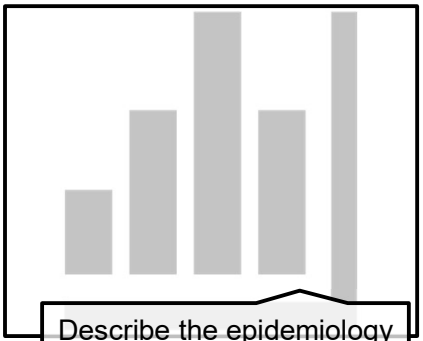
Poisonings and Toxidromes Across the Lifespan

Christopher Gaw, MD, MPH, MBE
Assistant Professor - Clinical
Division of Emergency Medicine, Nationwide Children's Hospital
Department of Pediatrics, The Ohio State University College of Medicine

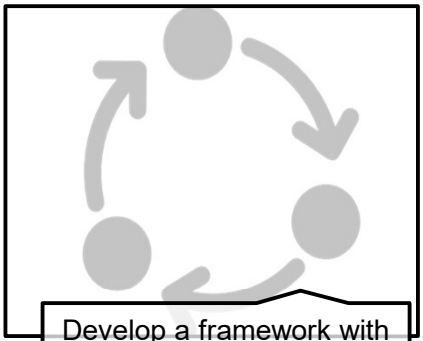
MedNet21
Center for Continuing Medical Education

