Medical Presentations & Complications of Substance Use

CSAM Addiction Medicine Board Review Course

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Presentation updated from 2021 Triveni DeFries, MD MPH

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CONFLICT OF INTEREST DISCLOSURE

I, Zachary Zwolak, DO, have nothing to disclose, and I will not be discussing “off label” use of drugs or devices in this presentation.

EDUCATIONAL OBJECTIVES

After attending this presentation, participants will be able to:

1. Recognize medical presentations of substance use including toxidromes and withdrawal syndromes.
2. Diagnose and manage several common medical complications of substance use.
3. Target screening for infectious complications of substance use for highest risk patients including sexual and gender minorities.

Poll:

What is your training in?

FM

IM

Psych

OB/GYN

Students

Other?

Need To Know

1. Toxidromes (clinical symptoms & management)
2. Withdrawal syndromes (clinical symptoms & management)
3. Cardiovascular morbidity: ischemia, arrhythmia, CHF
4. Pulmonary morbidity: COPD, cancer, pulmonary hypertension
5. GI morbidity: hepatitis, cirrhosis, malignancy associated with AUD
6. Infectious disease morbidity: Endocarditis, soft tissue infections, sexually transmitted infections
7. Common drug interaction concerns: serotonin syndrome, cytochrome P-450 enzyme inducer/inhibitors

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Question 1

A 32-year-old man with IV drug use presents to the emergency room. He has a runny nose, complains of diffuse myalgia, has 5 mm pupils bilaterally, and states that he has had no injection drug use in 2 days because of about 10 days of malaise and fatigue. His girlfriend told him his eyes were starting to look yellow. On exam, his temperature is 38.0°C (100.4°F), HR 97, BP 128/70, and RR 14/min. He has mild scleral icterus, scattered non-tender firm nodules in the muscles of bilateral arms and legs, and hepatomegaly, but no splenomegaly, asterixis, or ascites.

Question 1 (cont.)

Blood chemistry shows:

Total bilirubin 4.4 mg/dL

AST 580

ALT 750

Alk phos 145

Albumin 4.2

INR 1.3

Urine drug screen: THC positive, otherwise negative

Ultrasonography shows:

Hepatomegaly and diffusely decreased echotexture

Viral testing:

HIV ELISA antibody: negative

HIV p24 antigen: negative

HIV viral load: negative

Hep B surface antigen: negative

Hep B surface antibody: negative

Hep B core IgM: negative

Hepatitis C antibody: negative

Hepatitis A IgG and IgM: negative

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Question 1 (cont.)

Which test is the most appropriate next step in this patient's evaluation?

A. MRI abdomen
B. Liver biopsy
C. Ethyl glucoronide urine testing
D. Hepatitis C virus RNA

1. Answer D) **Hepatitis C virus RNA**

- In possible acute hepatitis C virus (HCV) infection, the most sensitive diagnostic test is measurement of HCV RNA. If positive, this suggests active infection.
- The patient has signs of an acute hepatitis, which include moderately elevated liver tests, jaundice, nausea, dark urine, fatigue, malaise, fever, chills that develop 2-12 weeks since exposure.
- The patient has possible exposure through injection drug use. The *incidence of HCV is approximately 20% for each year* of injection drug use, and a review estimated overall hepatitis C prevalence of about *53% among people who inject drugs* in the US.
- *Acute hepatitis C virus may remain seronegative for longer than 8 weeks. So, in cases of high risk, testing HCV RNA is appropriate.* Only about 20% of new hepatitis C infections are acutely symptomatic, which contributes to fact that many cases go undetected without routine testing.

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1. Answer D) **Hepatitis C virus RNA**

- Update: **As of 2020, CDC now recommends:**
  - **Universal one-time hepatitis C screening for all U.S. adults**
  - **All pregnant women during every pregnancy.**
  - **At anytime for those with ongoing risk i.e. IVDA, multiple sex partners**
- Injection drug use accounts for the *majority of new HCV infections* (70%), and is a driving force behind this recommendation since testing with *linkage to antiviral treatment* has the potential to decrease HCV infections
- Needle-related infections can also include skin and soft tissue infections, bloodstream and endovascular infections, epidural abscess, spinal osteomyelitis, transmission of viruses (HIV, HBV, HCV – consider prevention with *HIV PREP/PEP* and HBV & HAV vaccination)

https://www.cdc.gov/hepatitis/hcv/guidelinesc.htm

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1. Answer D) **Hepatitis C virus RNA**

- 2023 CDC Guideline Hepatitis B:
  - Screen all adults aged 18 years and older at least once in their lifetime using a **triple panel test**
  - Screen pregnant people for **hepatitis B surface antigen** (HBsAg) during each pregnancy regardless of vaccination status and history of testing
  - Expand periodic **risk-based testing** to include people incarcerated, people with a history of sexually transmitted infections or multiple sex partners, and people with hepatitis C virus infection
  - Test **anyone who requests HBV** testing regardless of disclosure of risk

https://www.cdc.gov/hepatitis/hbv/testingchronic.htm

1. Answer D) **Hepatitis C virus RNA**

- **Liver biopsy** may show histopathological features, including steatosis, lymphoid aggregates, and bile duct damage. However, these findings are not specific for HCV and similar findings are associated with several forms of acute hepatitis.
- **MRI of the liver** will detail hepatic morphology but will not contribute any more to the diagnosis than the ultrasonography.
- Alcohol can cause of acute hepatitis, though this case does not suggest its role. **Ethyl glucuronide** (EtG) is a metabolite of alcohol that can be tested in urine or hair but is generally not used in this clinical setting.

https://www.aasld.org/sites/default/files/2022-07/PracticeGuidelines-HCV-November2018.pdf

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Question 2

45-year-old male is found to have positive HCV antibodies and high HCV RNA viral load suggesting active, chronic HCV infection. He has alcohol use disorder and is interested in treatment with direct-acting antiviral therapy. **Which of the following is true regarding treatment of HCV in patients with ongoing substance use?**

A. Alcohol is not a contraindication to starting antiviral therapy
B. Alcohol does not affect liver health in people with HCV
C. There is no benefit to treating HCV in people who inject drugs
D. People cannot start medications for opioid use disorder prior to treatment for HCV

2. Answer A. **Alcohol is not a contraindication to starting antiviral therapy**

- *60-75% of patients infected with hepatitis C will fail* to clear the virus and go on to develop chronic HCV, and 16% of those will develop cirrhosis
- **Alcohol use is not a contraindication** to starting antiviral therapy. Treatment success rates appear equivalent to patients who do not drink alcohol.
- Alcohol is associated with increased hepatitis C viral load, progression of liver fibrosis and risk of developing hepatocellular carcinoma
- *HCV treatment should be offered to patients engaging in injection drug use.* High cure rates have been achieved regardless of active use of drugs or medications for opioid use disorder

ASAM Principles of Addiction Medicine, 6th edition. Chapter on Liver Disorders Related to Alcohol and Other Drug Use
http://www.hcvguidelines.org/full-report/hcv-testing-and-linkage-care

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Question 3

A 25-year-old woman comes to clinic. Six months ago, she had an episode of syncope and was hospitalized and given a new diagnosis of Hypertrophic Obstructive Cardiomyopathy (HOCM). One week after hospitalization, she failed her bar exam to practice law in California, and has been struggling with depressed mood, insomnia, and anxiety ever since.

PDMP report reveals monthly refills of lorazepam 1 mg, which she states she takes only once or twice a week on the weekends (4-6 tabs at a time). Since her HOCM diagnosis, she has also been drinking 1 glass of alcohol daily during the week/4-6 drinks daily on the weekends and using marijuana every evening (previously only occasionally). She states that her biggest source of anxiety is concern over her heart condition.

Question 3 (cont.)

In counseling this patient, which potential complication of her substance use would you consider the most immediately likely and most concerning?

A. Myocardial infarction
B. Endocarditis
C. Atrial fibrillation
D. Cerebrovascular accident

3. Answer C. **Atrial fibrillation**

- Atrial fibrillation is the most common arrhythmia in adults and is associated with heavy alcohol use.

