyl
- 3-methylthiofentanyl
- Acetyl fentanyl
- Acetyl-alpha-methylfentanyl
- Alfentanyl
- Alpha-methylfentanyl
- Alpha-methylthiofentanyl
- Beta-hydroxy-3-methylfentanyl
- Beta-hydroxyfentanyl
- Butyrfentanyl
- Carfentanyl
- Para-fluoro-fentanyl
- Remifentanyl
- Sufentanyl
- Thiofentanyl
- Ocfentanyl

The Fentanyl Crisis



- Fentanyl & acetyl fentanyl is produced in China and shipped
 - Through a chain of freight forwarding companies and multiple transfers
 - Difficult to track
- By legitimate laboratories and clandestine laboratories in China
 - Legitimate laboratories also sell legitimate chemicals

The Fentanyl Crisis

- Counterfeit pills resemble real tablets
 - Oxycodone, Xanax® (alprazolam)
- Heroin laced with fentanyl
- Clandestine laboratories in U.S.
- Smuggled in from Canada & Mexico as well



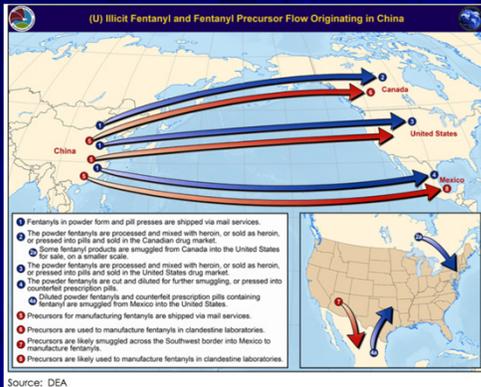
The Fentanyl Crisis

- Pill presses must be reported to the Drug Enforcement Administration (DEA)
 - Foreign vendors (usually China) will send parts individually and mislabel the equipment
 - China does not regulate the production or sale of presses
 - Canada does not regulate pill presses



Fentanyl Precursors

- Precursors shipped mainly from China to Canada, U.S. & Mexico via mail services
- Fentanyl produced in Canada, U.S. & Mexico with available precursors in clandestine laboratories
- Precursors also shipped from U.S. to Mexico



Fentanyl Precursor Regulations

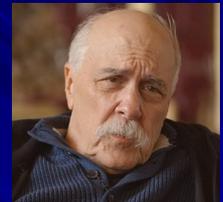
- Canadian government to regulate fentanyl precursors
- 4 of them have no legitimate use
- Currently can be imported in any amount
 - Propionyl chloride & 4-Piperidone and its salts
 - Norfentanyl (N-phenyl-N-piperidin-4-ylpropanamide) and its salts
 - 1-Phenethylpiperidin-4-ylidenephethylamine and its salts
 - N-Phenyl-4-piperidinamine and its salts
- 1-Phenethyl-4-piperidone & its salts
 - Also controlled in U.S. and Australia

Fentanyl Profits

- Cost of 1 kg of fentanyl powder from China for a few thousand dollars
- 1.5mg of fentanyl per pill yields ~ 666,666 counterfeit pills
- \$10-20 per pill
- **\$ 6.7 – 13.3 million in retail sales**

The Walter Whites

- George Marquardt
 - Wichita Kansas
 - “Walter White of Wichita”
- 1978 convicted of cooking crystal methamphetamine
- Self taught genius
- Made his own mass spectrometer
 - To measure purity



The Walter Whites

- Flooded the northeast U.S. with fentanyl
- Rare skills
 - He was worth more alive than dead
- Tried to make each batch unique
 - Looked like more than 1 lab & avoid detection
- 1993 convicted of producing fentanyl
- Drug supply dried up
 - Now back again

Fentanyls and the Internet

- Manufacturing tools available online and are inexpensive
 - Auction websites selling pill presses for \$995
 - Produces 5,000 pills per hour
 - Die moulds for oxycodone & Xanax® for \$115 & \$130
- Unique level of threat
- **Non-cartel-affiliated individuals** traffic
- Purchase online from anonymous ‘darknet’ markets & overtly-operated websites
 - E.g. Silk Road