The Ohio State University
Wexner Medical Center

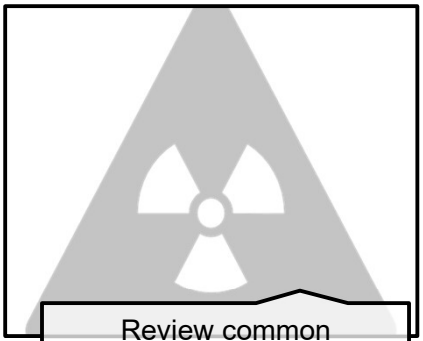
Objectives



Describe the epidemiology of poisonings over the lifespan



Develop a framework with which to approach the poisoned patient

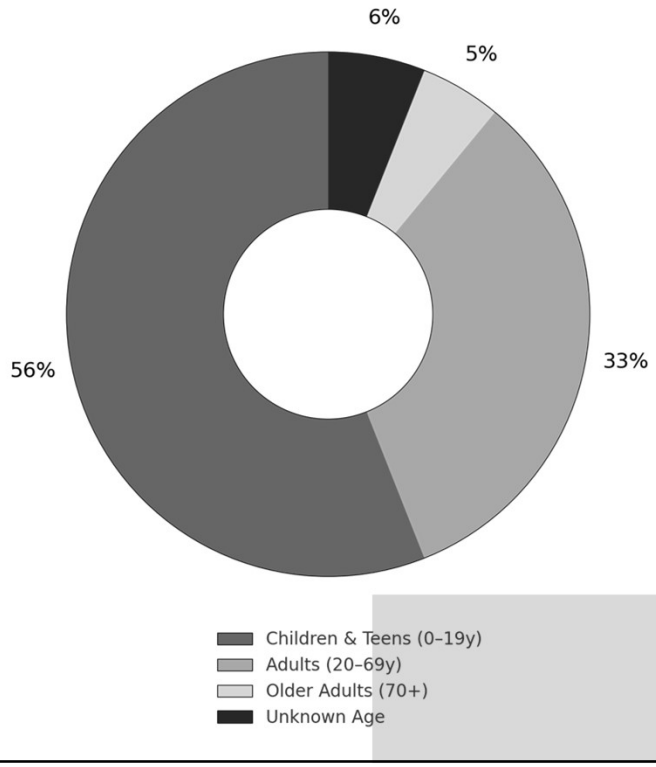


Review common toxidromes and their associated management

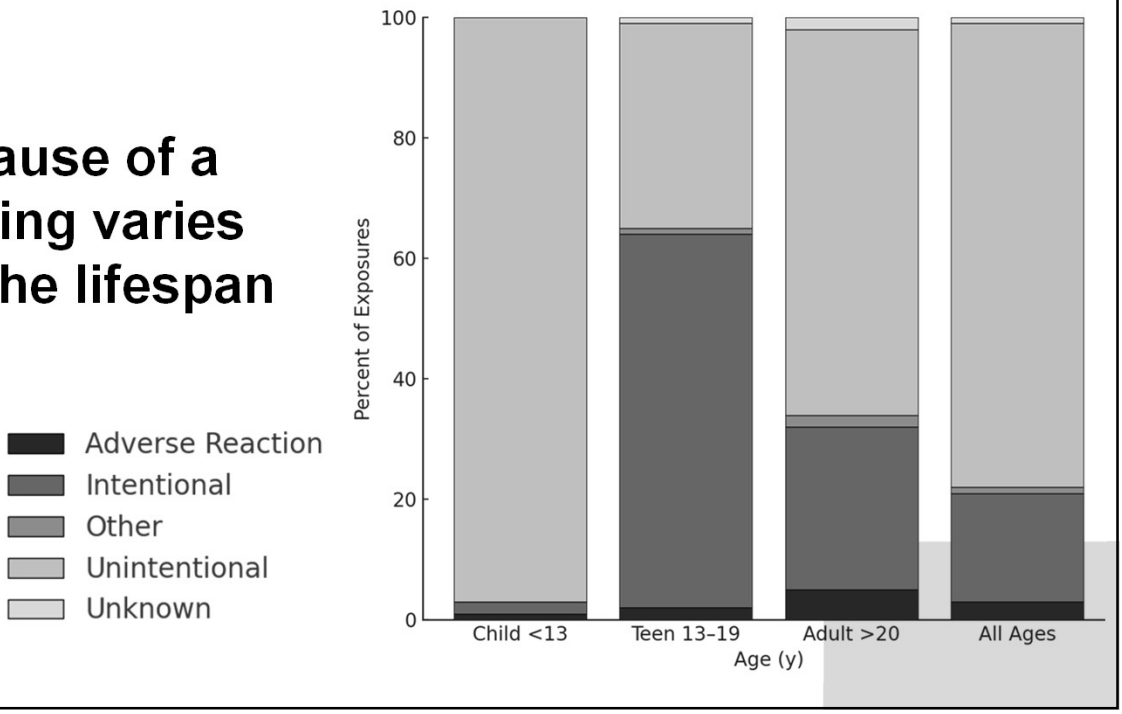
Epidemiology of Poisonings

The Development Confounder

Children and teens comprise the majority of reported exposures



The cause of a poisoning varies across the lifespan



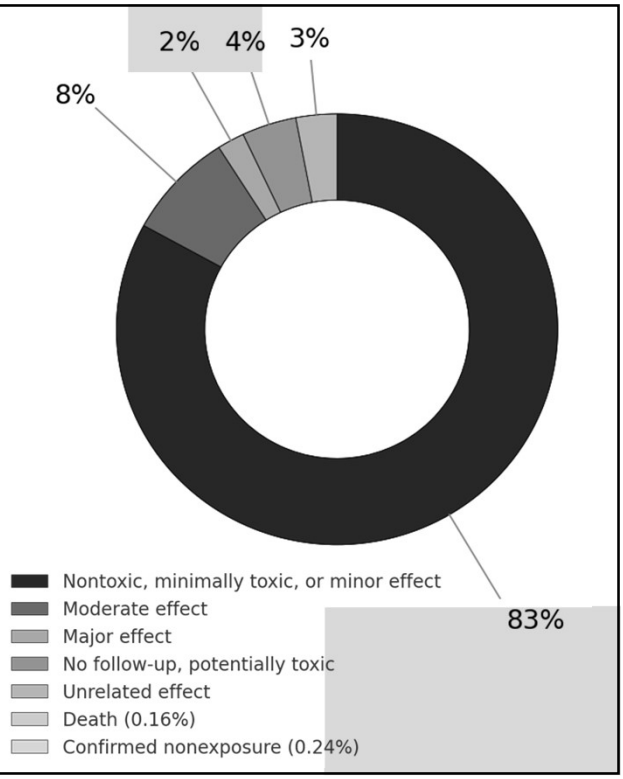
Common Substances: ≤5 years-old

Substance	%
Household cleaning substances	10.1
Analgesics	9.1
Cosmetic & personal care products	9.1
Foreign body, toys, miscellaneous	8.0
Dietary supplements, herbal, homeopathic	6.9
Antihistamines	4.7
Vitamins	4.7
Topical preparations	3.9
Pesticides	3.4
Plants	3.3