- Occurs at some point in up to 60% of people with binge drinking (> 3 drinks at a time in women or > 4 drinks at a time in men). This most commonly presents during or after holidays or weekends when patients have consumed more than usual, earning the term “holiday heart.”

- Recent trial found atrial fibrillation burden lower in abstinence/reduced drinking group. *Alcohol use is a modifiable risk factor in management of atrial fibrillation.*

3. Answer C. **Atrial fibrillation**

- Patients with **hypertrophic obstructive cardiomyopathy (or any heart disease) are also at increased risk of atrial fibrillation** which puts them at risk of worsening cardiomyopathy, outflow obstruction, and more malignant arrhythmias including ventricular fibrillation.

- Slightly increased risk of endocarditis in HOCM patients, none of this patients' substance use patterns substantially increases that risk. You can review the *Duke Criteria* for endocarditis probability and diagnosis.

- Alcohol increases *cardiovascular risks* such as myocardial infarction and cerebrovascular accident, though less immediately likely since this risk develops with more chronic use.

Voskoboinik A, Kalman JM, De Silva A, et al. Alcohol abstinence in drinkers with atrial fibrillation. N Engl J Med 2020;382:20-28.

Question 4

A 62-year-old man is found down on the sidewalk and brought to your emergency department. Blood testing reveals a pH of 7.1 and an anion gap of 26, and an elevated serum osmolal gap. Creatinine is 3.2. Blood-alcohol level is 245 mg/dL. There are calcium oxalate crystals in his urine. He has a past history of suicide attempts.

What is your first step in treating this patient?

A. Arrange dialysis first

B. Wait for blood alcohol level to decrease and then proceed with dialysis

C. Administer fomepizole first

D. Give IV fluids and thiamine until anion gap closes.

4. Answer A. **Arrange dialysis first**

- Toxic alcohols (methanol, ethylene glycol, isopropyl alcohol) are occasionally ingested as a substitute for ethanol.
- They are metabolized by *alcohol dehydrogenase a*nd their metabolites can cause anion gap acidosis, osmolal gap and organ damage such as kidney failure.
- This patient has signs and symptoms consistent with ethylene glycol (antifreeze) toxicity, including **calcium oxalate crystals in the urine & osmole gap metabolic acidosis**.

4. Answer A. **Arrange dialysis first**

- Fomepizole is a treatment that **inhibits alcohol dehydrogenase and prevents metabolism of the ethylene glycol to its harmful metabolites**.
- However, if ethanol is co-ingested along with ethylene glycol, alcohol dehydrogenase will preferentially *metabolize ethanol first (historical treatment).*
- *If serum alcohol concentration is sufficiently high (>100 mg/dL), then there is some time before fomepizole administration is necessary*, since the alcohol dehydrogenase will first be occupied with ethanol metabolism. In this case, with a very elevated serum BAL, the first and **most important step is arranging hemodialysis** to remove ethylene glycol and its metabolites. Once these arrangements have been made, treatment with fomepizole could begin.

Question 5

A 76-year-old woman is being treating for co-occurring chronic pain syndrome, opioid use disorder, and major depressive disorder. She also has atrial fibrillation and is on anticoagulation with warfarin. She mentions at a monthly follow-up appointment that her gums have been bleeding when she brushes her teeth. INR is checked, and results 3.9. Goal INR for atrial fibrillation is 2.0-3.0.

Which medication started last month is the most likely culprit for the supratherapeutic, elevated INR?

A. Fluoxetine

B. Naproxen

C. Sertraline

D. Buprenorphine-naloxone

5. Answer A) Fluoxetine

- Warfarin is metabolized by the *cytochrome P-450* isoenzyme system (mainly **2C9**) in the liver. Many medications inhibit these isoenzymes, thereby prolonging the action of warfarin (as is the case for other medications, e.g. **methadone**) and increasing the patient's INR.

CYP450 inducers	Accelerate metabolism, decrease medication effect	Examples: rifampin, phenytoin, carbamazepine, phenobarbital, nevirapine, efavirenz
CYP450 inhibitors	Slow metabolism, increase medication effect	cimetidine, ciprofloxacin, fluconazole, erythromycin, fluvoxamine, fluoxetine

5. Answer A) Fluoxetine

- Among SSRI antidepressants, the two most potent inhibitors are fluoxetine (choice A) and fluvoxamine. The **safest are escitalopram, citalopram and sertraline (choice C).** SNRIs and TCAs have more limited impact and are likely safe with warfarin, if INR checks are instituted at the start of therapy.
- Although NSAIDs like naproxen (choice B) can increase bleeding risk through platelet inhibition and irritation of gastric mucosa, they do not affect INR.
- Buprenorphine-naloxone (choice D) is not known to affect warfarin metabolism and is primarily metabolized by CYP3A4 and 2C8

Question 6

A local hospitalist calls you for history about your 24-year-old non-binary patient (they/them) who is being admitted and is too altered to provide much history. The patient has chronic epigastric pain, nausea, and vomiting. As their addiction medicine doctor, you have been working with their primary care physician to taper their medications. They have a history of club drug (i.e., MDMA, ketamine, GHB) use as well as sedative/hypnotic and opioid use disorders.

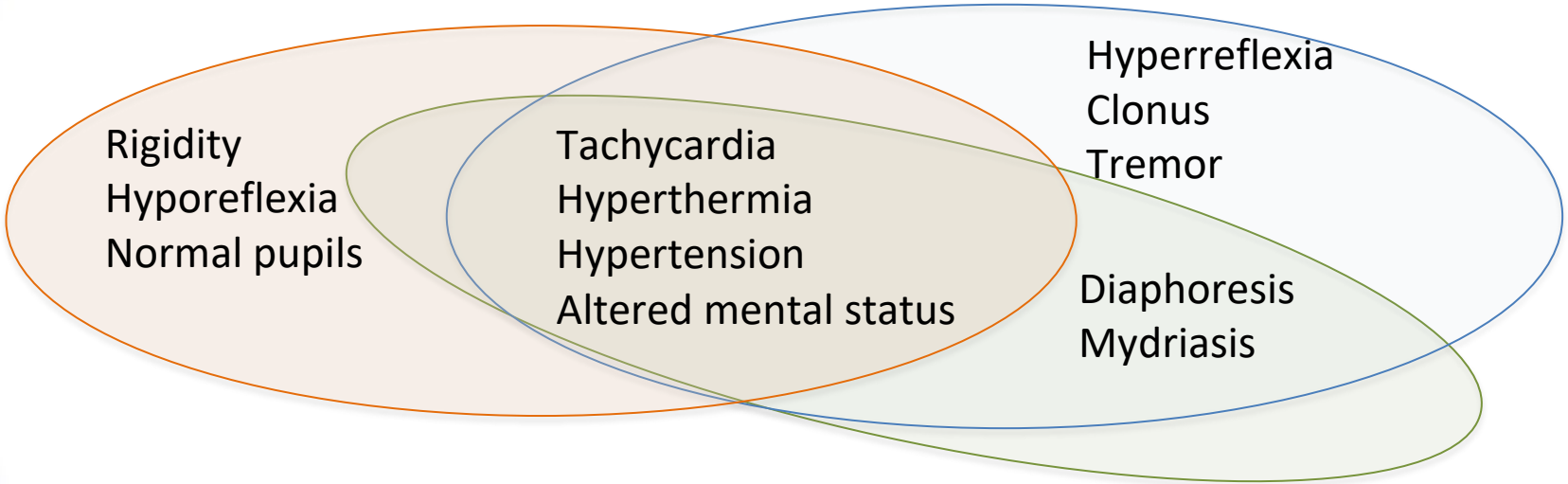
They have been taking tramadol for pain, duloxetine for pain and depression, metoclopramide and ondansetron for nausea, trazodone for insomnia. You have transitioned from alprazolam to diazepam for taper.

Question 6 (cont.)

They initially presented to the ER with tremor, diaphoresis, fever of 102°F, clonus in bilateral lower extremities, and agitation.
What do you suspect is the diagnosis, and how will you confirm it?

