Pediatric Poisonings & Their Challenges

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Objectives

Define	**Define the components of digital addiction in adolescents**
Examine	**Examine risk taking behaviors of adolescents & some of the substances of abuse**
Develop	**Develop a plan using cases to prioritize early interventions and address prevention**

Overview

- Poisoning one of the leading causes of childhood morbidity & mortality worldwide
- Despite the advancement of poison detection, the clinical skill of toxidrome recognition combined with detailed hx and physical exam, and talking with patient and family is still indispensable for the management of any suspected poisoning

Some Thoughts

8% of adolescents between ages of 12 -17 who meet criteria for at least one SUD receive specialized treatment each year

Adolescents are at high risk for using & abusing substances. Their still-developing brain presents increased vulnerability to stress & a higher likelihood of engaging in risky behaviors

Substance use in adolescence is a robust predictor of SUD in adulthood

Rural and Urban Substance Use Rates

(ages 12 and older, unless noted)

	Non-metro	Small metro	Large metro
Alcohol use by youths aged 12-20	26.3%	30.1%	26.9%
Binge alcohol use by youths aged 12 to 20 (in the past month)	9.2%	9.5%	8.0%
Cigarette smoking	21.9%	18.1%	15.4%
Smokeless tobacco use	6.2%	3.8%	2.4%
Marijuana	19.5%	22.2%	22.1%
Illicit drug use	22.4%	25.1%	25.3%
Misuse of opioids	3.5%	3.0%	3.1%
Cocaine	1.4%	1.7%	1.9%
Hallucinogens	2.2%	3.0%	3.4%
Methamphetamine	1.5%	0.9%	0.8%

Source: Substance Abuse and Mental Health Services Administration (SAMHSA), Results from the 2023 National Survey on Drug Use and Health: Detailed Tables.

Not Only a Problem of the Inner City

Why Do They Use ?

- Rebellion
- Curiosity/Adventure
- Availability
- “Want to fit in”
- Pleasure/relaxation/relief from the chaos going on
- Self medications

Dogs and alcohol: the tragic untold story.

Lots of Change Going On!

Adolescents a critical time in development

- Physical
- Cognitive & neurological transitions
- Social/emotional development
  - Developmental milestones (graduation, events (prom), sporting events)
  - Poor awareness
  - Relationship issues
- Psychiatric vulnerability
- Changes that symbolize increasing independence

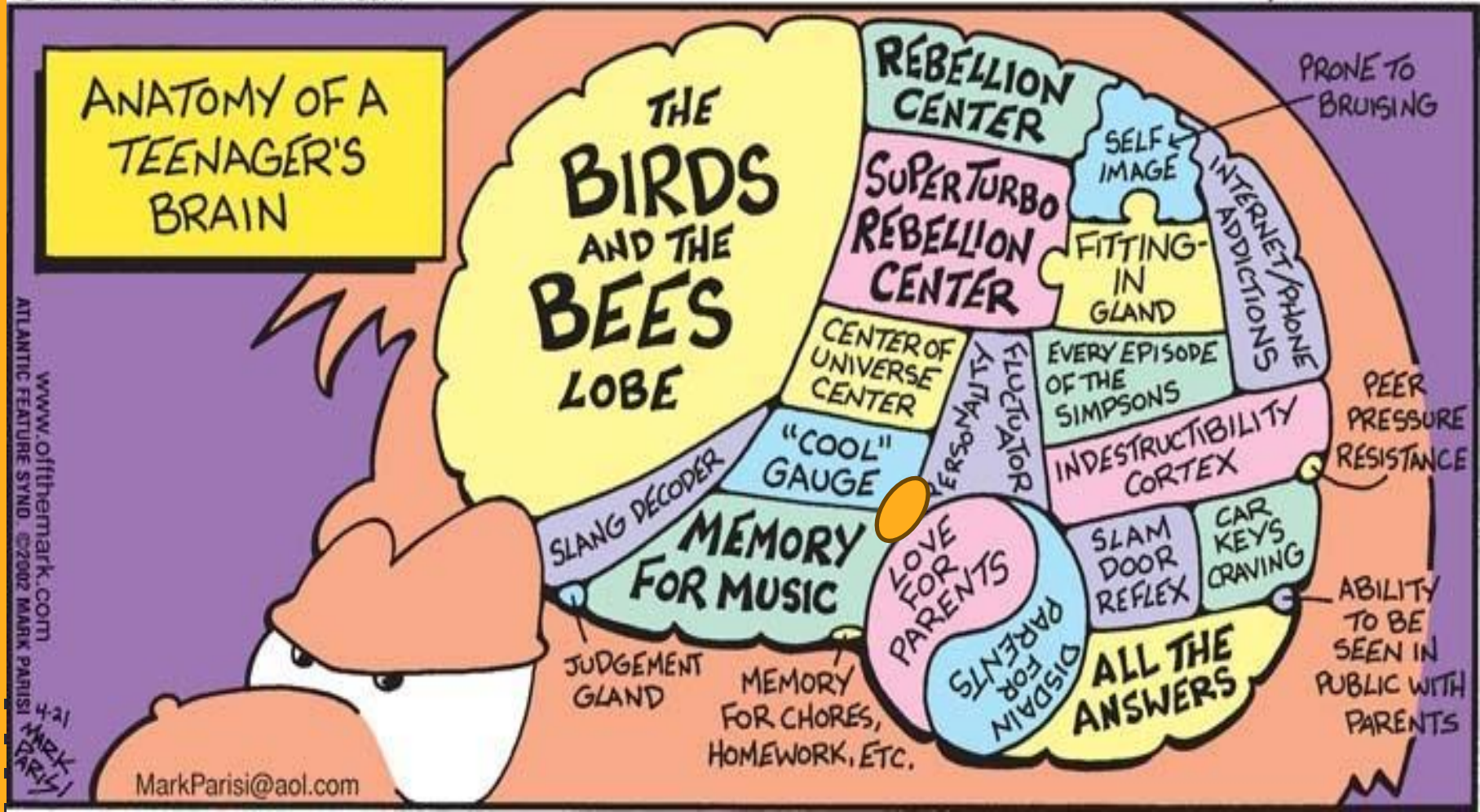
Typical Adolescent Behavior

- Emotional ups & downs
- Some withdrawal from family life
- Changes in appearance- keeping up with trends
- Increased arguments