Common Substances: ≥20 years-old

Substance	%
Analgesics	10.9
Cardiovascular drugs	7.4
Antidepressants	7.4
Sedatives, hypnotics, antipsychotics	7.1
Household cleaning substances	6.1
Alcohols	4.4
Anticonvulsants	3.8
Antihistamines	3.7
Hormones and hormone antagonists	3.4
Stimulant and street drugs	3.1

4 in 5 exposures had minor effects or were minimally toxic

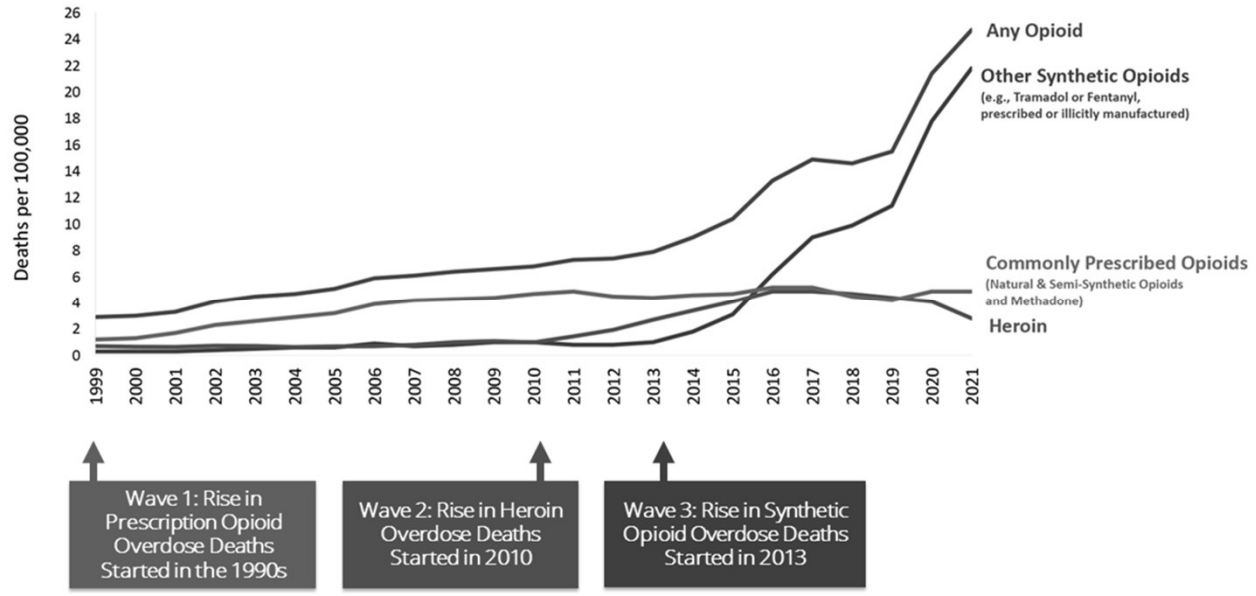


Substance Associated Fatalities

Substance	No.	%
Acetaminophen alone	360	8.8
Miscellaneous sedatives, hypnotics, and antipsychotics	308	7.5
Miscellaneous alcohols	306	7.5
Pharmaceutical and illegal opioid preparations	260	6.4
Miscellaneous stimulants & street drugs	240	5.9
Miscellaneous unknown drug	226	5.5
Calcium antagonist	205	5.0
Beta blockers	152	3.7
Miscellaneous antidepressants	131	3.2
Hypoglycemic, single agent	118	2.9