A. Neuroleptic Malignant Syndrome, by clinical presentation and CK level
B. Serotonin syndrome, by clinical presentation
C. MDMA (Ecstasy) intoxication, by urine drug testing
D. Meningitis, by lumbar puncture

6. Answer B) **Serotonin syndrome, by clinical presentation**



Serotonin Syndrome. *Uptodate.com*. 2023FEB16.

6. Answer C) **Serotonin syndrome, by clinical presentation**

Neuroleptic Malignant Syndrome

Rigidity	Tachycardia
Hyporeflexia	Hyperthermia
Normal pupils	Hypertension
	Altered mental status

Perry PJ, Wilborn CA. Serotonin syndrome vs neuroleptic malignant syndrome: a contrast of causes, diagnoses, and management. *Ann Clin Psych.* 2012; 24(2) 155-162.

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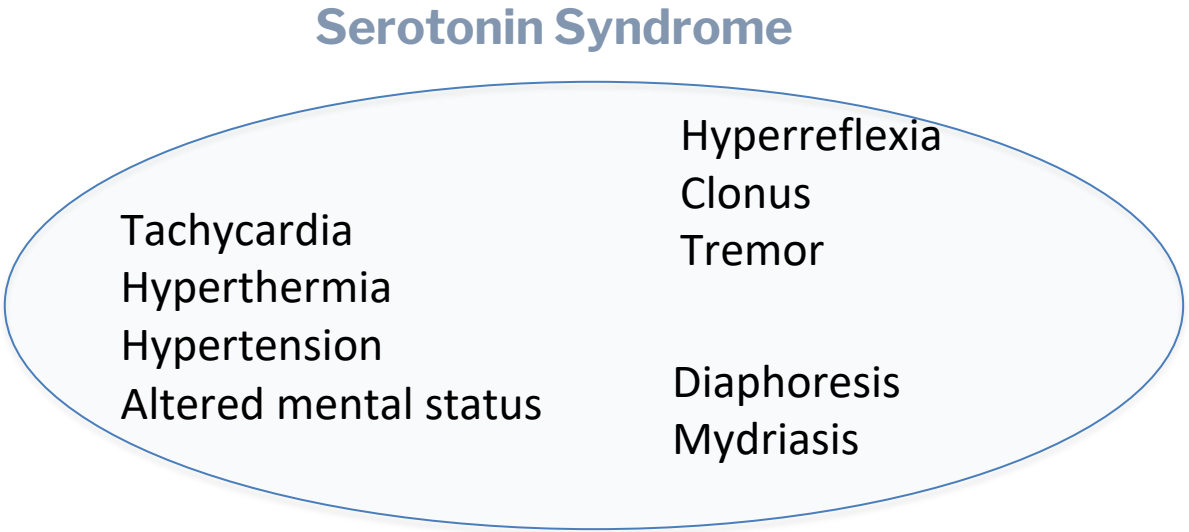
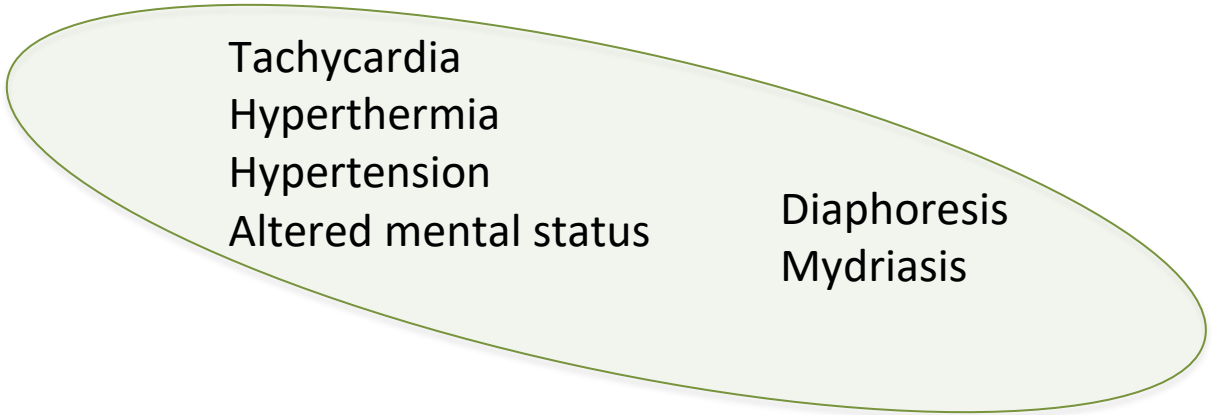
6. Answer C) **Serotonin syndrome, by clinical presentation**

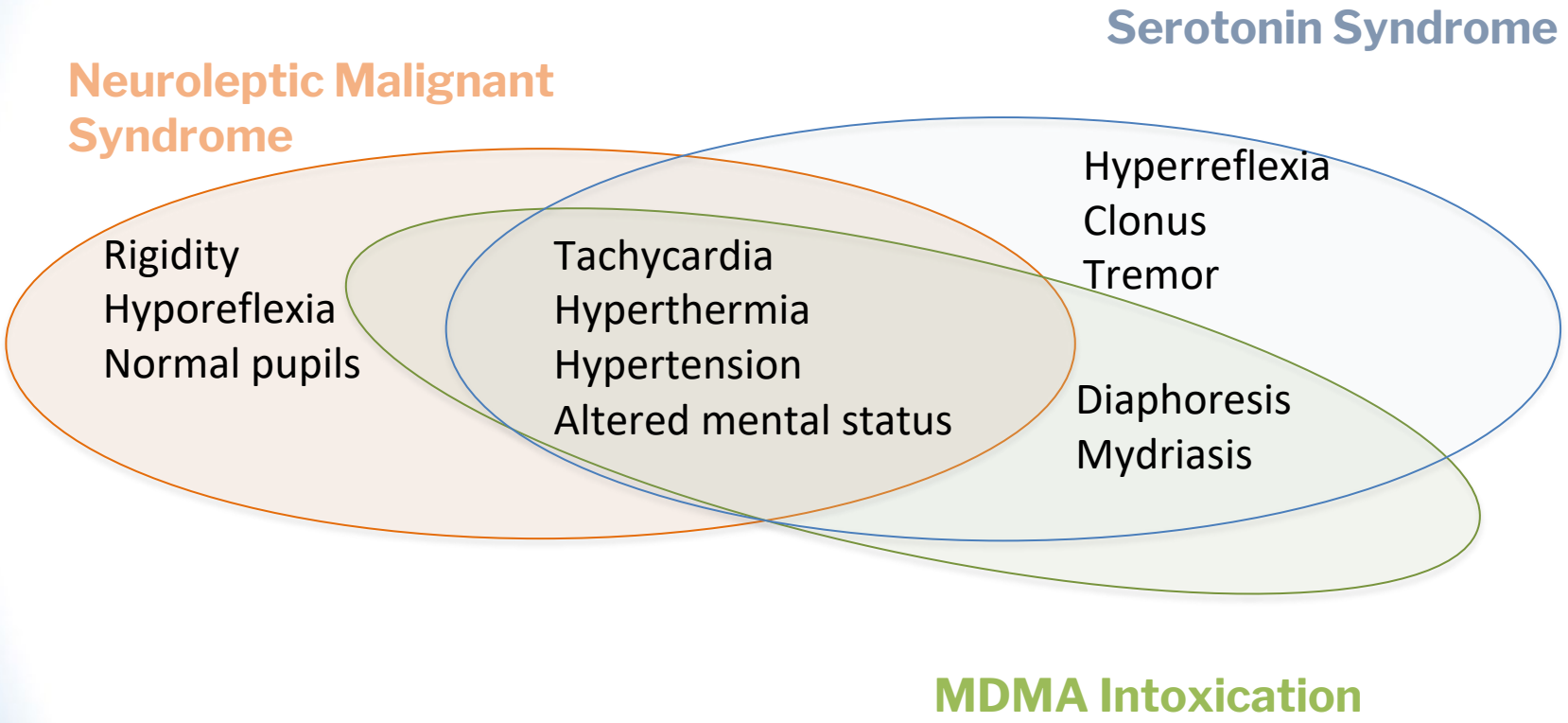


6. Answer C) **Serotonin syndrome, by clinical presentation**



MDMA Intoxication

6. Answer C. **Serotonin syndrome, by clinical presentation**



Common combos to provoke SS

SSRI + tramadol increase Tramadol

SSRI + trazodone, mirtazapine, doxepin- increase Serotonin

SSRI + Ondansetron increase each other and Serotonin

SSRI + Metoclopramide increase Ser and can cause NMS EPS sxs

Lower risk: morphine, (codeine), buprenorphine, oxycodone

Medium risk: fentanyl & methadone

High risk: tramadol & dextromethorphan

Opioids and serotonergic medications. *Medsafe*. https://www.medsafe.govt.nz/profs/PUArticles/September2022/Opioids-and-serotonergic%20medicines-risk-of-serotonin-syndrome.html. *Prescriber Update 43 (3):32-34.*

Question 7

A patient's acute alcohol withdrawal has resolved, and she is now interested in a medication for alcohol use disorder. Most recent tests show AST 659, ALT 400, T bili 4.3, INR 1.7, Albumin 2.8 and moderate ascites. She has Child-Pugh class C cirrhosis. Which medication is the *least* appropriate?