Fentanyls & Europe

- Estonia
 - Long history of overdose deaths
- Bulgaria & Slovakia
 - Affected by heroin shortage
- Germany, Finland & the U.K.
 - New outbreaks

Carfentanil

- 100 times more potent than fentanyl
- Large animal use only
 - Elephant tranquilizer
- Found in Vancouver
- Calgary Alberta: 1 kg seized
 - 50 million fatal doses

Carfentanil

- Shipped from China
 - Fedex & UPS not used – tracking information required
 - Via U.S. postal system – does not require tracking
- Ohio, Indiana, West Virginia, Kentucky
- Heroin laced
- Multiple doses of naloxone required
- China has now banned exports of carfentanil

Drug Lacing

- **Reasons:**
 - Fillers with similar physical properties are used to increase weight
 - Adulterated with substances to increase addiction or effect (increase sales & drug dealer reputation)
- **Heroin**
 - Quinine, caffeine, procaine, lactose, inositol, mannitol, dextrose, starch
 - Fentanyl & carfentanil

Drug Lacing

- **Cocaine**
 - lactose, glucose, maltodextrin, procaine
 - levamisole (antiparasitic drug – agranulocytosis)
- **Marijuana**
 - lead for weight
 - PCP for effect (super-weed)
- **LSD** is virtually never laced
 - LSD is tasteless, other lacing drugs have taste

Doctor Death (PMA & PMMA)



- **PMA Paramethoxyamphetamine**
- **PMMA Paramethoxy N-methylamphetamine**
 - Often sold as MDMA
 - Stimulant and hallucinogenic effects
 - Major ↑ in BP & pulse, hyperthermia, ↑ breathing
 - Highly toxic: convulsion, coma, and **DEATH**
 - Death within 40 minutes if untreated
 - Ecstasy user believes it's MDMA, when in fact it is a lethal dose of PMA or PMMA

Drug Lacing

- **Ecstasy**
 - MDA, MDEA, BZP, TFMPP, dimethylamine, phenethylamines, PCP, tryptamines, PMA, PMMA
 - Caffeine, ephedrine, pseudoephedrine, dextromethorphan, diphenhydramine, acetaminophen



Ecstasy & PCP

Krokodil

- Thionyl chloride & codeine → α -chlorocodide → dihydrodesoxycodine → desomorphine
- 8-10 times more potent than morphine
 - Fast onset, short duration of action
 - Little nausea
- Pure form does not cause skin damage
- Street form: OTC codeine, iodine, red phosphorous from red strikers on match sticks → desomorphine with impurities

Krokodil

- Illicit production began in Russia in 2010
 - after the crackdown on heroin
- Impurities cause
 - Flesh-eating (nickname) Gangrene, phlebitis, thrombosis
 - Pneumonia, meningitis, septicemia, osteomyelitis
 - Liver, kidney & brain damage
- Alleged reports of use in Canada & the U.S.

Outlook Fentanyl & Opioids

- Overdoses and deaths will increase
- Users will inaccurately dose themselves with imitation medications
- Often ingest or inject alone

Naloxone & Acute Treatment

- Increased availability of naloxone for the public but repeated doses of naloxone required
 - Available as IM injection or nasal spray
- Not effective if asystolic
- May not be effective if severe overdose
 - or with carfentanil
- Hospital emergency admission with intubation and mechanical ventilation
 - Naloxone infusion

Opioids Dental Implications

- Often highly anxious & needle phobic
 - May require oral sedation, nitrous oxide
- Cross-tolerance
 - with other sedatives, nitrous oxide
- Increased postoperative pain
- Infectious risks of IV drug use
 - Hepatitis C, HIV

Opioids Dental Implications

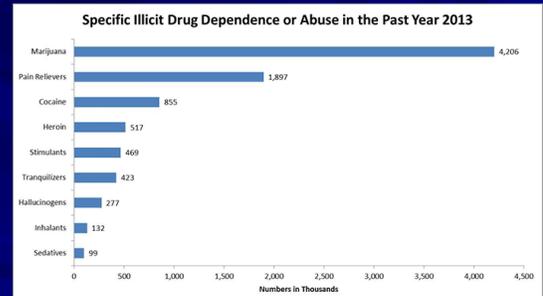
- **Current or acute use**
 - Slow respiratory rate
 - Constricted or pinpoint pupils (except meperidine)
 - Will require less opioids if they have used that day
- **Recent users**
 - Will require more potent opioids and higher doses
- **Rehabilitated users**
 - Amnesia prior to administration to avoid relapse
 - Midazolam, ketamine