Trends in Poisoning: Contemporary Issues

Opioids



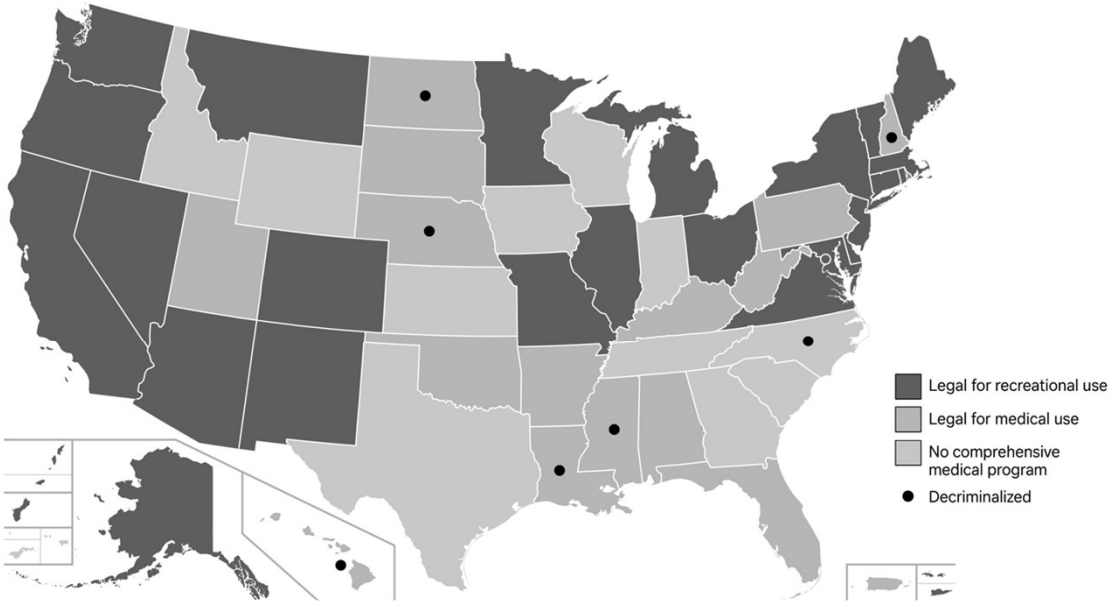
Opioids and Children

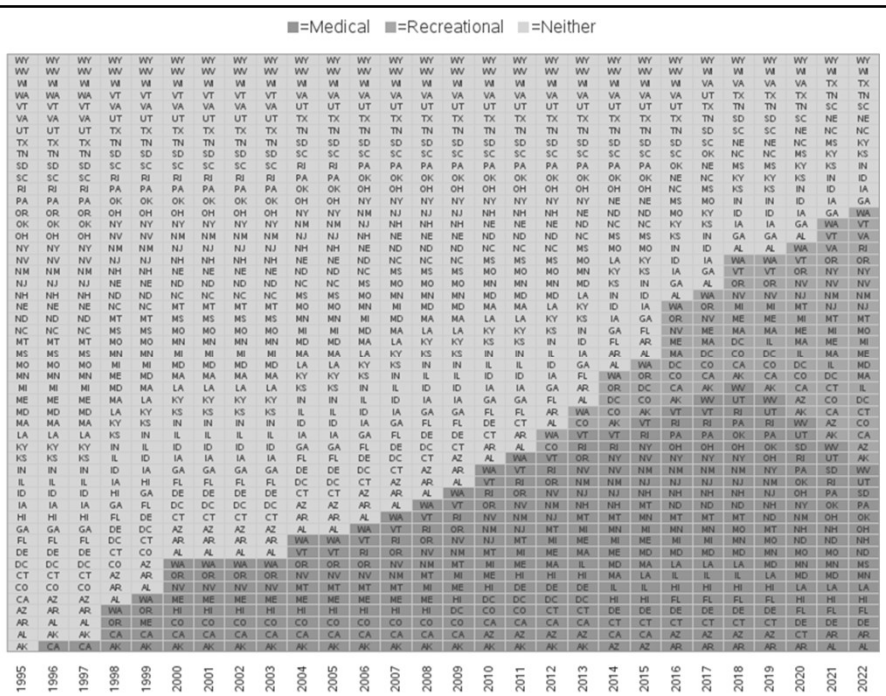
1997-2012: Rx opioid hospitalizations for children 1-19 years increased 165%

2013-2021: Mortality rate per 100,000 in children ages 0-19 years increased 3740%