A. Acamprosate
B. Topiramate
C. Naltrexone
D. Thiamine

7. Answer C. Naltrexone

With evidence of decompensated cirrhosis, Naltrexone is relatively contraindicated.

Table 2. Summary of Pharmacologic Treatment Recommendations for Patients with Alcohol-Use Disorder and Liver Disease.

Drug	Dosage	FDA-Approved for Treatment of Alcohol-Use Disorder*	Use in Patients with Liver Disease
Naltrexone	50 mg orally once a day or 380 mg intramuscularly monthly for ≥4 mo	Yes	Yes, but use with caution in patients with acute hepatitis and decompensated cirrhosis
Disulfiram	250–500 mg once a day for ≥3 mo	Yes	No
Acamprosate	666 mg three times a day†	Yes	Yes
Baclofen	10 mg three times a day; ≤80 mg once a day	No	Yes‡
Gabapentin	900–1800 mg once a day	No	Data are limited§
Ondansetron	1–16 μg per kg of body weight twice a day	No	Data are limited¶
Topiramate	300 mg once a day	No	Data are limited‖
Varenicline	2 mg once a day	No	Data are limited

* FDA denotes Food and Drug Administration.
† In patients who weigh less than 60 kg, the recommended dose of acamprosate is 333 mg four times a day (two 333-mg pills with breakfast, one with lunch, and one with dinner).
‡ Studies of the efficacy of baclofen have had mixed results.
§ Gabapentin can be addictive.
¶ Liver toxicity has been reported with the use of ondansetron.
‖ The side effects of topiramate may mimic the symptoms of hepatic encephalopathy.

D Fuster, JH Samet. N Engl J Med 2018;379:1251-1261

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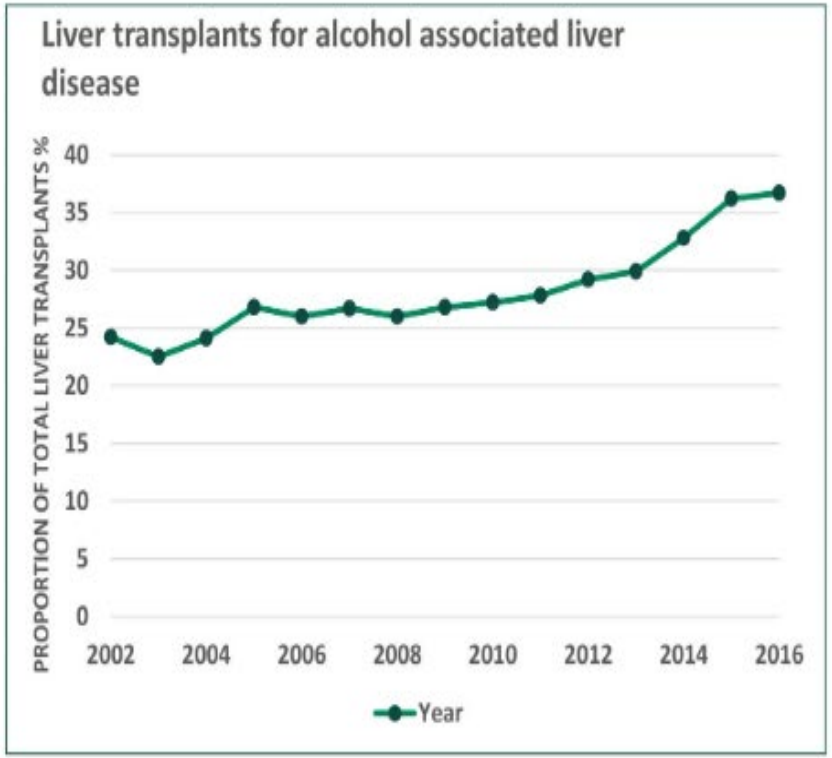
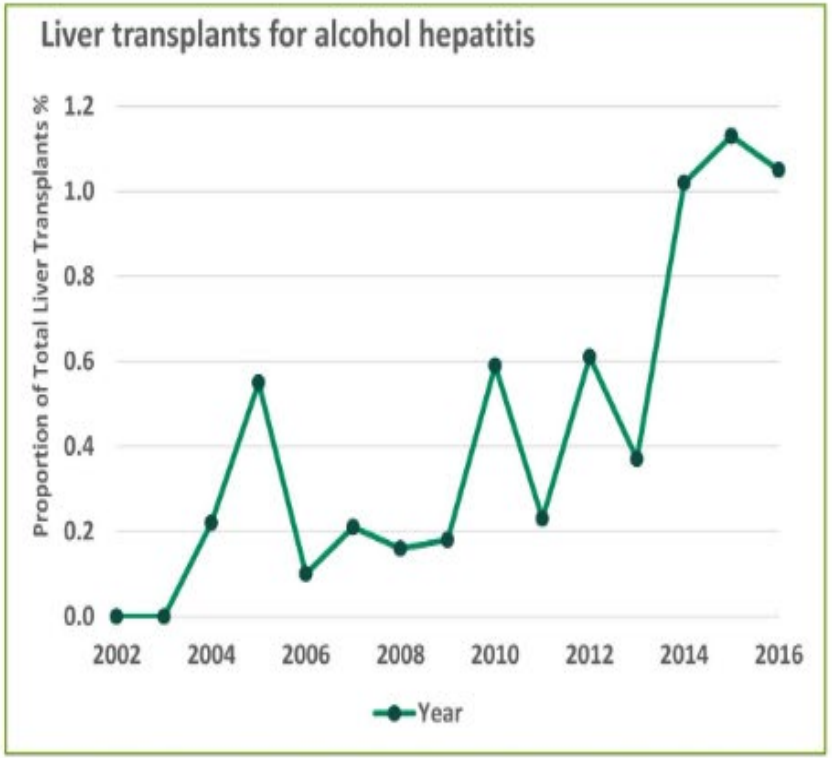
Alcohol-related liver disease is on the rise.