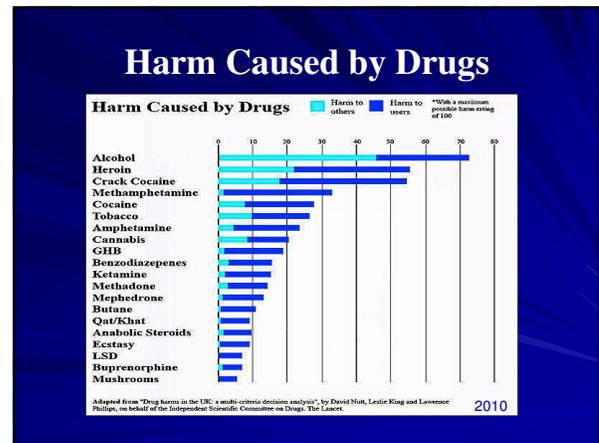
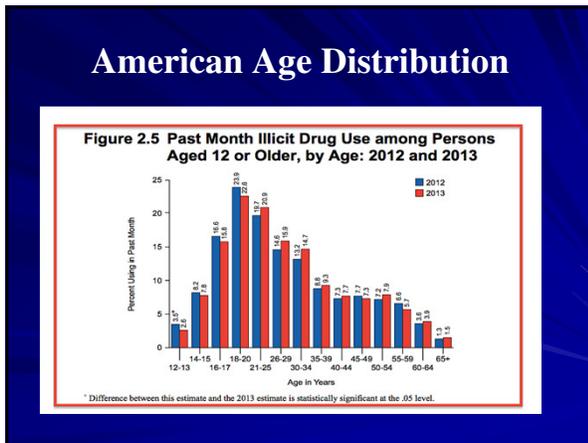
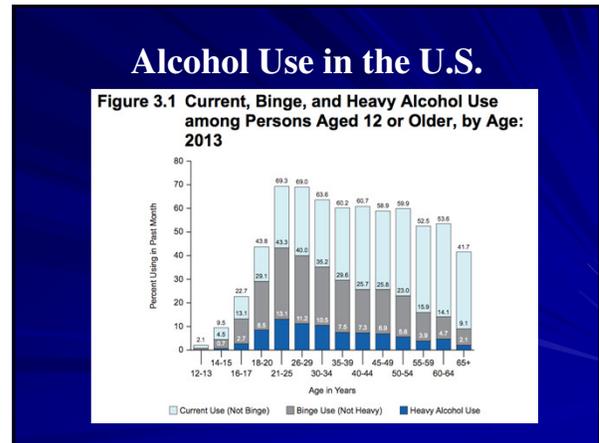
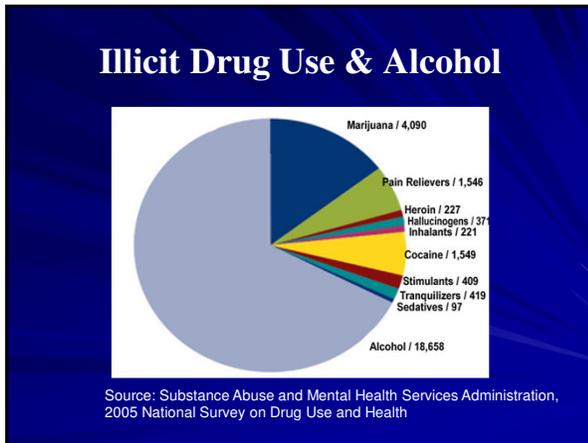
Administering Sedation to Opioid Addicts

- Fentanyl never given first
 - Poor practice by some clinicians to reward their patients
- **TITRATE**
 - Start low and go slow
- **Stimulant users:**
 - Caution: ketamine & epinephrine

Other Street Drugs

American Prevalence





Cannabis (Marijuana)



