

Medical complications of substance use disorders

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alcohol

- **Alcohol equivalents for standard drink:**
- 0.6 fluid ounces = 10 grams of EtOH =
- 12 ounces of beer =
- 5 ounces of wine =
- 1.5 ounces of 80 proof (40% ethanol by volume) distilled spirits

alcohol

- 88% of the US population report using alcohol at least once in their lifetime
- “Current alcohol use” (defined as use in the past 30 days)
- 3.9% among 12- to 13-year-olds to nearly
- 70% of 21- to 25-year-olds. Prevalence decreased among older groups, although it was nearly
- 50% among 60- to 64-year-olds.

Alcohol-related liver disease (ALD): risk factors

- **Amount of alcohol consumed:**
 - Reversible fatty liver (steatosis) may be observed after a single heavy drinking episode.
 - ALD usually requires regular intake of >40g/d for > 10 years (in men).
 - Risk of severe liver damage rises to approximately 50% with chronic use
 - Does not reach 100% even at the highest levels of alcohol consumption.
- **Gender:**
 - Women at greater risk than men for a given level of alcohol consumption.
 - Risk of ALD becomes evident at 20g/d in women.
 - Differences related to:
 - Body composition
 - Average weight
 - Gastric alcohol dehydrogenase activity
 - Hepatic alcohol metabolic rate
 - Liver mass per kilogram of body weight difference in women versus men

Alcohol-related liver disease (ALD): risk factors

- **Genetic:**

- ✓ Cloninger type I and II

- ✓ Babor type A and B

- ❖ Genetic susceptibility to dependence is highly correlated with progression of liver disease.

- **Other liver insults**

- ✓ **Obesity:**

- Commonly associated with fatty liver disease.

- Interaction in the liver between alcohol and obesity

- Risk factor for alcohol hepatitis and cirrhosis

- ✓ **Chronic viral hepatitis (CVH):**

- Chronic EtOH use + CVH (esp. Hep C) → liver fibrosis

- ✓ **Ingestion of hepatotoxins:**

- EtOH + acetaminophen, industrial solvents, anesthetic gases, illicit drugs → ALD

Clinical features

- **Alcohol-related fatty liver disease (steatosis):**

- ✓ Often asymptomatic and self-limited
- ✓ May be completely reversible with abstinence
- ✓ **S/SX:**
 - Anorexia
 - Nausea and vomiting
 - RUQ pain or discomfort
 - Liver is enlarged, soft, or firm, tender?
- ✓ **Typically no signs of chronic liver disease (yet)**

- **Alcohol-related hepatitis:**

- ✓ Mild forms > severe
- ✓ **S/SX:**
 - Anorexia
 - Nausea
 - RUQ pain or discomfort
 - Fever
 - Elevated liver enzymes (AST/ALT ratio >2)
 - Increased bilirubin with jaundice
 - Increased INR with bruising
 - Encephalopathy (wet brain)
 - Ascites

Clinical features: alcohol-related cirrhosis

- Portal hypertension → variceal bleeding and/or ascites
- Recurrent infection
- Hepatocellular carcinoma
- **S/SX:**
 - ✓ Decreased muscle mass
 - ✓ Palmer erythema
 - ✓ Spider nevi
 - ✓ Loss of body hair in males
 - ✓ Hirsutism in females
 - ✓ Gynecomastia
 - ✓ Splenomegaly
 - ✓ Caput medusa

- **Decompensated liver disease:**
 - ✓ Jaundice
 - ✓ Encephalopathy
 - ✓ Petechial hemorrhage or ecchymosis
 - ✓ Ascites

Treatment of ALD

• Stop drinking!!!

✓ Twelve-step based abstinence therapy

✓ Medications:

➤ Acamprosate

➤ Naltrexone (associated with dose -dependent hepatotoxicity if dose > 300 mg/day)

➤ Disulfiram (Antabuse) is hepatotoxic itself and contraindicated

Cardiovascular consequences of alcohol use

- **Alcohol-related heart disease is dependent on amount X time.**

- ✓ Heavy use of EtOH = 14 standard drinks/week in men; 7 standard drinks/week in women
- ✓ Cardiac output increases even after small amount of EtOH
- ✓ Ejection fraction decreases during alcohol use
- ✓ Acute myocardial depression may occur even after binge drinking