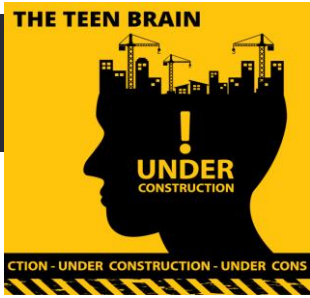
Abnormal Teen Behaviors

- Anxiety & depression that never goes away
- Stealing
- Getting arrest
- Constantly arguing, even over those small things
- Openly defiant
- Staying out all night
- Verbally and physically abusive

by Mark Parisi



Adolescent Brain



- Amygdala- aggressive, instinctual, risky-behaviors
- Don’t forget the prefrontal cortex
  - Responsible for analyzing, self-control, & awareness not fully developed in children/teenagers
- That’s why teens & adolescents during puberty often easily influenced by external factors

Easy to believe and quickly try out!!!

Why Do They Take Dares

- Within the developing teenage brain reasoning causes the teen to accept & go through with challenges
- Heightened sensitivity to rewards
- Teen brain programmed to seek out new & pleasurable experiences that help the brain learn, but they have not yet developed the tools to make rational decisions or choices

Technology

- Digital technology that facilitates interaction among adolescents, (texting and social media), associated with risk of past 30-day drinking, cannabis use, & vaping
- Texting, phone calls, & video chatting, were all more strongly associated with substance use than with activities that do not require interaction such as gaming and watching videos
- Digital media use frequency was modestly associated with risk of initiation & progression of alcohol use in adolescence

Kaur et al (2020). *Drug and Alcohol Dependency. 18*(213), 108124

What Does This Mean?

- Use of social media has proliferated the rate of information sharing with significant benefits & concerns
- Emerged in last decade have been Internet challenges that pose a significant risk to peds
- Cinnamon challenge in 2012, the Tide Pod challenge in 2016, and nutmeg challenge in 2020
  - Each resulted in serious morbidity amongst children
- Challenges are spread rapidly through social media

Which Platforms are the Most Used by Adolescents

Redditt

You Tube

Twitter (X)

Twitch

BeReal

Discord

SnapChat

Instagram

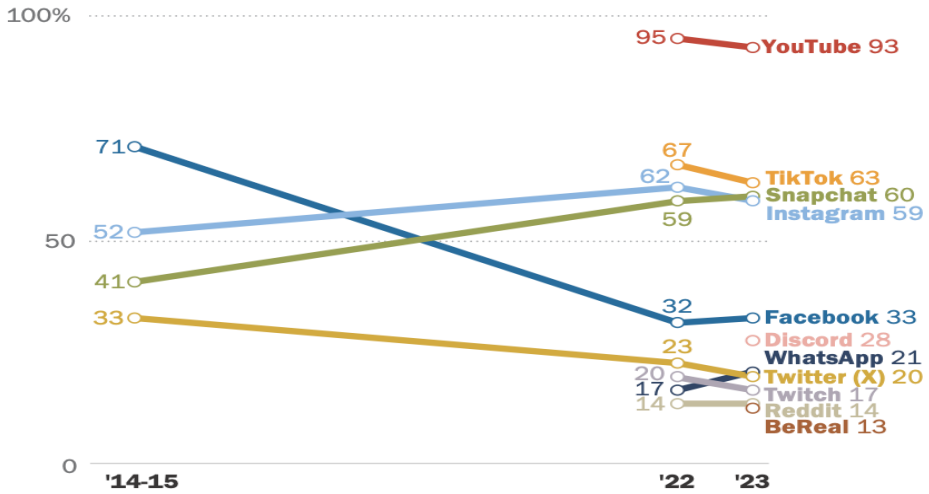
Facebook

WhatsApp

TikTok

YouTube continues to be top platform among teens, followed by TikTok, Snapchat and Instagram

% of U.S. teens ages 13 to 17 who say they ever use the following apps or sites



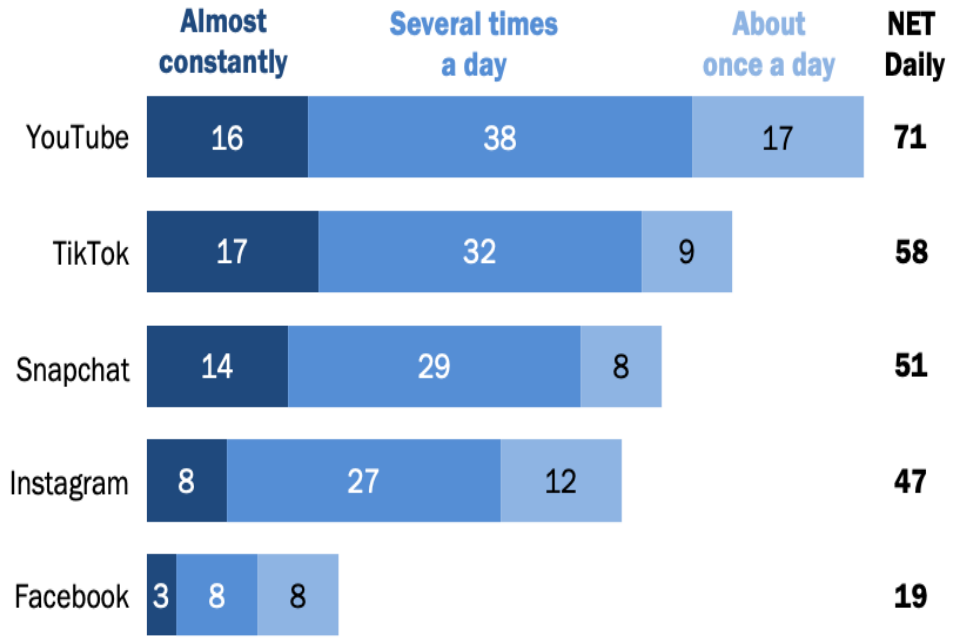
Note: Those who did not give an answer are not shown.
Source: Survey of U.S. teens conducted Sept. 26-Oct. 23, 2023.
"Teens, Social Media and Technology 2023"

PEW RESEARCH CENTER

https://www.pewresearch.org/internet/2023/12/11/teens-social-media-and-technology-2023/

A majority of teens visit YouTube, TikTok daily

% of U.S. teens ages 13 to 17 who say they visit or use the following apps or sites ...