- Most common street drug
- Grass, pot, joint, weed, reefer, ganja, dope, hydro (hydroponic)
 - Hashish: Hash, weed oil, weed juice, honey oil
- Smoked, oral
- Principal constituent
 - Tetrahydrocannabinol (THC)
 - 5-11% in marijuana, 28% in hashish
 - Other cannabinoids

Cannabis (Marijuana)



- Pharmacokinetics:
 - Accumulates in fat tissue for up to 4 weeks
 - Elimination half-life 24-36 hours
- Cannabinoid receptors in the brain & spinal cord:
 - Emotions, pain sensation, coordination, movement, learning, memory, appetite, nausea

Cannabis (Marijuana)



- Medical trials:
 - ↓ pain including neuropathic pain, ↑ appetite, may relieve muscle spasticity, antiemetic, depression
- CNS effects:
 - Euphoria, drowsiness & relaxation
 - Dysphoria, anxiety, agitation, confusion, hallucinations, emotional lability, increased appetite
- Physical effects: tachycardia, weight gain

Cannabis (Marijuana)

- Cannabis linked to:
 - Psychosis, Schizophrenia
 - Depression, apathy
 - Learning & memory problems
 - Chronic cough, respiratory infections
- Withdrawal:
 - Irritability, anxiety, insomnia, ↓ appetite

Synthetic Cannabinoids



- K2, Spice, Black Mamba, Bombay blue, Fake weed, Genie, Zohai, Bliss, Blaze, Moon rocks
- Smoked, oral
- CNS effects:
 - Euphoria, relaxation, altered perception, hallucinations
 - Confusion, anxiety, agitation, paranoia, psychosis
- Physical effects:
 - Tachycardia, hypertension
 - Myocardial infarction
 - Increased ER visits

Cannabis Dental Implications

- Acute use:
 - Dental treatment while high? Consent?
 - Postoperative pain management? Opioids?
- Chronic use:
 - Similar to tobacco smoking
 - Respiratory: thick saliva & secretions, coughing
 - Cross tolerance with: benzodiazepines & opioids

Hallucinogens

Lysergic Acid Diethylamide (LSD)



- Acid, Blotter, Cubes, Purple haze, Raggedy Ann, Yellow sunshine
- 5-HT₂ receptor agonist
- Oral, transmucosal
- CNS effects:
 - Visual hallucinations, irrational thinking
- CNS effects:
 - Dizziness, insomnia, weakness, dry mouth, dysphoria, panic
 - Flashbacks (Hallucinogen Persisting Perception Disorder)

Lysergic Acid Diethylamide (LSD)



- Physical effects:
 - Mydriasis, loss of appetite, dry mouth
 - Hyperthermia, hypertension, tachycardia
 - Weakness, numbness, tremors
- Non-addictive but psychological dependence

Mescaline



- Mesc, peyote, buttons, cactus
- Oral, inhaled, injected
- CNS effects:
 - Euphoria, hallucinations, brilliant colours, weightlessness
 - Headache, anxiety, disorientation, dizziness, ataxia
- Physical effects:
 - Hyperthermia, hypertension, tachycardia



Psilocybin



- Magic mushrooms, shrooms, purple passion
- Eaten, raw, cooked or steeped as tea
- Poisonous mushrooms look similar
- CNS effects:
 - Euphoria, hallucinations, altered perception of time, relaxation, ataxia, inability to tell fantasy from reality, panic
 - Nausea, vomiting, drowsiness
 - Memory problems with prolonged use
- Physical effects:
 - Enlarged pupils



Phencyclidine



- PCP, angel dust, love boat, dust, hog
- Oral, snorted or injected
- CNS effects:
 - Euphoria, hallucinations, delusions, anxiety
 - Long term: depression, memory loss
- Physical effects:
 - Low doses: tachycardia and hypertension
 - High doses: bradycardia, hypotension, nausea & vomiting, blurred vision, dizziness, loss of balance, violence, suicidal thoughts, seizures, coma, death