- **Alcoholic cardiomyopathy:**

- ✓ Second leading cause of dilated cardiomyopathys in Western society
- ✓ Worldwide 1/3 to 1/2 of all cases of dilated cardiomyopathy are 2/2 alcohol
- ✓ Product of amount X time (usually 80 to 90 g/d X 5 years)
- ✓ Independent of nutritional status
- ✓ Heart changes structurally
- ✓ Treatment: **STOP DRINKING**, may require cardiac transplantation

Cardiovascular consequences of alcohol use

- **Hypertension:**

- ✓ Associated with moderate/heavy EtOH use
- ✓ Particularly severe when associated with sleep apnea
- ✓ Effects may persist even after 4 weeks of abstinence
- ✓ Severity of HTN is EtOH dose-dependent

- **Atrial fibrillation (so-called “Holiday heart”):**

- ✓ Onset of AF in an alcoholic = significant heart disease

- **Coronary artery disease** Low/moderate EtOH use (5 to 25g/d) is protective

- ✓ Heavy EtOH use → increased CAD
- Increase coronary artery calcification and atherosclerosis

- **Stroke (at any level of consumption):**

- ✓ Lower risk of ischemic stroke
- ✓ Higher risk of hemorrhagic stroke

Other medical complications due to alcohol abuse

- **G.I. complications:**

- ✓ Parotid gland enlargement and dysfunction
- ✓ Poor dentition
- ✓ Gastroesophageal reflux disease (GERD)
- ✓ Gastritis (can be very severe or hemorrhagic)
- ✓ *H. pylori* infection → ulcerative disease
- ✓ Acute alcoholic pancreatitis (30% of cases associated with alcohol)
- ✓ Chronic pancreatitis (fibrosis and severe chronic pain, pancreatic insufficiency)
- ✓ Acute and chronic diarrhea
- ✓ Vitamin and nutrient malabsorption including lactase deficiency
- ✓ Non-ulcerative inflammatory changes in the colonic mucosa
- ❖ ***Increased risk for cancer of the tongue, mouth, pharynx, larynx, esophagus, stomach, pancreas, colon, rectum, and liver.***

Other medical complications due to alcohol abuse

- **Renal:**

- ✓ Anion gap acidosis
- ✓ Renal failure secondary to rhabdomyolysis
- ✓ Hepatorenal syndrome (ALD/cirrhosis → renal failure; often fatal)
- ✓ Renal failure secondary to ingestion of toxic alcohols (MetOH, IsoOH)

- **Metabolic**

- ✓ Severe hypokalemia, hypomagnesemia, hypophosphatemia, B12 and folate deficiency

- **Respiratory tract:**

- ✓ Aspiration, pneumonia

- **Neurological:**

- ✓ Wernicke-Korsakoff syndrome (2/2 thiamine deficiency; seen acutely)
- ✓ Pellagra (2/2 niacin deficiency)
- ✓ Alcohol-related dementia (seen after chronic use)

Morbidity and mortality from acute alcohol intoxication

- 600,000 ED visits each year
- + BAL detectable in 15 to 40% of ED patients
- EtOH responsible for injury in 30 to 50% of trauma patients

Acute alcohol poisoning



6 a day

An average of 6 people die of alcohol poisoning each day in the US.



3 in 4

76% of alcohol poisoning deaths are among adults ages 35 to 64.

Please say that again



76%

About 76% of those who die from alcohol poisoning are men.

Effects of BAL in the absence of tolerance

Behavioral Effects and Tolerance

- **"Legal intoxication"** with alcohol in most states requires a blood alcohol concentration of 0.08 g/dL, while levels of 0.04 or even lower are cited in other countries. In INDIA 0.15g/dL.
- **Effects of Blood Alcohol Levels in the Absence of Tolerance.**

Blood level g/dL	Usual Effect
Less than 0.03	Not noticeable
0.03-0.05	Selective impairment
0.05-0.10	Slight impairment
0.10-0.15	Under the influence
0.15-0.20	Drunk
0.20-.30	Very drunk
0.30-0.35	Stupor to coma
Over 0.35	Comatose to death

Cardiovascular effects of opioids

- **Significant medicinal value:**

- ✓ Lower heart rate

- ✓ Lower blood pressure

- ✓ Decrease preload

- ✓ Analgesic

- ✓ Anxiolytic

- **Primary cardiovascular risk infective endocarditis (IE) in IVDU:**

- ✓ Right-sided valvular disease (typically tricuspid valve) is much more likely to be associated (with IVDU).