Note: Those who did not give an answer or gave other responses are not shown.
Source: Survey conducted Sept. 26-Oct. 23, 2023.
"Teens, Social Media and Technology 2023"

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Signs A Child's Addicted to Social Media

- Wants Constant Access to Social Media
- They Overshare with the World (TMI)
- Ignoring Real Life
- Become Stressed or Upset About Posts
- They Become Obsessed
- Don't Understand Potential Real-World Consequences
- Middle of the Night Checks
- Try to Curb Usage But Can't

Internet Addiction

- Internet addiction disrupts neural networks, decreasing activity in the executive control network responsible for decision-making
- Adverse effects include trouble maintaining relationships, dishonesty about online activity, irregular eating & sleeping patterns
- We need better screening, targeted tx, & parental education to manage screen time & mitigate risks

Sites

- What's APP
- Ask.fm
- Omegle
- Snapchat
- YOLO
- TikTok
- Whisper

How Kids Are Buying Drugs on Social Media

- It's a fairly easy thing to do
- Specific things that parents may be able to look for within their child's online communication
- Program called "TOR"

On-Line Drug Sales

- Online drug sales average ≈ $ 300,000-500,000/day
- 1in 5 teens have already tried Rx drugs illegally
- 76 % of these teens, buy these Rx pills illegally through smugglers, forged prescriptions, & online pharmacies
- Buying drugs online is that easy!!!!
- “Algorithms & Amplification: How Social Media Platforms’ Design Choice Shape our Discourse & our Minds”

Digital Marketplaces

- Silk Road- “The Amazon of Illegal Drugs”
- Sign up on the anonymity network Tor
- Silk Road users could view a seller’s profile & comments before doing business
  - Sells include cocaine, heroin, ecstasy & marijuana
- Shipping, products were often triple vacuum-packed & either mailed or sent by private carriers like UPS or FedEx


CHALLENGES
AHEAD

Common & Life-threatening Pediatric Ingestions

- Intent of ingestion in a toddler/preschooler usually differs from that in an adolescent is a result of environmental “exploration” through developmental milestones rather than self-harm
- Many involve unwitnessed or unmeasured exposures, further complicating the situation
- Most incidents are benign & nontoxic, some meds (Rx & OTC), as well as household products, can cause severe toxicity or death in young children

Household Items

Button Batteries

- Kids < 6 y who ingest batteries >20 mm, rates of major complications as high as 12.6%
- Creates highly alkaline environment pH of tissue up to 12-13, leading to liquefactive necrosis of adjacent tissues- goal to removal 2 hours
- May also cause perforation and erosion into adjacent structures
- Tx- Juice, sports drinks, honey or syrup

Laundry Detergent Pods

Toddlers will put anything in their mouths, and packets & these are the perfect size & shape to be picked up

S& S

- GI (vomiting, drooling)
- Neurological symptoms (CNS depression)
- Metabolic changes (Lactic acidosis)

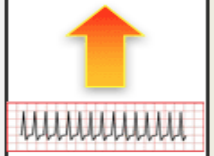
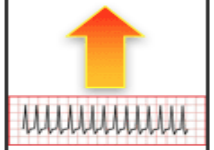
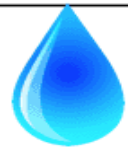
Our Next Challenges

Evaluation

- Classic Toxidromes
- Timing and route of exposure
- Known or unknown toxin

Toxic Agent	Selected Pediatric Antidotes and Targeted Therapies[a]
Acetaminophen	Acetylcysteine (IV, PO)
Anticholinergics	Physostigmine (IV)
Anticoagulants	
• Heparin, low-molecular-weight heparins	• Protamine (IV)
• Warfarin, vitamin K antagonists	• Phytonadione (IV, PO), prothrombin complex concentrates (IV), fresh frozen plasma (IV)
• Dabigatran	• Idarucizumab (IV)
• Direct-acting anticoagulants (rivaroxaban, apixaban)	• Inactivated coagulation factor Xa [recombinant] (IV), prothrombin complex concentrates (IV)
Benzodiazepines	Flumazenil (IV)
β-Blockers	Glucagon (IV), calcium (IV), insulin (IV), vasopressors (IV)
Botulinum toxin (secondary to botulism)	Botulinum antitoxin (IV), botulism immune globulin (IV)
Calcium channel blockers	Calcium (IV), insulin (IV), vasopressors (IV)
Cholinergics	Atropine (IV), pralidoxime chloride (IV, IM), and diazepam (IV, IM, PO) in organophosphate toxicity
Cyanide	Sodium nitrate (IV) and sodium thiosulfate (IV); hydroxocobalamin (IV)
Digoxin	Digoxin fab antibodies (IV)
Iron	Deferoxamine (IV)
Isoniazid	Pyridoxine (IV)
Lead	Calcium disodium EDTA (ethylenediaminetetraacetic acid) (IV), dimercaprol (IM), succimer (PO)
Local anesthetics, lipophilic xenobiotics	Lipid emulsion (20%) (IV)
Methemoglobinemia	Methylene blue (IV)
Methotrexate	Glucarpidase (IV), leucovorin (IV)
Opioids	Naloxone (IV, IM, intranasal, intraosseous, SC)
Sulfonylureas	Dextrose (PO, IV), octreotide (SC, IV)
Toxic alcohols (ethylene glycol and methanol)	Fomepizole (IV), ethanol (IV, PO)
Tricyclic antidepressants	Sodium bicarbonate (IV)
Valproic acid	Levocarnitine (IV, PO)