Ketamine



- Special K, K, vitamin K, ket, kit-kat
- NMDA receptor antagonist
- Oral, injection, snorted, smoked
- CNS effects:
 - Dream-like state, depersonalization, hallucinations,
 - Confusion, amnesia
 - Toxicity: catatonia, severe delirium, unconsciousness, respiratory depression
- Physical effects
 - ↑ HR & BP & muscle tone, nausea, vomiting, nystagmus

Salvia Divinorum



- Diviner's sage, magic mint
- Member of mint family
- Chewed, smoked
- CNS effects:
 - Laughter, hallucinations, altered visual perception, mood, body sensations, mood swings
- Legal in some states

Tryptamines



- Dimethyltryptamine (DMT), Alphamethyltryptamine (AMT)
- Crystal smoked or injected
- Hallucinations – visual & auditory
- Anxiety and panic effects
- Tachycardia, hypertension, agitation, seizures, dilated pupils, dizziness
- High doses: coma, respiratory arrest

Ayahuasca

- Street names: Aya, Yage, Hoasca
- DMT containing plants in South America
- Swallowed as a tea
- Plants containing it are not controlled

Piperazines



- Benzylpiperazine (BZP)
- Trifluoromethylphenylpiperazine (3-TFMPP)
- Chemically synthesized
- Hallucinations, euphoria & stimulant properties
- Paranoia, renal toxicity, convulsions, respiratory depression

Stimulants

Stimulant Effects

Mental

- Euphoria
- Exhilaration
- Alertness
- Improved task performance
- Exacerbation of obsessive-compulsive symptoms

Physical

- Elevated BP, Tachycardia
- Increased respiration & temperature, sweating
- Tremors / Restless
- Decreased appetite
- Dilated pupils
- Insomnia, Reduced fatigue
- Increased or decreased sexual arousal/libido

Stimulants Effects

High Doses

- Anxiety, Panic attacks
- Excitation
- Grandiosity, Increased sense of power
- Delusions
- Visual, auditory and tactile hallucinations
- Mania
- Delirium
- Paranoia
- Violence

Chronic Doses

- ↓ appetite & weight
- Abdominal pain
- Difficulty urinating
- Increased risk of stroke
- Tachycardia
- Hypertension, MI
- Arrhythmia, Heart failure
- Impotence
- Headache
- Anxiety, Paranoia
- Violence

Cocaine



- Coke, Blow, Snow, Flake, Toot, C, Crack, Rock, Bump, Candy, Charlie
- Snorted, smoked, injected
- Crack is free based and more potent
- CNS effects: inhibits reuptake of 5-HT, NE, DA
 - Euphoria, energy & alertness
 - Anxiety, restlessness, paranoia, violence, psychosis
- Powerful psychological dependence
 - Depression & dysphoria can last for weeks or months - Promotes repetitive use

Cocaine



<h3>Short Term Effects</h3> <ul style="list-style-type: none"> ■ Half life ~ 1 hour ■ Stimulant cardiovascular effects ■ Hyperthermia ■ Hyperreflexia ■ Stroke, seizures, coma 	<h3>Long Term Effects</h3> <ul style="list-style-type: none"> ■ Tolerance ■ Sexual dysfunction ■ Loss of smell ■ Nosebleeds ■ Nasal damage ■ Dysphagia ■ Weight loss
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Methylphenidate (Ritalin®)

- Vitamin R, R-ball, skippy, the smart drug, jif, mph
- Swallowed, snorted, smoked, injected
- CNS effects: inhibits reuptake of DA & NE
 - Alertness, energy, euphoria
 - Psychosis, paranoia, seizures, stroke
- Physical effects:
 - Stimulant cardiovascular effects



Amphetamines

<h3>Medical</h3> <ul style="list-style-type: none"> ■ Dextroamphetamine ■ Dexedrine®, Dexampex® ■ Amphetamine & dextroamphetamine ■ Biphentamine or Adderall® 	<h3>Street</h3> <ul style="list-style-type: none"> ■ Ice, benn, bennies, hearts, pep-pills, dex, dexies, truck-drivers, beans, jolly beans, black beauties, crank, pink football, crosses, LA turnaround ■ Oral, sniffed, smoked, injected
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Amphetamine Pharmacology