2005-2018: Opioids were the most common substance contributing to death in child death reviews

Cannabis


Legal for recreational use
Legal for medical use
No comprehensive medical program
Decriminalized



Cannabis and Children

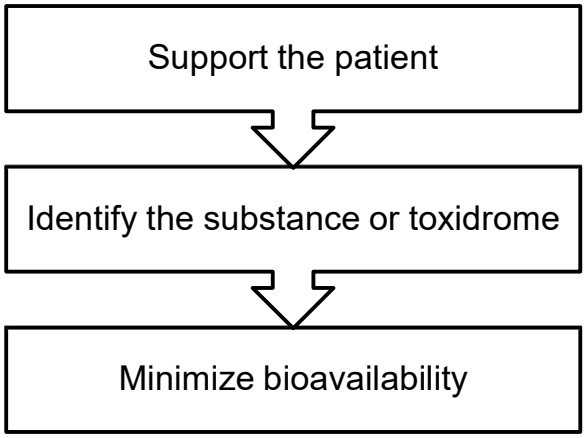
2004-2018: 13-fold increase in cannabis-related exposures among children <6 years

2017-2021: Exposures reported to poison centers for children <6 years increased 1375%

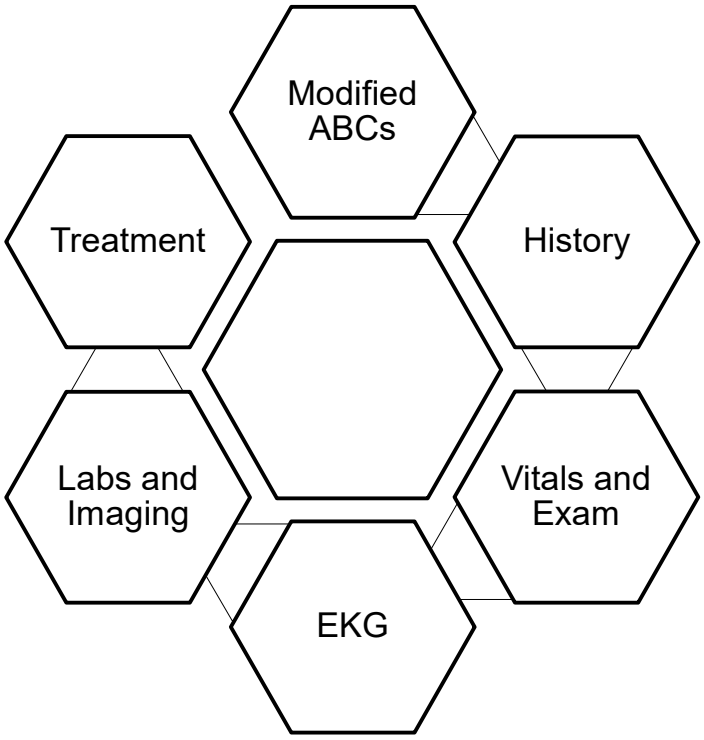
Retrospective case series identified 1.7 mg/kg as dose threshold for clinically significant toxicity in children <6 years

Clinical Framework for the Poisoned Patient

Basic Principles



Focus on the patient, not the poison!



Poisoning ABCs: $ABCD_3E_2F$

Airway

Breathing

Circulation

Disability, **D**rugs, **D**extrose

Exposure (and decontamination), **E**KG

Fever

Key History Elements

Identify substance, dose, and route
Focus on timing and symptoms
Characterize any attempted therapies
For at-risk populations - expand on social history