Mellinger et al, 2018; Lee et al, 2019

Naltrexone and Liver Disease

2022 Providers Clinical Support System Statement

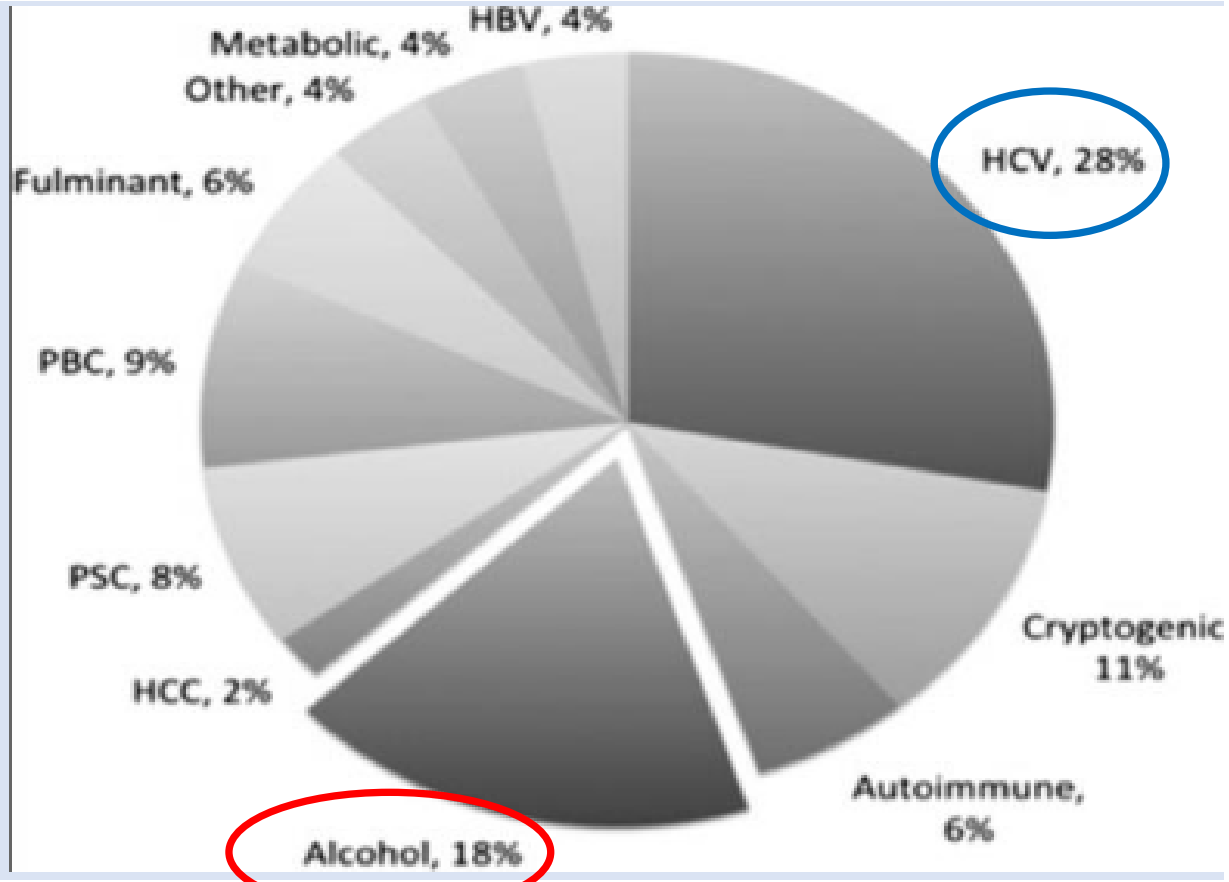
- Cytochrome P450 not involved
- Hepatic impairment, mild to mod, does not significantly alter transaminase.
- Previously advised caution to contraindicated, more recent evidence does not support.
- Patients with liver failure had concomitant HCV or HIV or other liver disease, but even these patients AST/ALT not significantly altered.

Bisaga, Adam. Monitoring of Liver Function Tests in Patients Receiving Naltrexone or Extended-Release Naltrexone. *PCSS*. 2022MAY.

Naltrexone and Liver Disease

- Summary:
  - *Do not withhold medication if no clinical signs of decompensated cirrhosis without baseline LFT.*
  - *Consider screening for HCV/HBV/HIV.*
  - *Check LFT within one month of starting therapy, but not needed if checked within past month*
  - *No recommendations on the frequency of monitoring, but consider monitoring for high-risk individuals i.e. hepatic impairment, decompensation.*
  - *Pt should report new medications that could affect liver, relapse, s/s of liver failure.*
  - *Discontinue NTX if signs of severe hepatoxicity or LFT > 10 x ULN or other acute hepatitis.*
  - *D/C NTX/xrNTX if no other etiology determined*
  - *Resume therapy when LFT < 10 x ULN*

Alcohol-related cirrhosis is now the 2nd most common indication for liver transplantation in the US



Mellinger et al, 2018;
Lee et al, 2019

Question 8

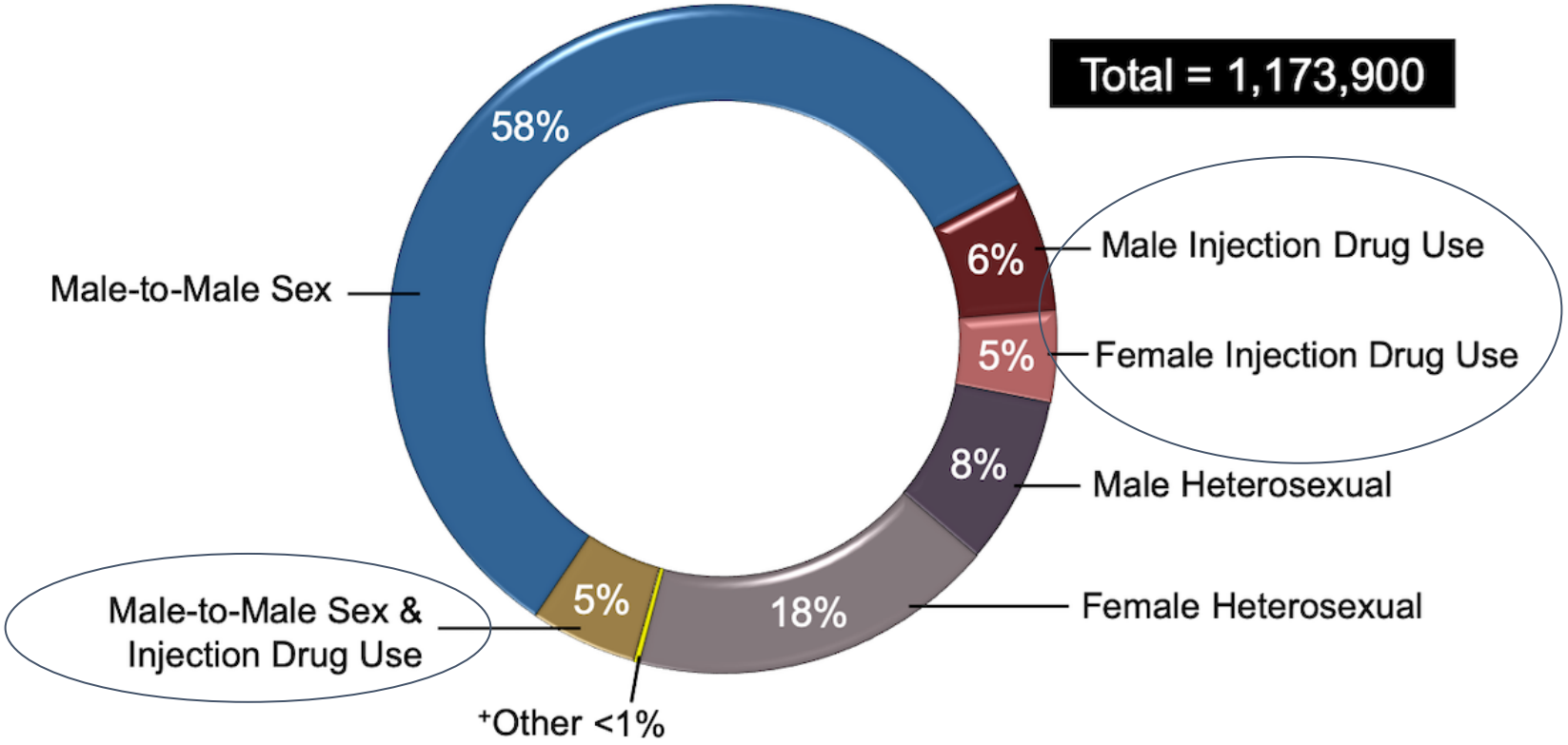
34-year-old patient presents with a rash on the flank consistent with herpes zoster which has recurred for a second time this year. She identifies as transgender woman and attends a clinic specializing in gender-affirming care. While at the clinic, she asks the clinician on duty about medications to cut back on methamphetamine use.