- Cause release of amines
 - Norepinephrine, serotonin, dopamine
- Termination of active drug use
 - Exhaustion with excessive sleeping
- Toxicity
 - Heart failure, delirium, coma, convulsions, death
 - Psychosis

MDMA (Ecstasy)



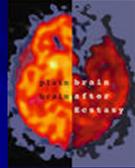

- 3,4-methylene-dioxymethamphetamine
- Ecstasy, MDMA, Adam, X, E, love drug
- Oral, snorted
- Half life ~ 7 hours
- Club drug, raves
 - Increased potency causing death recently

MDMA (Ecstasy)



- **CNS effects:**
 - Lowers inhibition, increases energy, euphoria, impaired memory & learning
 - Confusion, depression, anxiety, nausea, blurred vision
- **Physical effects:**
 - Sexual arousal, bruxism, trismus, restless legs
 - Dry mouth, urinary retention, ↓ thirst & sleep
 - Stimulant cardiovascular effects

MDMA (Ecstasy)



- **Hyperthermia:**
 - Liver, kidney, heart failure → death
- **Chronic use:**
 - Mood swings, depression, impulsivity, memory loss, aggression, progressive neurodegeneration

Methamphetamine Crystal Meth




- Speed, meth, ice, crystal, crank, fire, chalk, glass, go fast
- Raves
- Swallowed, snorted, injected or smoked
 - “chasing the white dragon”
- Half life ~ 10-12 hours
- A “run”: repeated use for several days

Methamphetamine Crystal Meth



- **CNS effects:**
 - Alertness, energy, euphoria, aphrodisiac
- **Physical effects:**
 - Stimulant cardiovascular effects
 - Hyperthermia
 - Intense itching leading to skin sores



Crystal Meth Chronic Use

- **Neuronal damage**
- Paranoia & hallucinations
- Cognitive impairment
- Mood disturbance, aggression
- Hyperawareness
- Irritability / Agitation
- Psychosis with homicidal or suicidal thoughts
 - May persist for months
- ↑ risk for STD's, HIV, hepatitis
 - Multiple partners, shared needles
- Bruxism
- Rapid tooth decay
- Cardiovascular problems
- Pulmonary damage

Khat




- Grows as a bush in Africa and the middle East
- Religious communities use it to attain euphoria
- Chewed or steeped like tea
- Cathinone & cathine is the psychoactive agent
- CNS effects: euphoria, excitation
- Physical effects: ↑ BP & heart rate, arrhythmia, cardiac arrest, constipation, ulcers
- Chronic use: fear, anxiety, agitation, confusion, aggression, hallucinations, paranoia

Designer Drugs – Bath Salts Synthetic Cathinones



- Ivory wave, Cloud 9, Bloom, Vanilla sky, Flakka, Lunar Wave, Acarface, White Lightning
- Mephedrone, flephedrone, ethylcathinone, methylone, methylenedioxypropylvalerone (MDPV), alpha-PVP
- Swallowed, snorted, smoked or injected
- Designer drug created to mimic illegal drugs but avoid existing laws
- Sold under the name bath salts, insect repellent, plant food, cleaner

Designer Drugs Synthetic Cathinones “Bath salts”

- Difficult detection by dogs
- CNS effects:
 - Euphoria, excitement, increased sex drive
 - Hallucinations, extreme anxiety & agitation, confusion, paranoia, psychosis, violence, suicidal thoughts, seizures
 - Irritability, depression
- Physical effects:
 - Stimulant cardiovascular effects
 - Rhabdomyolysis, kidney failure
 - Death



Stimulant Withdrawal

- Anxiety
- Distorted sleep
- Chronic fatigue
- Irritability
- Difficulty concentrating
- Craving
- Depression
- Paranoia
- Suicidal or homicidal ideation
- Chronic psychosis
- GI distress



Stimulants - Rehabilitation

- Monitor BP, temperature, hydration, electrolytes
- Calming techniques
- Reassurance
- Supportive measures
- Non-pharmacologic mainly
- Severe agitation
 - benzodiazepine
- Psychosis
 - High potency anti-psychotic e.g. haloperidol



Stimulants Dental implications

- Blood pressure
- Potential for myocardial ischemia
- Cardiac arrhythmias
- Temperature
- Irritability or agitation with dental treatment
- Dehydration
 - Especially after weekend raves