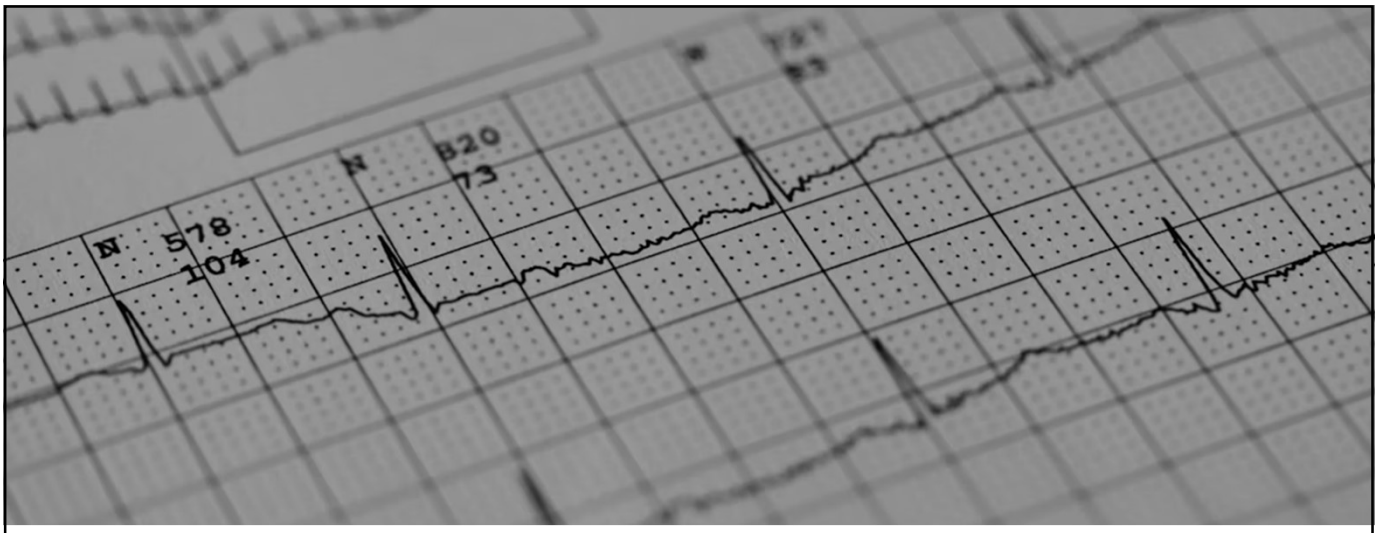
History can inform severity and treatment plan

Vitals and Exam

Vitals & temperature	CNS/mental status	Cardiac	Respiratory

GI	Skin & mucous membranes	Odors

Vitals and exam can support toxidrome identification



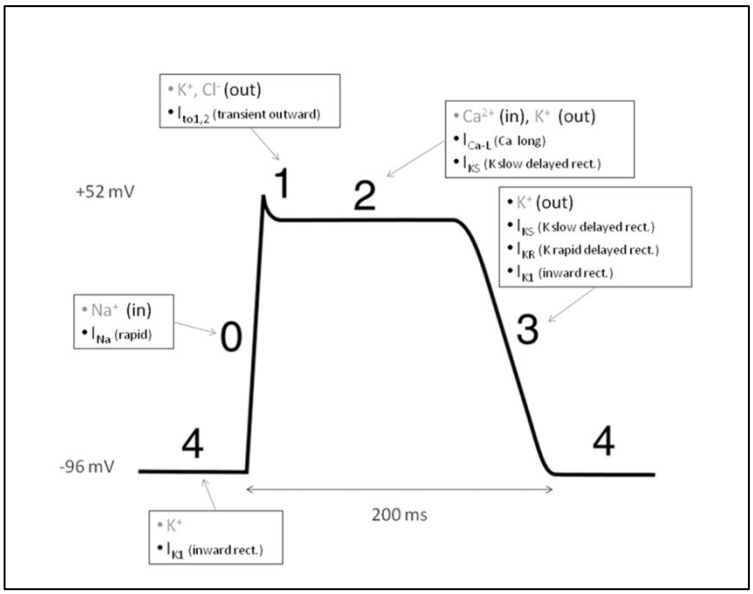
EKGs in poisonings can be an all-in-one screening, diagnostic, and prognostic tool

In a poisoning, look at the EKG for:

Conduction delays

Arrhythmias

Ischemia



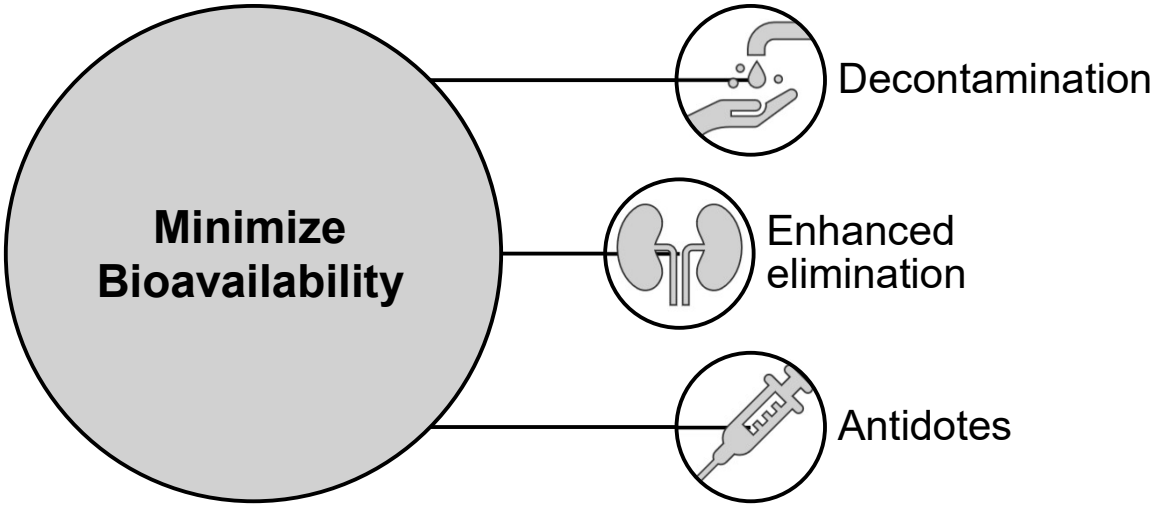
EKG Changes by Drug Class

Tachycardia	Bradycardia	Prolonged QRS	Prolonged QTc
☐ Beta-agonists	☐ Alpha-agonists	☐ Chloroquine, hydroxychloroquine	☐ Antihistamines
☐ Caffeine	☐ Beta-blockers	☐ Class I antiarrhythmics	☐ Antipsychotics
☐ Cocaine	☐ Calcium channel blockers	☐ Tricyclic antidepressants	☐ Chloroquine, hydroxychloroquine
☐ Nicotine	☐ Digoxin		☐ Class IA, 1C, III antiarrhythmics
☐ SNRIs/SSRIs	☐ Opioids		☐ Macrolides
☐ Tricyclic antidepressants	☐ Organophosphates		☐ Tricyclic antidepressants

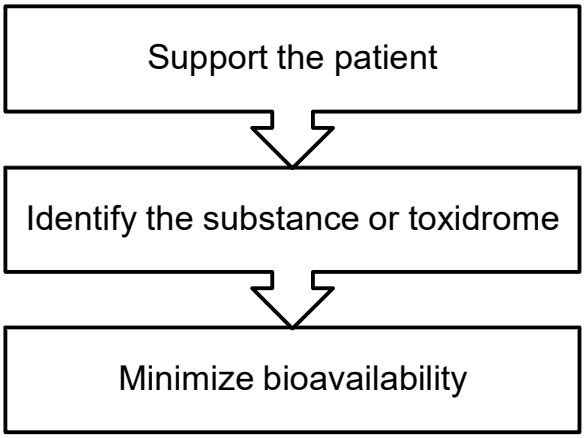
Labs and imaging should be individualized to the patient and clinical suspicion

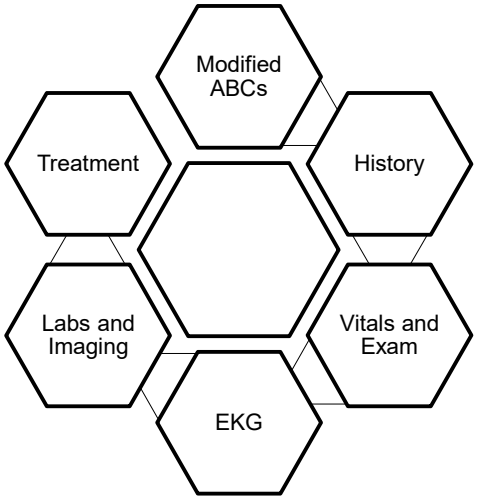
Treatment is solely supportive in many cases

"Toxicology" Treatments



Remember the Framework!