- ✓ Patients with opioid use disorders are at increased risk for repeated episodes of endocarditis (with IVDU).

Other medical complications associated with opioid use disorder

- **Liver:**

- ✓ **Blood-borne hepatitis viruses (B, C, and D) (with IVDU):**

- 60 to 80% of Hep C infected individuals develop chronic Hep C.

- 40% of these patients will progress to cirrhosis over a 30 to 40-year period.

- **Lung**

- ✓ Ineffective cough and aspiration

- ✓ Respiratory infections 2/2 nonsterile injection technique, bacteria contaminated injection substances (with IVDU)

- ✓ Fibrotic and granulomatous lung disease from adulterants such as talc, cellulose, mannitol, etc. (with IVDU)

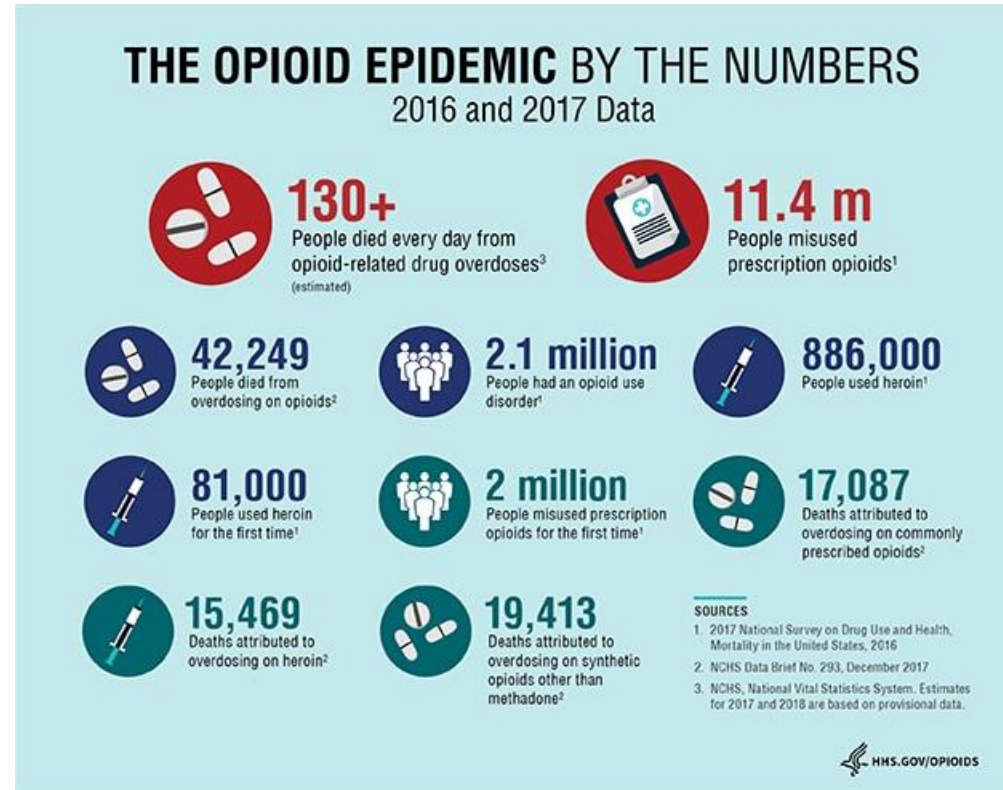
- ✓ Chronic hypoxemia

- ✓ Pulmonary hypertension (with IVDU)

- ✓ Septic thromboemboli and drug/needle embolization (IVDU)

- ✓ Others: pneumothorax, empyema, mycotic aneurysms, emphysema (with IVDU)

Opioid crisis



Opioid deaths by the number

Location	Natural and Semisynthetic Opioids (e.g. oxycodone, hydrocodone)	Synthetic Opioids, other than Methadone (e.g. fentanyl, tramadol)	Methadone	Heroin
United States	14,487	19,413	3,373	15,469
Kentucky	403	465	48	311
Ohio	785	2,296	96	1,478
Indiana	231	304	34	297

Signs of opioid overdose

- The classic signs of opioid toxicity include:
 - •Depressed mental status
 - •Decreased respiratory rate
 - •Decreased tidal volume
 - •Decreased bowel sounds
 - •Miotic (constricted) pupils

