Case: Cannabis ingestion with severe intoxication in a child

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Target Audience: Emergency Medicine Residents, Medical Students

Primary Learning Objectives

1. Generate a broad differential for unknown exposure to chemical/ingestion
2. Adequately evaluate and rule out likely agents
3. Treat correctly with supportive care

Secondary Learning Objectives: Detailed technical/behavioral goals, didactic points

1. Describe the pathophysiology of cannabinoid toxicity
2. Discuss management priorities in the altered pediatric patient
3. Compare the different types of cannabis formulations
4. Describe supportive care of acute ingestion

Critical Actions Checklist

1. Perform a focused history and physical exam based on possible ingestion
2. Evaluate for other causes of altered mental status through appropriate diagnostics
3. Order KUB to evaluate for iron pill fragments
4. Weight-based volume resuscitation
5. Consult Toxicology/Poison control
6. Admit to PICU

Environment

1. Room Set Up - ED pediatric area
    a. Manikin Set up - mid or high fidelity simulator
    b. Props - Standard ED equipment
2. Distractors - ED noise, bell alarming from another room

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Case Summary

Synopsis of Case

This is a 3-year-old male with no significant past medical history who presents after the mother found him lethargic at home with the older sister who is also acting altered. The child presents with severe ataxia, slurred speech and altered mental status that progresses to somnolence. The patient is tachycardic and hypotensive with several episodes of vomiting. The learner will discover the parents have edibles in the home in the form of colorful candies. The children got into this despite the parent thinking it was well hidden. The patient will initially be hypotensive and tachycardic. This will be responsive to fluid resuscitation. The learner should order basic blood work including toxic coingestion labs, UA and UDS for screening. The treatment will be primarily supportive. Due to the worsening somnolence the child should be admitted to PICU or moderate care on tele with frequent neuro checks.

Setting is a busy community emergency department

Synopsis of Physical

Patient presents with slurred speech and ataxia.
The child is unable to provide any history.
The child falls asleep easily and is increasingly more difficult to arouse on assessment.

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Critical Actions

1. Perform focused history and physical exam based on possible ingestion.
    a. Should focus on primary survey initially but once cleared, a deeper dive into the household medications/supplements should be sought after.
    b. Cue to primary survey: Frantic mother is asking why her baby is hard to arouse.
    c. The learner should ask about household supplements/medications.
    d. Cueing guideline: The nurse can ask the doctor if they have reviewed all the medications in the home yet.
2. Evaluate for other causes of altered mental status with appropriate diagnostics
    a. BMP with LFTs, ETOH, toxicology (salicylates, acetaminophen) and UDS
    b. Cue guideline: Nurse asks if you would like to send off any blood work.
3. Order KUB to evaluate for iron pill fragments
    a. Cue guideline: Mom asks if there is a quicker way to check to see if he took any of the multivitamins or iron supplements than waiting on the blood work?
    b. Cueing guideline: The nurse can ask the doctor if they would like any imaging to help assess the reason why the patient is altered
4. Weight-based volume resuscitation
    a. If not already completed after initial evaluation
    b. Cue: Patient becomes more hypotensive and more tachycardic on repeat vitals.
    c. Cueing guideline: The nurse can ask the doctor if they would like anything attached to the IV or any fluids for resuscitation
5. Consult Poison control/toxicology
    a. Cue: Nursing staff asks if anyone has called poison control
6. Admit to PICU
    a. Cue: Patient has worsening somnolence despite fluid resuscitation.
    b. Cueing guideline: The nurse can ask the doctor where they would like the patient to go from the emergency department

Critical Actions Checklist[1]

Resident Name	
Case Description	

Skills measured **Core competencies: PC** Patient care, **MK** Medical knowledge, **IC** Interpersonal and communication skills **P** Professionalism, **PB** Practice-based learning and improvement **SB** Systems-based practice	Very Unacceptable		Unacceptable		Acceptable		Very Acceptable	
Data Acquisition (D) PC MK I	1	2	3	4	5	6	7	8
Problem Solving (S) PC MK PB	1	2	3	4	5	6	7	8
Patient Management (M) PC MK IC P PB SB	1	2	3	4	5	6	7	8
Resource Utilization (R) PC PB SB	1	2	3	4	5	6	7	8
Health Care Provided (H) PC SB	1	2	3	4	5	6	7	8
Interpersonal Relations (I) IC P	1	2	3	4	5	6	7	8
Comprehension of Pathophysiology (P) MK PB	1	2	3	4	5	6	7	8
Clinical Competence (C) PC MK IC P PB SB	1	2	3	4	5	6	7	8

Critical Actions

Yes	No		Comments:
		Order liver function tests	
		Administer supportive therapies for abdominal pain and nausea	
		Order an abdominal and hepatic ultrasound	
		Obtain APAP level	
		Administer N-acetylcysteine	
		Consult Toxicology	
		Admit to the MICU	