Toxidromes and Management

Toxidromes

	Temp	HR	RR	BP	Mental Status	Pupils	Bowel Sounds	Skin
Anticholinergic	↑	↑	↔	↑	Agitation, Delirium, Psychosis	Dilated (sluggish)	↓	Flushed, dry
Cholinergic	↓	↑↓	↑	↓↔	Confusion, Coma, Seizures	Constricted	↑	Diaphoretic
Opioids	↓	↓	↓	↓	Coma, Somnolence	Constricted	↓	—
Salicylates	↑	↑	↑	↔	Agitation, Lethargy, Seizures	—	—	Diaphoretic
Sedative-hypnotics	↓	↔	↓	↓	Agitation, Coma, Somnolence	—	—	—
Sympathomimetics	↑	↑	↑	↑	Agitation, Psychosis, Seizures	Dilated (reactive)	↑	Diaphoretic

Case 1

Presentation
- 15-month-old F found on kitchen floor unresponsive

Vitals
- Temp: 98.0°F, HR 108, RR 10, BP 90/50, SpO2 90% on room air

Exam
- Groans to pain, pinpoint pupils, shallow and slow respirations, cool extremities

What dose of naloxone do I give?

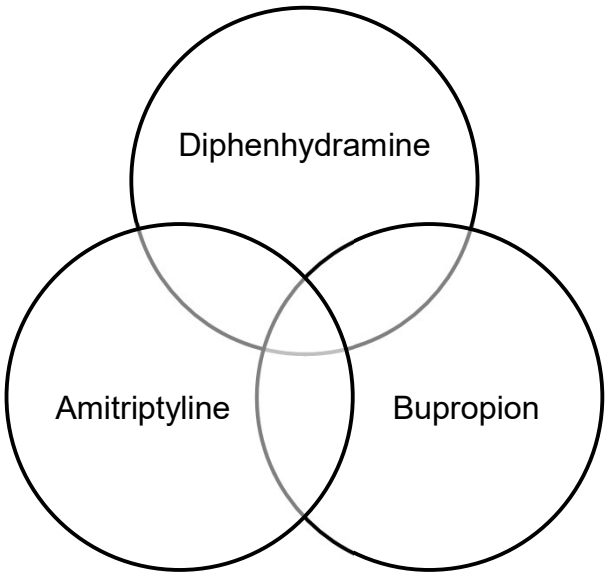
Infants/children <5 years or ≤20 kg	Children ≥5 years or >20 kg and adolescents	Adolescent/adults with concern for opioid dependence
0.1 mg/kg/dose every 2-3 minutes PRN	2 mg/dose every 2-3 minutes PRN	0.2-0.4 mg once and observe for withdrawal

In an emergency, full dose naloxone is safe and lifesaving

Case 2

Presentation	• 16-year-old female found agitated at home with open pill bottle at home
Vitals	• T 99.3°F, HR 125, RR 20, BP 130/80, SpO_2 98% on room air
Exam	• Incoherent speech dilated pupils, tachycardic, flushed skin

What substance did our patient ingest?



Case 3

Presentation	• 30-year-old M found 19 hours after taking “many” fast-release acetaminophen with alcohol
Vitals	• T 98.9°F, HR 96, RR 20, BP 118/72, SpO_2 99% on room air
Exam	• Sad affect but alert and oriented, no hepatomegaly or right upper quadrant pain

Should I give N-acetylcysteine?

Acute Ingestion (Immediate-Release)

- Acute ingestion presents within 24-hour window
- Revised Rumack-Matthew nomogram
- High-risk ingestion defined as ≥30 g or above new high-risk line

NAC

- Give in high-risk cases, uncertain timing, or delayed laboratory results
- If giving NAC, deliver at least 300 mg/kg during first 20-24 hours
- Stopping criteria via clinical markers codified

Summary

America's Poison Centers is a 24/7 Resource
1-800-222-1222 | PoisonHelp.org

Exposure type and severity are age-specific

Opioids and cannabis are highly relevant exposure substances

Thoughtful evaluation can risk stratify patients and identify toxidromes

Poisoning treatment is mostly supportive, though exceptions exist