Stimulants – Dental Implications

Epinephrine

- Tachycardia
- Arrhythmia
- Hypertension
- Stroke



Pain, Anxiety, Post-operative Analgesia

- Effective use of local anaesthesia
- Oral sedation, nitrous oxide
- NSAID's for analgesia

Others:
GHB
Sedatives
Inhalants
Alcohol

Gamma-Hydroxybutyrate (GHB)



- Treats cataplexy & narcolepsy under the name sodium oxybate (Xyrem®)
- Street: Liquid X, G, liquid E, lollipops
- Salty or soapy taste
- Produced naturally in the body,
 - metabolite of GABA, acts on GABA_B
- Date rape drug
- CNS effects: Euphoria, hallucinations

GHB



- Other effects:
 - Amnesia, disinhibition, relaxation of voluntary muscles
 - Drowsiness, dizziness, nausea, vomiting, headache, hypotension, hypothermia, ataxia, tremors, seizures, respiratory depression, coma, death
- Dangerous in combination with alcohol
 - Both CNS depressants
- Overdose - unknown concentration or purity

Flunitrazepam (Rohypnol®)



- Roofies, roofinol, forget me pill
- Ingested, snorted
- Added to alcoholic beverages in unsuspecting victims
- CNS effects:
 - Drowsiness, loss of inhibition, amnesia, relaxation, confusion
- Available in some countries but not Canada or U.S.
- Legal manufacturers have added blue or green dye to color beverages & make them murky

Sedatives/Tranquilizers

- Barbs, Phennies, Reds, Yellow, Candy, Tranks, Valium, roofies
- Anxiety, sedation, insomnia, or used in combination
- Barbiturates
 - Benzylbutylbarbiturate, amobarbital, secobarbital, pentobarbital, phenobarbital
- Benzodiazepines
 - Alprazolam (Xanax), clonazepam (Rivotril), diazepam (Valium), lorazepam (Ativan), temazepam (Restoril)
- Antipsychotics
- Chloral hydrate

**GHB & Sedatives
Dental Implications**

- GHB - treat like benzodiazepine
- Withdrawal effects
 - Irritability & anxiety
- Cross tolerance
 - Oral sedation, nitrous oxide, opioids
- Pain Management: NSAIDs
 - Caution with opioids

Inhalants/Aerosols



- Poor man's drug
- Substances:
 - Volatile gases: butane, propane, propellants
 - Glue, gasoline, toluene, printing fluid, cleaning solvents, benzene, acetone, spray paint,
 - Aerosols: deodorants, hair spray, freon
 - Anaesthetic gases: nitrous oxide, chloroform, ether

Inhalants/Aerosols



- Street names: Snappers, poppers, rush, bolt, kix
- Nitrites (Poppers): club scene to promote sexual excitement & loss of social inhibitions to ↑ sex
 - Enlarged blood vessels
 - Enhanced sexual pleasure
- Nitrous oxide:
 - laughing gas, balloons, whippets

Inhalants/Aerosols

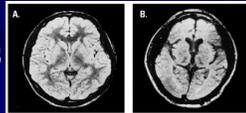


- Bagging:
 - Pouring liquid or discharging gas into plastic bag or balloon
- Sniffing:
 - Holding mouth over container as gas is discharged
- Huffing:
 - Holding a soaked rag over mouth or nose
- Torching:
 - Inhaling fumes discharged from a cigarette lighter then igniting the exhaled air

Inhalants/Aerosols

- CNS effects:
 - Euphoria, disinhibition, impaired judgment, hallucinations
- Other effects:
 - Drowsiness, dizziness, confusion, headache, slurred speech, impaired motor function, muscle weakness, cramps, nausea & vomiting, sneezing, coughing
- Death: Aspiration, asphyxiation

Inhalants/Aerosols



- Chronic Use:
 - Brain damage, ataxia, peripheral neuropathy, loss of consciousness, convulsions
 - Fatigue, headaches, encephalopathy, hearing & visual impairment
 - Memory disturbance, impaired thinking, irritability, hostility, paranoia
 - Pulmonary, bone marrow, liver & renal damage,
 - Arrhythmia, cardiac arrest, death
 - Sinusitis, rhinitis, laryngitis, weight loss
- Tolerance, psychological dependence