The clinician orders testing for which of the following conditions:

a) Diabetes
b) HIV
c) Psoriasis
d) Skin allergies

8. Answer B) HIV

- Methamphetamine use may increase risky sexual behaviors that can lead to HIV transmission
- HIV seroconversion rates are high among sexual and gender minorities (in this case transgender woman assigned male at birth)
- Regularly test for HIV infection and offer pre- and post- exposure prophylaxis (PrEP)
- If high suspicion for acute infection, check HIV viral load.
- Offer PreP: emtricitabine/tenofovir (Descovy or Truvada) or cabotegravir (Apretude)



+Other = perinatal, hemophilia, blood transfusion, and risk factor not reported or identified.

*Estimate for persons ≥13 years of age living with diagnosed or undiagnosed HIV infection

Figure 6 - Estimated Number of Persons Living with HIV in United States, by Transmission Category, 2018

Source: Centers for Disease Control and Prevention. Estimated HIV Incidence and Prevalence in the United States, 2014–2018. HIV Surveillance Supplemental Report. 2020;25(No. 1):1-77. Published May 2020.

Question 9

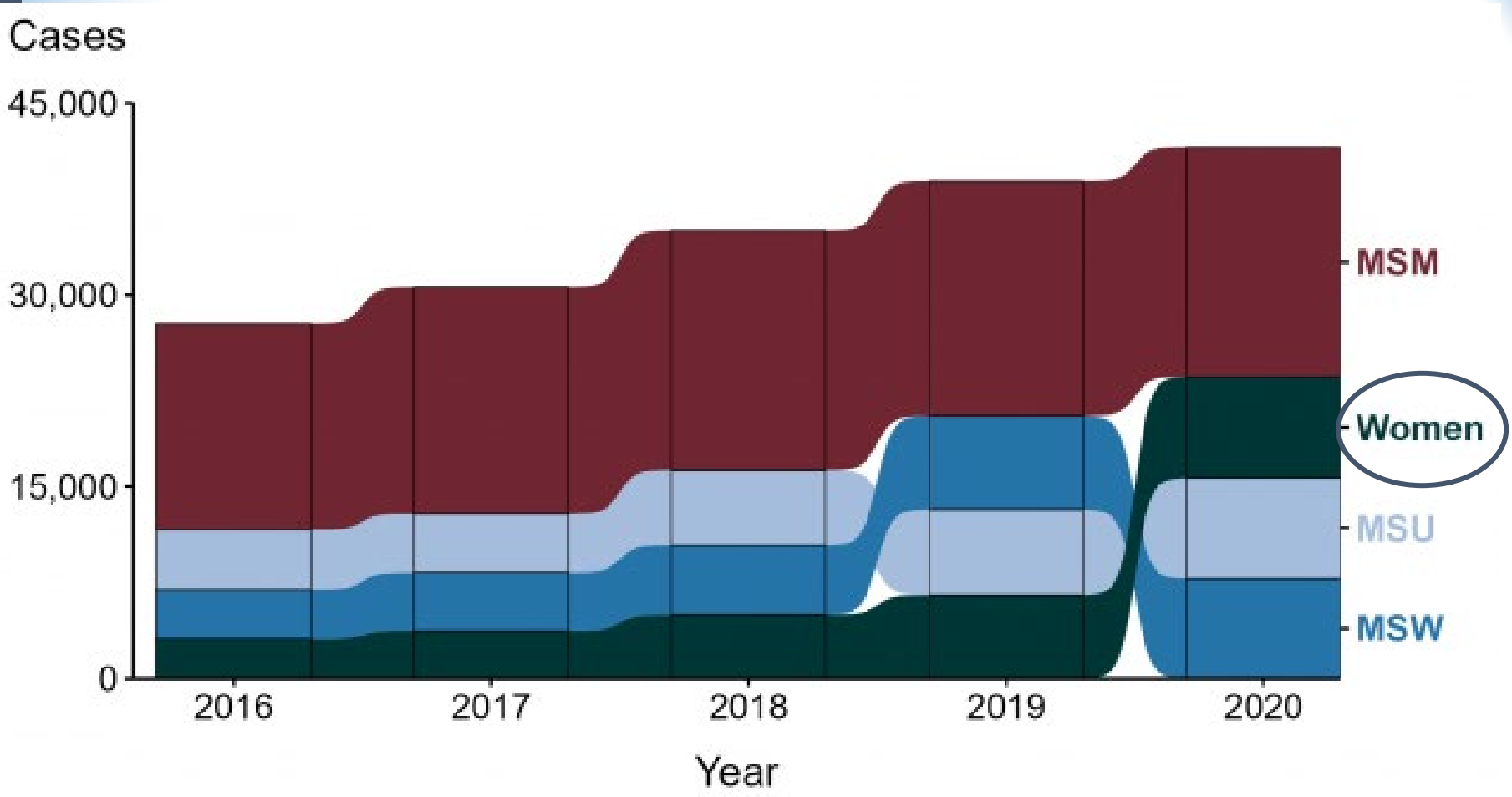
37-year-old male visits a primary care clinic affiliated with an outpatient opioid treatment program. He reports a painless ulcer on his penis. Which test is most appropriate?

A. PPD Skin Testing
B. Interferon gamma release assay testing for tuberculosis
C. RPR, VDRL Testing
D. GC/Chlamydia Urine Testing

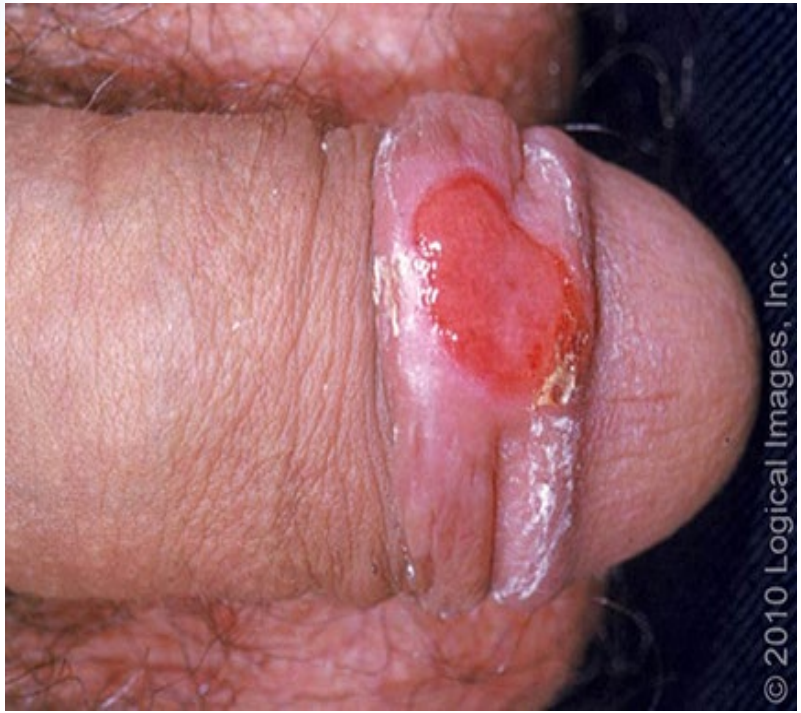
9. Answer C. RPR, VDRL Testing

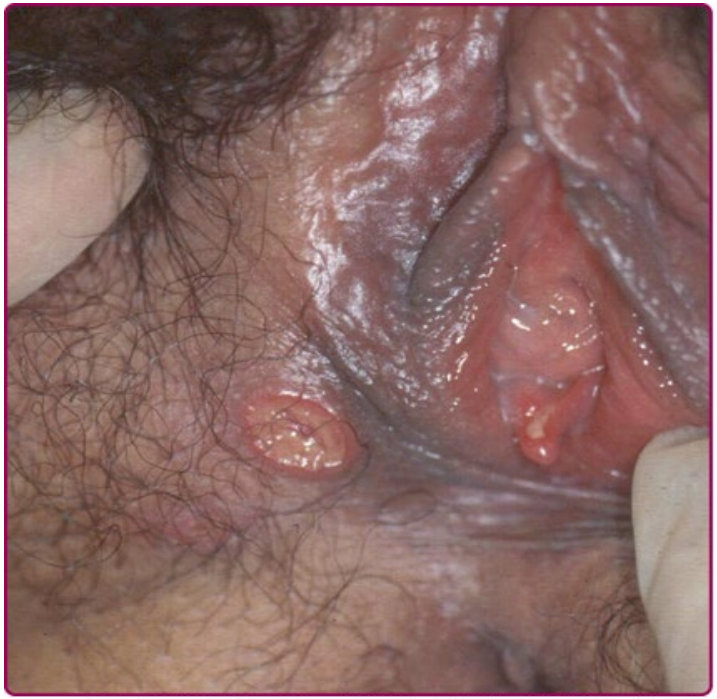
- Syphilis transmission and drug use, particularly methamphetamine use, are intersecting epidemics
- Until 2013, the increase was primarily among MSM
- During 2013–2017, syphilis rate increased 72.7% nationally and 155.6% among **women**. Reported methamphetamine, injection drug, and heroin use increased substantially among women and heterosexual men with syphilis.
- File Communicable Disease Report (in CA)