Toxicities of specific agents

- [Buprenorphine](#) – Partial opioid agonist; induces withdrawal in opioid-dependent patients who have full agonists in their system
- [Dextromethorphan](#) – Serotonin toxicity; at high doses exhibits some μ effects of opioids (miosis, respiratory and CNS depression) but is not a pure opioid agonist
- [Fentanyl](#) – Very short acting; may be associated with an acute amnestic syndrome in overdose [17].
- [Hydrocodone](#) – Often combined with [acetaminophen](#)
- [Loperamide](#) – QRS and QT prolongation; Wide-complex tachycardia; loses specificity for gastrointestinal tract in overdose [18-23]
- [Meperidine](#) – Seizure, serotonin toxicity (in combination with other agents) (see "[Serotonin syndrome \(serotonin toxicity\)](#)")
- [Methadone](#) – Very long-acting; QT prolongation, Torsade de Pointes (see '[Electrocardiography](#)' below)
- [Oxycodone](#) – Often combined with [acetaminophen](#); possible QT interval prolongation [24]
- [Tramadol](#) and [tapentadol](#) – Seizure

Treatment of opioid overdose

- **Begin ABC's**

- ✓ Airway

- ✓ Breathing

- ✓ Circulation

- **Naloxone (Narcan)**

- ✓ Intravenous

- ✓ Intramuscular

- ✓ Subcutaneous

- ✓ Nasal

Cardiovascular complications of stimulants: COCAINE

- Chest pain
 - Acute myocardial infarction
 - Aortic dissection
 - Stroke
 - Heart failure
 - Sudden cardiac death by malignant arrhythmia
- ❖ Any of these complications may be caused by both acute and chronic abuse***

Mechanism of cocaine's effects

- Potent sympathomimetic action
- Powerful vasoconstrictor
- Blocks presynaptic norepinephrine and dopamine reuptake
- Elevates heart rate and blood pressure
- Cocaine-induced vasoconstriction is accentuated by the presence of atherosclerosis and tobacco smoking
- Suppresses cardiac contractility
- Affects all components of hemostasis including platelet dysfunction and increases anticoagulant properties of blood

When and how

- CV symptoms occur early after cocaine use
 - Markedly elevated risk of cocaine-associated MI within the first 24 hrs.
 - Cocaine-related chest pain most frequent CV presentation after use.
 - Incidence of acute MI with cocaine-associated CP is 1 to 5%.
 - Cocaine-related aortic dissection tends to occur in young, hypertensive subjects.
 - Both ischemic and hemorrhagic strokes occur with approximately equal frequency cocaine users
- ❖ ***When treating acute MI associated with cocaine intoxication avoid beta blockers!!***



Abdominal x-ray of cocaine body packer, Miami International



Stimulants: Cocaine

Preop considerations:

- ✓ Euphoria 30 to 60 minutes but CV and neuro effects last hours
- ✓ Toxicity includes cerebral hemorrhage, stroke and myocardial infarction
- ✓ Coronary vasoconstriction 2/2 → decreased nitric oxide synthesis
- ✓ Avoid beta-blockers → unopposed alpha → hypertensive crisis
- ✓ Control of BP: Nitroprusside, Nitroglycerin, or Dexmedetomidine
- ✓ Snorting → septal destruction and soft palate necrosis → NG, ETT hazards
- ✓ Crack cocaine → preexisting interstitial fibrosis, barotrauma, alveolar hemorrhage, pulmonary HTN

Stimulants: Cocaine

Intraop:

- ✓ Hemodynamic instability 2/2 acute intoxication → ↑ T, ↑HR, ↑ or ↓ BP 2/2 catechol excess/depletion
- ✓ Hypotension → ephedrine resistant → use phenylephrine
- Ketamine or halogenated anesthetics → ↓intrinsic inotropic effects
- Alcohol + cocaine → cocaethylene → ↓ cardiac function, greatly enhanced myocardial irritability
- ❖ *Cocaethylene increases risk of sudden cardiac death 18-fold as compared to cocaine alone*
- ↑ Malignant ventricular arrhythmias 2/2 hypersensitivity to catecholamines
- ❖ *Place R2 pads prior to prep, cover with sponge then plastic adhesive drape*

Postop:

- ✓ Withdrawal → depression, irritability, increased sleep and appetite, drug-seeking behavior, AMA
- ❖ *Street cocaine is frequently contaminated with levamisole (anthelmintic and antineoplastic agent) → immunodeficiency and all its frequent postoperative complications.*

Fatal total intestinal necrosis from cocaine ingestion



Stimulants: amphetamines

- Very similar medical complications as cocaine
- Includes:
 - ✓ 3,4-methylenedioxymethamphetamine (MDMA or “ecstasy”).
 - ✓ Methylenedioxyethylamphetamine (MDEA or “eve”).
- Produce dose-dependent elevation of BP-dissipates over 3 to 4 hours and
- Heart rate-dissipates over as much as 10 hours.
- Ingestion can result in life-threatening hypertension, tachycardia, and malignant ventricular dysrhythmias.