Inhalants/Aerosols

- History of solvent use
 - High rate of psychopathology
 - Alcoholism, depression, antisocial personality disorder



Inhalants Dental Implications

- Potential for end-organ damage
 - Heart
 - Lung
 - Brain
 - Kidney
 - Liver
- Tests: exercise tolerance, PFT's, creatinine, liver function tests

Alcohol



- 20-30mg/100mL (4-6mmol/L)
 - Impaired judgment & impulsivity
- 80mg/100mL (17mmol/L)
 - Slurred speech, incoordination, unsteady gait, inattention
- Higher levels
 - Cognitive deficits, aggressiveness, anterograde amnesia (blackouts)
- Ontario legal limit: 0.05 (50mg/100mL)

Alcohol



- Onset: 15 minutes Peak: 30-60 min
- Elimination: 10g/hour (~30mL of whiskey or 1 bottle of beer)
 - Blood alcohol level declines 3-7mmol/L (~15mg/100mL)
- Acute effects:
 - Disinhibition, euphoria, relaxation, agitation, drowsiness, impaired cognition, judgment & memory, motor dysfunction

Alcohol



- ↓ hepatic metabolism of other drugs
- Chronic effects:
 - Tolerance, psychological & physical dependence
 - ↑ metabolism of other drugs
- Physical (chronic use):
 - Hand tremor, dyspepsia, diarrhea, polyuria, impotence, pancreatitis, headache, hepatomegaly & cirrhosis, peripheral neuropathy, cardiomyopathy (heart failure)

Alcohol



- Mental (chronic use):
 - Memory blackouts, nightmares, insomnia, hallucinations, paranoia, intellectual impairment, dementia
- Wernicke-Korsakoff syndrome:
 - Vitamin B1 (thiamine) deficiency
 - Ocular disturbances, impaired memory & dementia, unsteady stance & gait

Alcohol



- Toxicity: CNS depression, ↓ reflexes, cardiac dysfunction, flushed skin → cyanosis, hypoglycemia, hypothermia, peripheral vasodilation, shock, respiratory depression, coma
 - Treatment: thiamine, benzodiazepine, hydration & electrolyte supplementation, antipsychotics, β-blockers, SSRI's if concomitant depression
- ↑ risk if taken with other CNS depressants

Alcohol Withdrawal



- Mild: insomnia, irritability, headache
- Severe:
 - Phase 1: tremor, tachycardia, diaphoresis, labile BP, nausea, vomiting, anxiety
 - Phase 2: visual & auditory disturbance
 - Phase 3: seizures (tonic-clonic) → status epilepticus
 - Phase 4: delirium tremens (DT's) autonomic hyperactivity (↑ HR & BP), severe hyperthermia, DEATH

Protracted Alcohol Abstinence Syndrome

- Sleep dysregulation
- Anxiety, irritability, mood instability
- Cognitive impairment persisting for weeks
- Risk of relapse
- ↓ Hepatic metabolism of other drugs

Alcohol Dental Implications

- Potential liver toxicity
 - Hepatitis
 - Cirrhosis / Ascites
 - Portal hypertension
 - Bleeding disorder: coagulopathies, GI bleed
- Anemia
- Cardiomyopathy
- Brain damage/Neuropathy

Summary Street Drugs

- Very prevalent
- Be open-minded during medical history taking
- Medical history accuracy
 - Double their drug & alcohol use estimates ???
- Polysubstance abuse
- Purity / Drug Lacing
- Concurrent psychiatric diseases

Summary Street Drugs

- Addiction is lifelong
 - Even if completely rehabilitated
- Differentiate acute, chronic, withdrawal or rehabilitated patients
- End-organ damage
 - Cardiovascular, pulmonary, hepatic, renal
 - Preoperative blood work
- Vital signs:
 - BP, heart rate, respirations, temperature

Summary Street Drugs

- Cross-tolerance
- Postoperative analgesia challenging
- Drug seeking
- Infectious risk:
 - HIV
 - Hepatitis
 - Abscess / Osteomyelitis