Kidd SE, Grey JA, Torrone EA, Weinstock HS. Increased Methamphetamine, Injection Drug, and Heroin Use Among Women and Heterosexual Men with Primary and Secondary Syphilis — United States, 2013–2017. MMWR Morb Mortal Wkly Rep 2019;68:144–148.



https://www.cdc.gov/std/syphilis/stats.htm





Source: Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, Wolff K: *Fitzpatrick's Dermatology in General Medicine, 8th Edition*: www.accessmedicine.com

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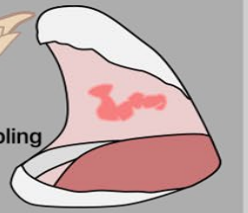
The Stages of Syphilis

Primary

The chancre lesion is the hallmark of primary syphilis. It may appear 10-90 days after exposure. Common sites include penis and labia. Other sites include anus, oral mucosa. Without treatment, chancre disappears in 2-8 weeks.

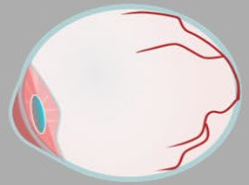
Secondary

Rash, pink to brown macules. Involves palms/soles in 50% of cases.

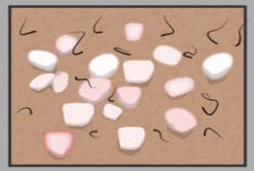


Oral lesions called "mucous patches" resembling snail tracks.

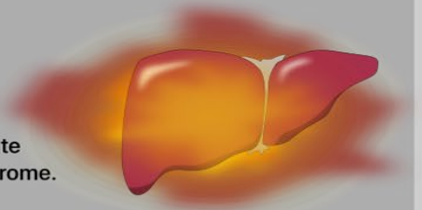
Symptomatic early neurosyphilis, cranial nerve deficits and/or aseptic meningitis presentation.



Ocular syphilis manifestations including anterior or posterior uveitis.



Genito-inguinal rashes, including tinea-mimicker or heaped-up wart-like lesions called condyloma lata.



Less common internal organ manifestations including acute hepatitis and nephrotic syndrome.

Latent

Latent syphilis refers to asymptomatic infection after the period of primary and secondary syphilis (noticed or unnoticed) has passed.

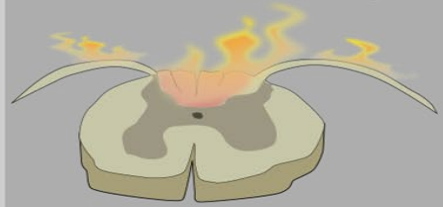
Early Latent

Early latent refers to asymptomaticpatients with positive testing, in whom history can confirm exposure to or symptoms of primary or secondary syphilis within the last year. This is group may receive single-dose penicillin like primary or secondary.

Late Latent

Late latent patients have positive serology but do not meet criteria for early. Thus, multiple doses of penicillin.

Late (Tertiary)



Late Neurosyphilis, including tabes dorsalis, gait impairments, and dementia. Tabes dorsalis damages the dorsal columns and sensory nerve roots, causing a syndrome of pain and sensory deficits similar to those of B12 deficiency.

Gumma are ulcerating granu-lomas on skin, bone, and internal organs.

Cardiovascular effects of late syphilis include aortic aneurysm and coronary arteritis.

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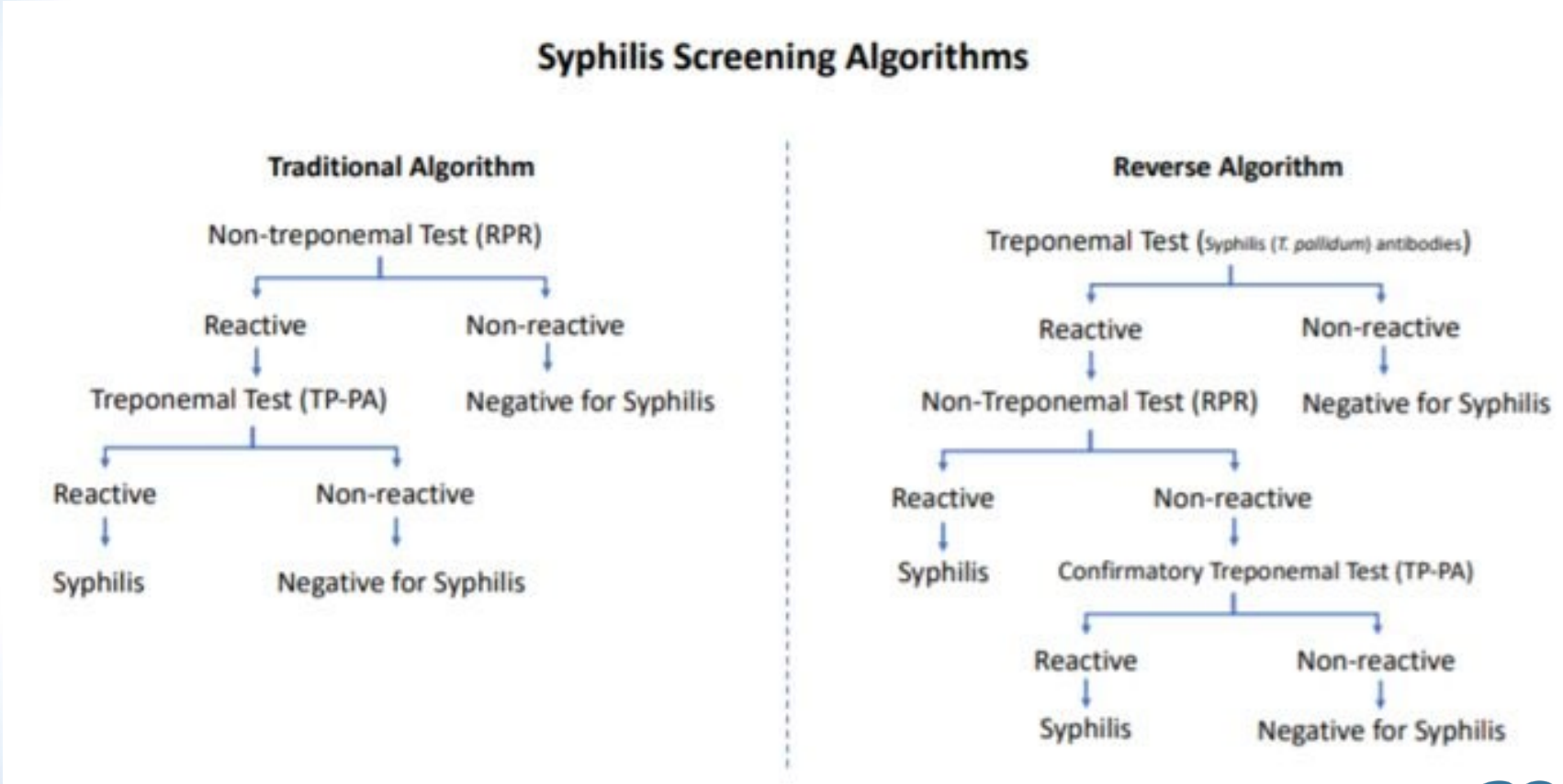
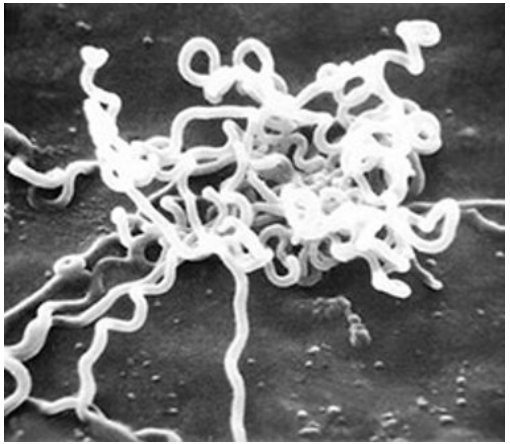
9. Answer C. RPR, VDRL Testing



9. Answer C. RPR, VDRL Testing

- Latest generation treponemal serology assays allow highly sensitive and specific screening

- *Penicillin G* is used to treat all stages of syphilis. Initiate without lab confirmation in symptomatic patients or those who report a sexual exposure.