https://twitter.com/recover2rene
w/status/1085103493394911233

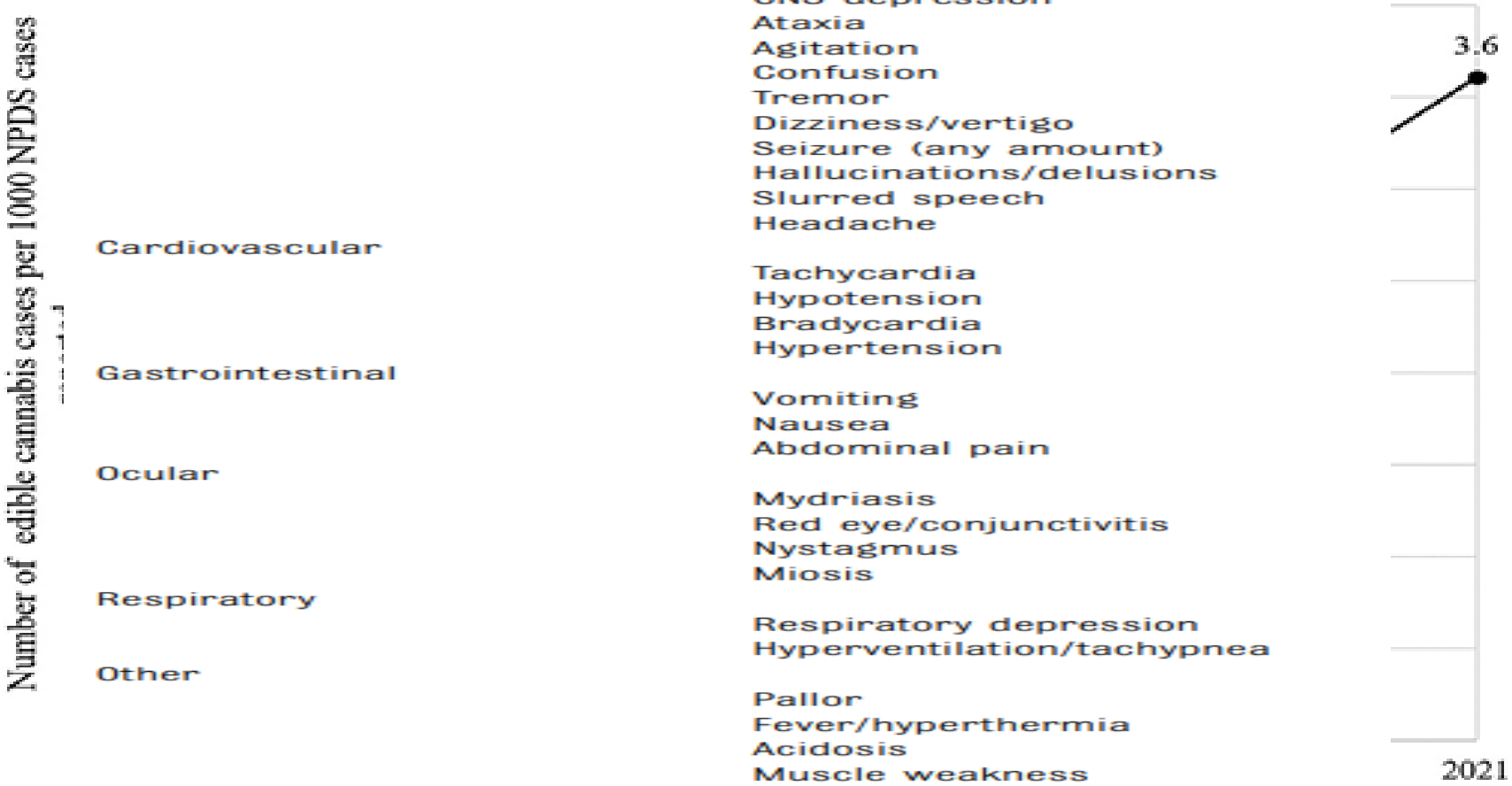
	HR & BP	Resp.	Temperature	Pupils	Bowel Sounds	Diaphoresis
Anticholinergic **Anticholinergics** –Atropine, scopolamine, glycopyrrolate benztropine, trihexyphenidyl **Antihistamines** – Chlorpheniramine, Cyproheptadine, Doxylamine, Hydroxyzine, Dimenhydrinate, Diphenhydramine, Meclizine Promethazine		No change		Dilated		
Cholinergic Organic Phosphorous Compounds: Carbamates • Arecholine, Pilocarpine, Urecholine (Betanechol), Carbachol, Choline, Metacholine, Mushrooms	No change	No change	No change	Pinpoint		
Opioid Morphine • Codeine • Tramadol • Heroin • Meperidine • Diphenoxylate • Hydromorphone • Fentanyl • Methadone • Propoxyphene • Pentazocine • DXM • Oxycodone • Hydrocodone				Pinpoint		
Sympathomimetic Caffeine, cocaine, amphetamines, methamphetamines, Ritalin, LSD, Theophylline, MDMA				Dilated		
Sedative-Hypnotic anti-anxiety agents, muscle relaxants, antiepileptics and preanesthetic medications –Barbituates –Benzodiazepines				No change		

Treat the patient!!