Stimulants: amphetamines

- Associated with acute myocardial infarction and aortic dissection.
- Amphetamines worsen the prognosis of MI.
- Greatly increased risk of both hemorrhagic and ischemic stroke.
- Phenylpropanolamine (PPA), an OTC appetite suppressant, removed by the FDA due to increased risk of hemorrhagic stroke especially in young women.
- Fenfluramine (Fen/Phen):
 - ✓ Strong serotonin receptor (especially 5-HT_{2B} receptor) agonists and were also
 - ✓ Removed from market because of development of valvular heart disease similar to a complication of serotonin-secreting carcinoid tumors.
 - ✓ Similar lesions have been described in recreational amphetamine use.

Stimulants: amphetamines

- **Ischemic cardiomyopathy:**

- ✓ most commonly associated heart disease in chronic amphetamine use.
- ✓ Chronic stimulant users account for as many as 5% of all patients presenting to ERs in the United States with decompensated heart failure.
- ✓ Concentric hypertrophy is a common finding in methamphetamine users and may precede the development of heart failure.
- ✓ May result in need for cardiac transplantation.

Stimulants: surgical considerations

- **Malignant dysrhythmias:** increased with general anesthesia
- **Aortic dissection:** increased with general anesthesia
- **Acute coronary syndrome:** increased with general anesthesia
- ✓ Preop EKG if possible
- ✓ **Meth mouth → loose teeth → intratracheal migration → bronchoscopy for retrieval**
- ↓ Alveoli, ↑ arterial remodeling → pulmonary HTN
- Septal and soft palate necrosis like cocaine
- ↓ or ↑↑↑ BP crisis: increased with general anesthesia
- Preop cardiomyopathy → ↑ M and M, deterioration postop → TT or TE echo
- ❖ ***Stimulants + anesthesia → ↑ sensitization of the myocardium to catecholamines especially if hypotensive, acidotic, or hypothermic***
- Postop withdrawal or craving → ↑ risk of going AMA or using in the hospital

Select complications from other substances

- **MDMA (“Ecstasy”):**

- ✓ Life-threatening hyperthermia
- ✓ Severe hyper and hyponatremia

- **Cannabis:**

- ✓ Squamous cell carcinoma of the head/neck and lung

- **Phencyclidine:**

- ✓ Seizures
- ✓ Rhabdomyolysis → hyperkalemia, renal failure

- **Dextromethorphan:**

- ✓ Respiratory depression
- ✓ Coma

Select complications from other substances

- **Ketamine:**

- ✓ Respiratory depression
- ✓ Hypertension
- ✓ Seizures

- **Cathinone (“bath salts”):**

- ✓ Increased HR and BP
- ✓ Myocardial infarction and stroke
- ✓ Seizures

- **Gamma hydroxybutyrate (GHB):**

- ✓ Increased intracranial pressure
- ✓ Coma
- ✓ Severe tachycardia or bradycardia
- ✓ Respiratory arrest
- ✓ Death
- ✓ Life-threatening withdrawal

Select complications from other substances

- Synthetic marijuana (“Spice”, “K2”, “Skunk”, etc.):
 - Severe tachycardia
 - Myocardial infarction
 - Renal failure
 - Coma
- **Anticoagulation**
 - Contaminated with brodifacoum, a very long-acting anticoagulant commonly used in rat poison.
- ***May result in severe bleeding and death!!***

Select complications from other substances: “krokodil” (desomorphine)

- Derivative of codeine
- Illicit, home-based manufacture
- Usually injected IV
- May contain:
 - Gasoline
 - Paint thinner
 - Lighter fluid
 - HCl
 - Red phosphorus



Severe injury or death to healthcare workers

- Routine chest X-ray of a cocaine dealer and addict taken in the Emergency Room at Jackson Memorial Hospital, Miami Florida, 1992.



LOONEY TUNES



"That's all Folks!"