Yes	No	
		Dangerous actions

[1] Modified ABEM Oral Certification Examination checklist and scoresheet

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HISTORY

Age: 3

Sex: Female

Name: Mary Ann Kushner

Method of Transportation: EMS

Person giving information: Mother

Chief Complaint: Altered mental status, altered breathing, sleepy

HPI:
Patient was found in the living room with his older sister who says she is acting funny. The older sister is 8 years old and at bedside. She is also being checked in as a patient. The mother states she left the children unattended for off and on throughout the morning while she did laundry and other chores around the house. She thought they were watching TV. The mother is acting appropriately and has no symptoms or concerns for herself. The children last appeared to be acting normally to the mother just over an hour prior to arrival.

Past Medical Hx: Hospitalized for RSV at age 1, no surgeries
Child is up to date on regular childhood vaccines

Family Med Hx: Mother denies any significant history in the parents or grandparents

Social Hx: Father smokes socially. There are2 dogs and 1 cat in the home. In the home are multivitamins, ibuprofen, acetaminophen, and iron supplements. There are no plants in the home.
Medications: None

Family Hx: - Noncontributory

Allergies: Amoxicillin

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PLAY OF CASE GUIDELINES

This is a case of a 3-year-old female with no significant past medical history who now presents with altered mental status, sedation and altered respiratory pattern.

1. The patient will be stable at the time of presentation.

2. Cannabis is the primary toxicant in this case.

3. The patient presents with altered mental status, tachycardia that will resolve over time and with supportive care.

4. If managed correctly, the patient will require fluid support for blood pressure and close observation with telemetry.

5. Consultation with the Poison Center/Toxicologist will be required.

6. The participant must obtain a thorough history and physical and generate a broad differential diagnosis for altered mental status in a child until the diagnosis is confirmed.

7. The patient requires PICU admission for continued observation and serial reassessments.

PHYSICAL EXAM

Vital Signs: BP 94/56, P128, R24, SpO2 97%, Wt: 15kg GCS 15, T 98.6 F

General Appearance: Lethargic and not easily arousable. She appears to be sleeping on the cot, deep breathing

HEENT: Conjunctival erythema bilaterally, otherwise normal.

Lungs: normal

CV: normal

Abdomen: normal

Extremities: normal

GU: normal

Back: normal

Neurological: Sleepy, difficult to arouse, minimally follows some commands once aroused, PERRL, good muscle tone, no hyperreflexia or rigidity

Skin: Moist, warm

Required Actions at the Beginning of the Case

- Perform focused hx and physical based on potential ingestion
- Begin weight-based fluid resuscitation based on initial vitals.
    - 20 mL/kg bolus (300 mL NS or LR), 4-2-1 rule for maintenance (50 mL/hr)
- Order KUB and iron levels to evaluate for iron supplement ingestion. As well as basic screening tests for other ingestants. (CBC, BMP +LFT, iron level, salicylate, acetaminophen, EtOH, UA, UDS)

Branch Points

- Reassessment of vitals
    - If fluids given: BP 74/52, p122, r22, SpO2 98%, T 98.6 F
    - If no fluids given: BP 62/38, P156, R26, SpO2 96%

Required Actions over the Next Four minutes

- If obtained, the venous critical care profile will show hypercapnia
- EKG - sinus tachycardia
- If KUB was ordered, it is negative as below under the stimulus section.
- If iron level was ordered, it is WNL as are the remainder of the labs other than UDS.

Branch point

Father walks into the room. He was over in his sister's exam room. He whispers something in the mother's ear leading to a shocked expression and a flushed complexion and then leaves the room without saying anything to you.

Branch Point:

Learner asks if everything is okay. Mom states the patient and her sister were eating their "special candy". Mom states this was thought to be well hidden but the 8 y.o. must have seen her put it away last night before bed. Mom continues by telling you the special candies are edibles they purchased at the dispensary down the street and contain varying amounts of THC from 5mg - 20 mg per edible. If the learner does not ask about what just happened, the mom sheepishly asks if it is possible for edibles to cause the patient to be like this.

Required Actions Over the Next Several Minutes:

- Call poison control: 1-800-222-1222
    - Poison control advises supportive care including IV fluids as needed. They advise somnolence with respiratory depression necessitating intubation may be needed if ingestion dose was high enough. There is no reversal agent.
- Consult social work and file a CPS report as a mandated reporter
- Call PICU for definitive disposition and admission for continued monitoring as the edibles wear off.