NOT the Drug!!!

et al,
3

Organ System	Clinical Effects
Neurologic	
	CNS depression
	Ataxia
	Agitation
	Confusion
	Tremor
	Dizziness/vertigo
	Seizure (any amount)
	Hallucinations/delusions
	Slurred speech
	Headache
Cardiovascular	
	Tachycardia
	Hypotension
	Bradycardia
	Hypertension
Gastrointestinal	
	Vomiting
	Nausea
	Abdominal pain
Ocular	
	Mydriasis
	Red eye/conjunctivitis
	Nystagmus
	Miosis
Respiratory	
	Respiratory depression
	Hyperventilation/tachypnea
Other	
	Pallor
	Fever/hyperthermia
	Acidosis
	Muscle weakness
	Hypothermia
	Urinary retention
	Electrolyte abnormality



Cannabis Use During Adolescence

- Gobbi et al. conducted a meta-analysis to evaluate the risk of cannabis use during adolescence for developing subsequent major depression, anxiety, and suicidal behavior.
- Consuming cannabis during adolescence had a risk of depression & suicide
- Affects the prefrontal area
- Anyway, screening of CUD in patients with mood disorder is important for preventing suicidal behavior

Gobbi G, Atkin T, Zytynski T, et al. (2019). Association of cannabis use in adolescence and risk of depression, anxiety, and suicidality in young adulthood: A systematic review and meta-analysis. *JAMA Psychiatry, 76*(4), 426-434

American Indian (AI) Adolescent

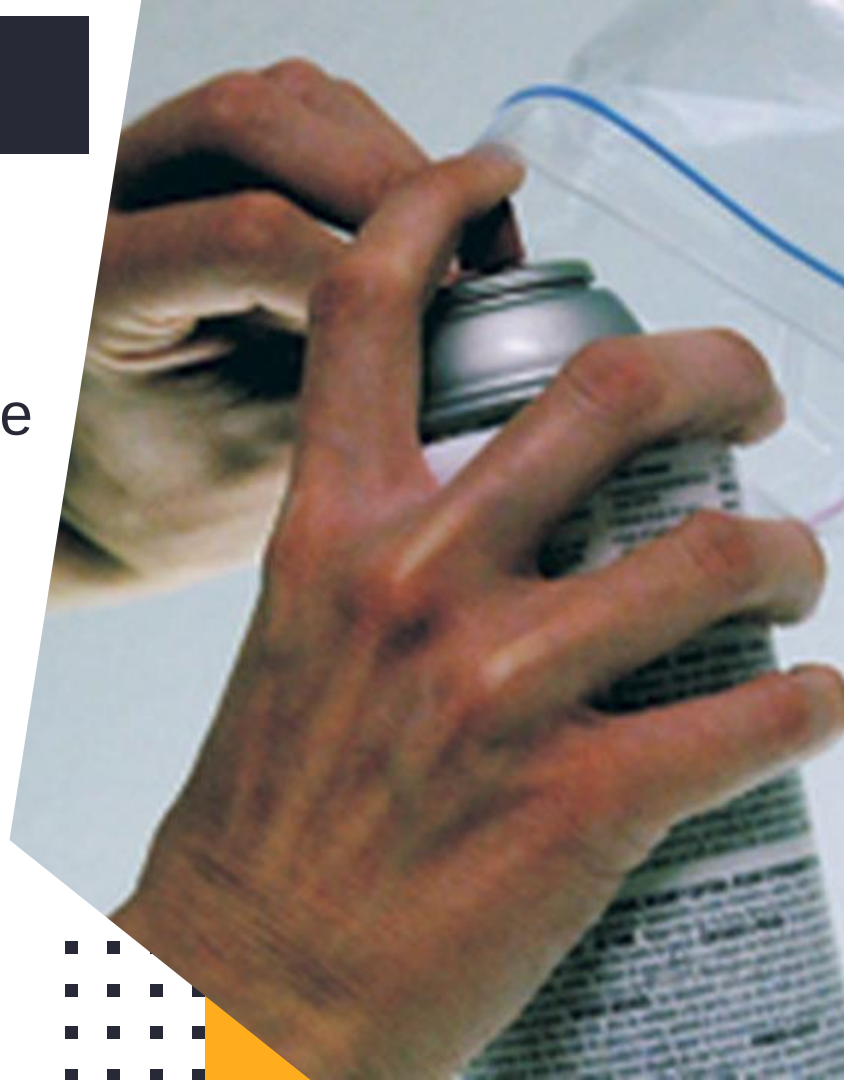
- Spillane, et.al. (2021) noted AI adolescents consistently report higher rates of marijuana use compared to non-AI adolescents with lifetime rates being 2-4x greater
- Found that AI youth perceived marijuana availability brought with it perceived approval
- Spillane (2020) also noted that Indigenous adolescents perceived sanctions against substance use to be more influential when coming from adults who do not use substances themselves