- **Obtain pregnancy test** in all women diagnosed with syphilis.

- **Test for other sexually transmitted infections** including HIV

- Offer P*re and Post Exposure Prophylaxis for HIV*

Question 10

34-year-old man presents with increase work of breathing, cough, swelling of the legs. He reports recent increase in methamphetamine frequency and change from smoking to IV.

VS: 98.6 HR: 105 BP: 105/83 SaO2: 93% RR: 22 BMI 44

Exam reveals bibasilar rales, 5 cm of JVD, 8 cm of HJR, 1+ peripheral edema.

Which test should be ordered first:

A. Echocardiogram
B. Polysomnography
C. Right heart catheterization
D. Pulmonary function test

10. Answer A. Echocardiogram

The patient is in acute heart failure: Methamphetamine-Associated Cardiomyopathy (MACM). Likely due to methamphetamine use.

A: Polysomnography may be indicated later given elevated BMI and elevated pulmonary pressures.

C: Right heart catheterization: may be reasonable after stabilization or if not responding to treatment.

D: PFT are unlikely needed here given more likely diagnosis. Severe untreated asthma can cause pulmonary hypertension.

10. Answer A. Echocardiogram - Evaluation

- Pathophysiology: direct & indirect myocardial damage
  - *Direct: free radical, apoptosis p53, mitochondrial dysfucntion, calcium hemostasis, gene alteration*
  - *Indirect: catecholamine surge: vasospasm, HTN, tachycardia*
- Evaluation: EKG, BNP, TTE, Trop
- Sequalae: acute CHF, Ao dissection, arrhythmia, PAH

10. Answer A. Echocardiogram - Management

Acute

- Inotropes/vasopressors for shock
- Benzodiazepines for agitation
- Beta-blocker when euvolemic
  - *α&β active: carvediolol or labetolol*
- Diuresis for fluid overload
- Oxygen for hypoxia to > 92% or comfort
- Treat rhabdomyolysis, acute kidney injury

Chronic

- Abstinence
- Abstinence
- Abstinence
- guideline-directed medical therapy (up to four drug therapy; diuretics, beta-blockers, angiotensin-converting enzyme inhibitors, digoxin)
- Anticoagulation if thrombus
- Possible implantable cardioverter-defibrillator (ICD)

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Need to Know

1. Toxidromes (clinical symptoms & management)
2. Withdrawal syndromes (clinical symptoms & management)
3. Cardiovascular morbidity: ischemia, arrhythmia, CHF
4. Pulmonary morbidity: COPD, cancer, pulmonary hypertension
5. GI morbidity: hepatitis, cirrhosis, cancer
6. Infectious disease morbidity: Endocarditis, soft tissue infections, sexually transmitted infections
7. Common drug interaction concerns: serotonin syndrome, cytochrome P-450 enzyme inducer/inhibitors

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REFERENCES (1/2)

1. Centers for Disease Control and Prevention (CDC), Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis. MMWR 2001.50:1-42.
2. Degenhardt L, Peacock A, Colledge S, Leung J, Grebely J, Vickerman P, Stone J, Cunningham EB, Trickey A, Dumchev K, Lynskey M, Griffiths P, Mattick RP, Hickman M, Larney S. Global prevalence of injecting drug use and sociodemographic characteristics and prevalence of HIV, HBV, and HCV in people who inject drugs: a multistage systematic review. Lancet Global Health. 2017;5(12):e1192-1207.
3. Havens PL, Anderson JR. Updated CDC Recommendations for Universal Hepatitis C Virus Screening Among Adults and Pregnant Women: Implications for Clinical Practice. *JAMA.* 2020;323(22):2258–2259. doi:10.1001/jama.2020.3693
4. Anand BS, Currie S, Dieperink E, et al. Alcohol use and treatment of hepatitis C virus: results of a national multicenter study. *Gastroenterology*. 2006;130(6):1607-1616.
5. AASLD-IDSA. HCV testing and linkage to care. Recommendations for testing, managing, and treating hepatitis C: Key Populations: Identification and Management of HCV in People Who Inject Drugs. http://www.hcvguidelines.org/full-report/hcv-testing-and-linkage-care. [Accessed July 14, 2020].
6. ASAM Principles of Addiction Medicine, 6th edition. Chapter on Liver Disorders Related to Alcohol and Other Drug Use.
7. Voskoboinik A, Kalman JM, De Silva A, et al. Alcohol abstinence in drinkers with atrial fibrillation. N Engl J Med 2020;382:20-28. https://www.nejm.org/doi/full/10.1056/nejmoa1817591
8. Robinson K, Frenneaux MP, Stockins B, Karatasakis G, Poloniecki JD, McKenna WJ. Atrial fibrillation in hypertrophic cardiomyopathy: a longitudinal study. *J Am Coll Cardiol.* 1990;15(6):1279.

REFERENCES (2/2)

Ettinger PO, Wu CF, De La Cruz C Jr, Weisse AB, Ahmed SS, Regan TJ. Arrhythmias and the "Holiday Heart": alcohol-associated cardiac rhythm disorders. *Am Heart J.* 1978;95(5):555.

Jammalamadaka D, Raissi S. Ethylene glycol, methanol and isopropyl alcohol intoxication. *American Journal of the Medical Sciences*, 2010; 33 (3) 276-281.

Druteika D, Zed P, Ensom M, Role of fomepizole in the management of ethylene glycol toxicity. *Pharmacotherapy,* 2012; 22(3) 365-372.

Sansone R, Sansone L. Warfarin and antidepressants: happiness without hemorrhaging. *Psychiatry (Edgmont), 2009; 6(7) 24-29.*

Perry PJ, Wilborn CA. Serotonin syndrome vs neuroleptic malignant syndrome: a contrast of causes, diagnoses, and management. *Ann Clin Psych.* 2012; 24(2) 155-162.

Kateon H. Differentiating serotonin syndrome and neuroleptic malignant syndrome. *Ment Health Clinician.* 2013; 3(3) 129-133.

Addolorato G, Mirijello A, Leggio L, Ferrulli A, Landolfi R. Management of alcohol dependence in patients with liver disease. *CNS Drugs.* 2013; 27(4): 287-299

Tapper EB, Parikh ND. Mortality due to cirrhosis and liver cancer in the United States, 1999-2016: observational study. BMJ. 2018 Jul 18;362:k2817.

D Fuster, JH Samet. Alcohol Use in Patient with Chronic Liver Disease. N Engl J Med 2018;379:1251-1261.

Kidd SE, Grey JA, Torrone EA, Weinstock HS. Increased Methamphetamine, Injection Drug, and Heroin Use Among Women and Heterosexual Men with Primary and Secondary Syphilis — United States, 2013–2017. MMWR Morb Mortal Wkly Rep 2019;68:144–148.

Grov C, Westmoreland D, Morrison C, et al. The crisis we are not talking about: one-in-three annual HIV seroconversions among sexual and gender minorities were persistent methamphetamine users. *J Acquir Immune Defic Syndr*. 2020;85(3):272–279.