Branch Point:

- If the learner does not page the PICU for admission or tries to admit the patient to the floor, the patient will become severely bradycardic. If no intervention is performed the child will then go into cardiac arrest and the PALS algorithm should be followed.
- The learner should treat bradycardia with atropine or epinephrine and support respirations appropriately
- At this point intubation of the child should be considered and performed

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STIMULUS INVENTORY

1. CBC
2. BMP with LFTs
3. Iron Levels
4. UA
5. UDS
6. Co-ingestions - acetaminophen, salicylates, etoh
7. CO-oximetry
8. Lactic Acid
9. VBG
10. EKG
11. KUB
12. CXR

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LAB DATA AND IMAGING RESULTS

Stimulus #1:

Complete Blood Count (CBC)	
WBC	8.000/mm3
Hg	13.2 g/dL
Hct	40%
Plts	249,000/mm
Differential	
PMNs	55%
Lymph	27%
Mono	12%
Eosin	4.5%
Baso	1.5%

Stimulus #2

BMP with LFTs	
Sodium	142
Potassium	3.6
Chloride	110
Bicarb	16
Glucose	98
Creatinine	0.6
AST	45
ALT	31
Alk	103
T. Bili	1.2
D. Bili	0.2
Albumin	4.3

Stimulus #3:

Iron level	72 (60-170)

Stimulus #4

Urinalysis	
Color	Yellow
Specific gravity	1.017
glucose	Negative
protein	Negative
ketones	Negative
LE/Nitrites	Negative
Blood	Negative
WBC	0
RBC	None
Crystals/Bacteria	Negative

Stimulus #5

UDS	
Amphetamines	Negative
Benzodiazepines	Negative
Cocaine	Negative
Opiates	Negative
THC	Positive
TCAs	Negative

Stimulus #6

Co-ingestions	
Salicylates	negative
acetaminophen	negative
ETOH	<0.01

Stimulus #7

CO-oximetry	2

Stimulus #8

Lactic acid	1.8

Stimulus #9

Venous Blood Gas	
pH	7.34
pO2	40
pCO2	50
HCO3	24
SaO2	95
Base excess	1

Stimulus #1:

Complete Blood Count (CBC)	
WBC	8.000/mm3
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Hct	40%
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Differential	
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Stimulus #3:

Iron level	72 (60-170)

Stimulus #4

Urinalysis	
Color	Yellow
Specific gravity	1.017
Glucose	Negative
Protein	Negative
Ketones	Negative
LE/Nitrites	Negative
Blood	Negative
WBC	0
RBC	None
Crystals/Bacteria	Negative

Stimulus #5

UDS	
Amphetamines	Negative
Benzodiazepines	Negative
Cocaine	Negative
Opiates	Negative
THC	Positive
TCAs	Negative