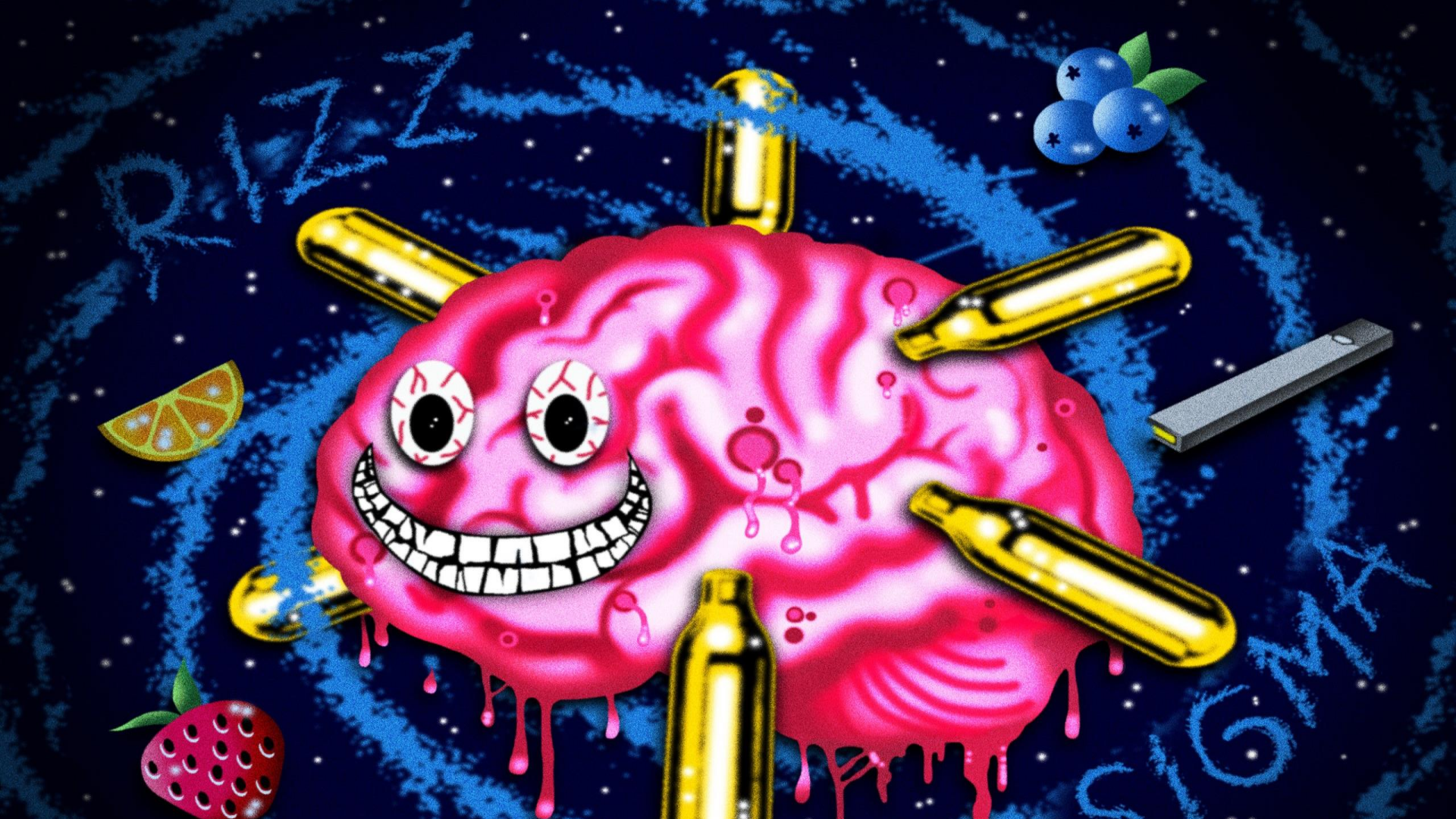
Spillane N.S, et. Al (2021). The three As of American Indian adolescent marijuana use: Availability, acceptability, and approval. *Drug and Alcohol Dependence, 219*, 108462


CHROMING!!!

Inhalants

- **How it is consumed**
  - Computer cleaner
  - Whippets
  - Paint thinner, nail polish, gasoline
- **Signs and symptoms**
  - Dizziness, ataxia, confusion, muscle weakness
- **What to worry about**
  - Arrhythmias
  - Demyelination
  - B12 deficiency




RYZZ

Kratom

- Kratom (Mitragyna speciosa)
- Commonly marketed and sold as a dietary supplement
- Mitragynine can interact with receptor systems in the brain to produce stimulant effects
- Taken as a pill or capsule. Some people chew leaves or brew the dried or powdered leaves as tea
- In SE Asia they are mixing it with Coke & cough syrup
- Most strains claim an effect in 3 primary areas:
  - ○Energy ○ Sedation ○ Pain Relief

A Non-Alcoholic “Euphoric Seltzer”

Kratom

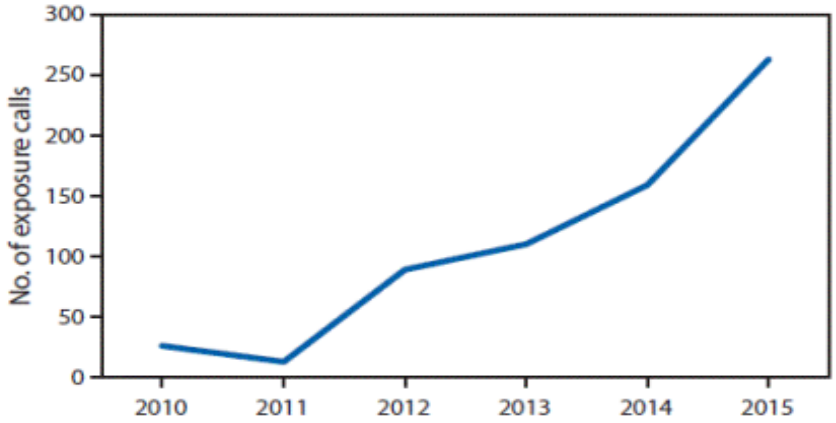
- Toxicity -- supportive management in most cases.
  - Acute hepatitis -- *N*-acetylcysteine (as in any other drug-induced hepatitis).
  - Seizures or neurological symptoms -- anti-epileptics.
  - Kidney injury, cardiovascular events, or other emergency presentations addressed with appropriate measures.

- Overdose
  - Kratom-only overdoses resemble stimulant overdoses (cardiovascular, seizure).
    - Poison Control Center reports show low levels of meiosis, sedation, and respiratory depression.
  - Co-ingestions are common
    - Reports describe mixed outcomes with reversal agents (naloxone); no clinical trials exist.

Infants Exposed

Poison control centers in the United States received about 1,807 reports involving use of kratom from 2011 through 2017, including deaths. About half of these exposures resulted in serious negative outcomes such as seizures and high blood pressure. Five of the seven infants who were reported to have been exposed to kratom went through withdrawal.

SOURCE: Anwar M, Law R, Schier J. Notes from the Field. Kratom (Mitragyna speciosa) Exposures Reported to Poison Centers — United States, 2010–2015. MMWR Morb Mortal Wkly Rep 2016;65:748–749.



Psilocybin Mushrooms

Mushrooms Duration	
Oral	
Total Duration	4 - 7 hrs
Onset	15 - 60 mins
Coming Up	15 - 30 mins
Plateau	2 - 4 hrs
Coming Down	1 - 3 hrs
After Effects	0 - 6 hrs
Hangover / Day After	- - -

$20-$40 per 1/8 ounce
$100 - $250 per ounce

https://www.erowid.org/plants/mushrooms/mushrooms_effects.shtml

Case 1

- 15 yo Female
- Mom found her acting strangely just before EMS arrived
- She is incomprehensible- altered mental status
- She had a fight with her boyfriend and raided the contents of the medicine cabinet in her home
- Patient not able to provide a hx the mom does not know what really happened

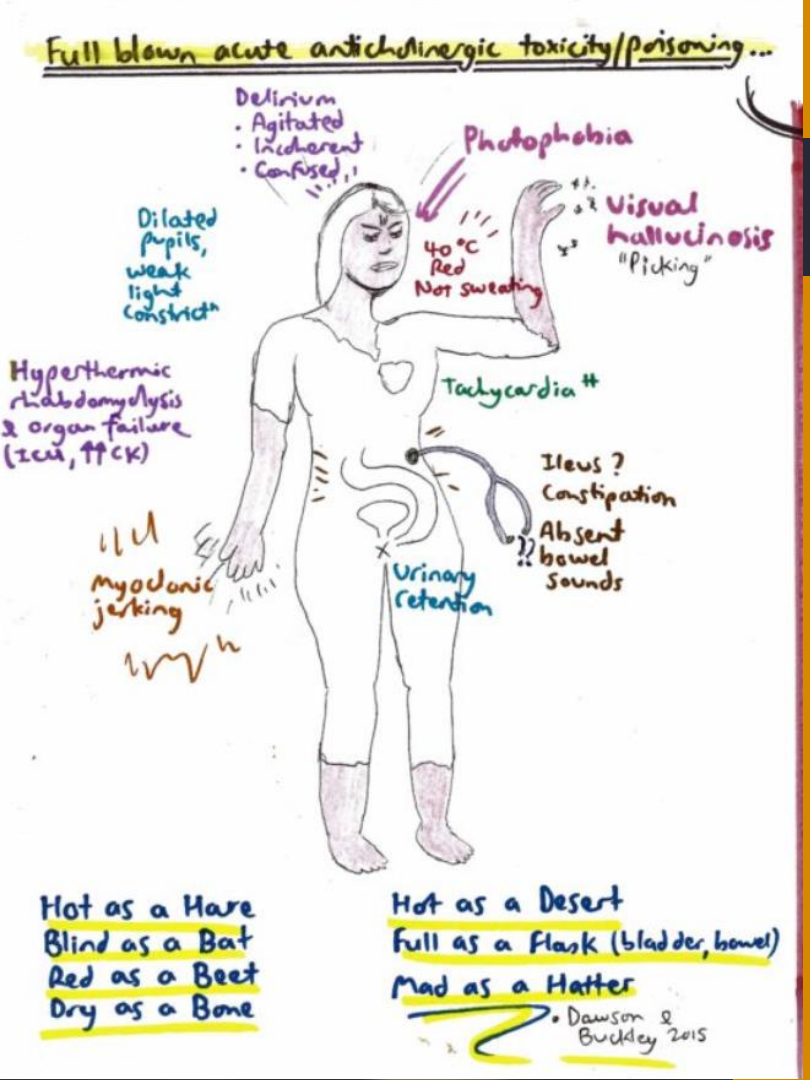
Physical Exam

Vitals: BP: 140/90, P: 135, R: 18, T: 40.5C (104.9F) Pulse ox: 98%

Pupils 6mm, no nystagmus. Dry mouth

Follows commands intermittently, easily startled. Incoherent words. MAE no focal deficits. Normal reflexes, No clonus

Flushed, dry skin



What Toxidrome ?

Wacky, Tachy Patient

Drugs with Anticholinergic Effects

- First-generation antihistamines
  - Diphenhydramine, doxepin, doxylamine, hydroxyzine, meclizine
- Tricyclic antidepressants
  - Amitriptyline, desipramine, imipramine, nortriptyline
- Muscle relaxants
  - Cyclobenzaprine, baclofen
- Antipsychotics, especially:
  - Chlorpromazine
  - Atypical agents: olanzapine, quetiapine

What Does it Do?

Diphenhydramine blocks NA^+ & K^+ channels in the myocardium

Causes widening of the QRS segment and QTc prolongation

Common effects were tachycardia, hallucinations, somnolence, agitation, and mydriasis

Seizures uncommon, but still occur in 5.5% of cases


WHAT WOULD YOU SAY
YOU DO HERE?

What Procedures

- ECG
  - What is my worry?
- Labs
  - CK (look for rhabdo due to hyperactivity)
  - BMP
  - UDS
  - Acetaminophen and salicylate levels
- IV fluids

Treatment

- Early recognition & supportive care
  - IV fluids, bladder scan, dimming the lights
- Benzos for agitation or seizures
  - High doses of benzodiazepine may perpetuate delirium!!
  - Dexmedetomidine (Precedex)
- QRS prolongation- bicarb & QTc prolongation- magnesium!
- Physostigmine-
  - 1 mg IV **slowly over 5-10 minutes on the monitor!**
- Teach parents to read labels

Case 2

- 17 yo male presents to the ED with altered mental status and abnormal body movements
- PMH: depression as well as SUDs, specifically marijuana and cocaine
- Meds- sertraline
- VS- BP 172/90, HR 138, R 28, temp of 100.3-F

Physical Exam

- Alert but not oriented to time, place, or person
- Pupils are large and mildly reactive, with bilateral horizontal nystagmus
- Neuro exam
  - Clonus in her ankles, brisk upper and lower extremity reflexes, and hypertonicity
  - Intermittent jerking of her upper extremities but no rigidity


WHAT WOULD YOU SAY
YOU DO HERE?

Serotonin Syndrome

Use of SSRIs and SNRIs to tx depression, mood disorders, and behavioral disorders has escalated dramatically in the last 20 years

Resulting in increased risk & clinical presentation of serotonin toxicity

Look Similar to Anticholinergic Toxicity

- Similar to anticholinergic toxicity
- Symptoms
- Distinguishing feature is that **muscle tone & reflexes normal in anticholinergic toxicity but clonus & hypereflexia in serotonin syndrome**

What Drugs Cause Serotonin Syndrome

SSRI and SNRI's

Bupropion

Tricyclic antidepressant

MAOIs

Migraine (anti-migraine) meds

Pain meds- Fentanyl

- Lithium
- Illicit drugs
- Herbal supplements
- OTC cough/cold meds
- Anti-nausea meds
- Linezolid (Zyvox)

Procedures

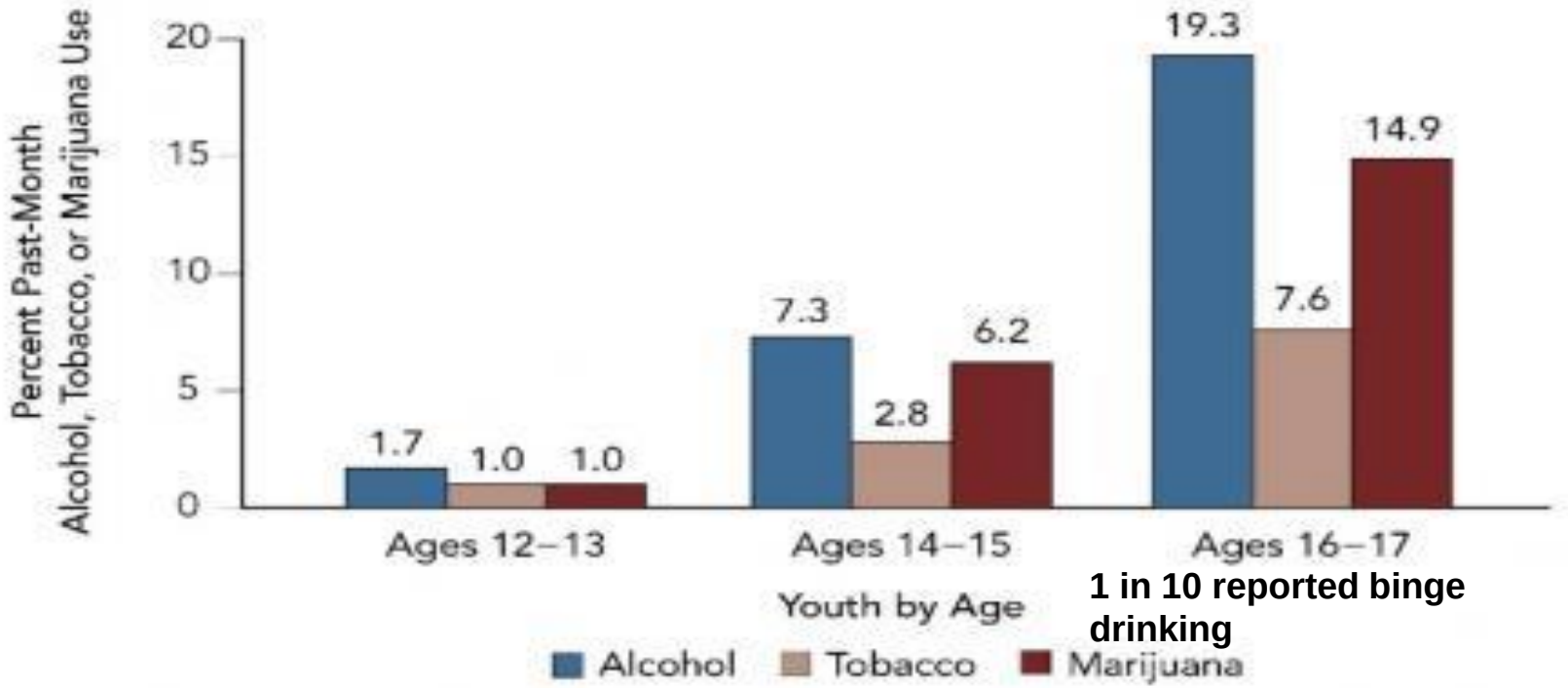
- ECG
  - What is my worry?
- Labs
  - CK (look for rhabdo due to hyperactivity)
  - BMP
  - UDS
  - Acetaminophen and salicylate levels
- IV fluids

Case 3

- 16 yo female presents to ED after ingesting a large amount of hand sanitizer after a fight with her boyfriend
- She appears very sleepy and complains of generalized weakness
- Denies SI
- Denies any co-ingestion


WHAT WOULD YOU SAY
YOU DO HERE?

More adolescents use alcohol than tobacco or marijuana



1 in 10 reported binge drinking

SOURCE: *2019 National Survey on Drug Use and Health*. Tables 2.6B, 2.2B, and 1.7B. Accessed 10/15/20.

Forms of Alcohol Abused

Physical Exam

- BP 90/60, HR-78, RR-18, T-99.4°F
- Lethargic with acetone odor on the breath
- Lungs clear
- Alert and slightly confused- CN II-XII grossly intact, Speech is slurred, ataxia is present- Hyporeflexia with no clonus, strength is 3/5

Procedures

Take care of ABC's

IV to hydrate

Labs- CMP, UDS, Ethyl alcohol level, osmolality


CAUTION
Navigating the Perilous Journey

Take Home Points

- Don’t underestimate ingestions
  - A child who comes in looking well can quickly become unresponsive and in shock
- Investigate the type of ingestion
- When coming up on a critically ill pediatric patient

Don’t underestimate the possibility of ingestion

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