Stimulus #6

Co-ingestions	
Salicylates	negative
acetaminophen	negative
ETOH	<0.01

Stimulus #7

CO-oximetry	2

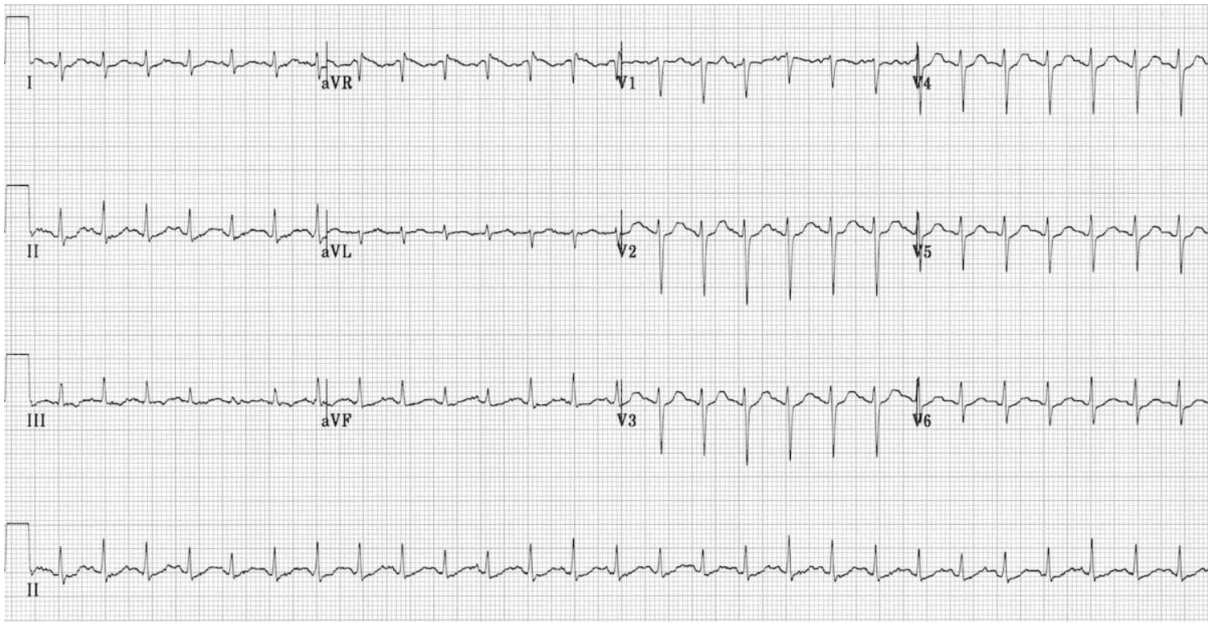
Stimulus #8

Lactic acid	1.8

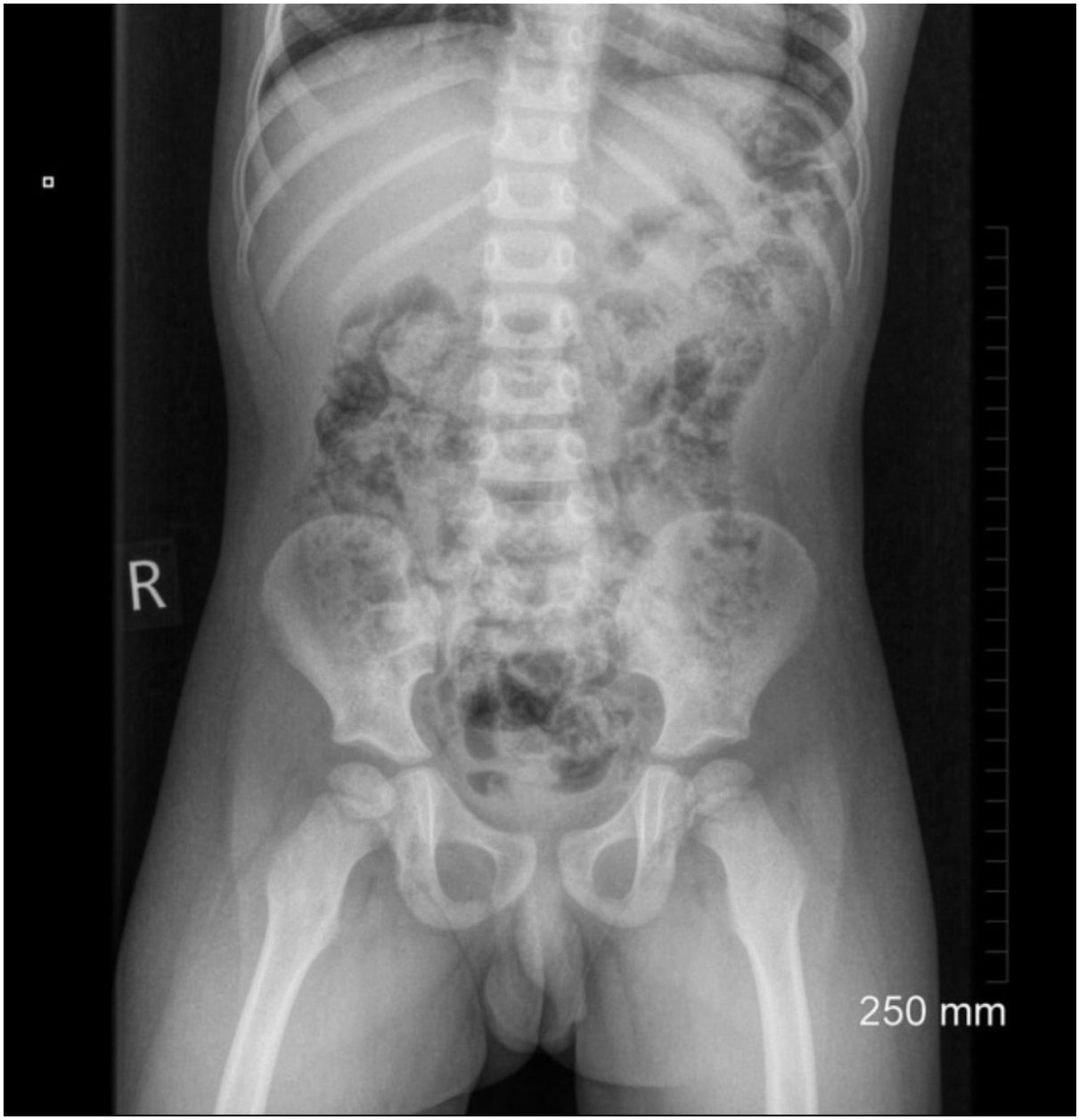
Stimulus #9

Venous Blood Gas	
pH	7.34
pO2	40
pCO2	50
HCO3	24
SaO2	95
Base excess	1

Stimulus #10: EKG



Stimulus #11: KUB



Stimulus #12 CXR

Debriefing Notes: Cannabis Ingestion in a Child

Educational Goals:
- Discuss a broad differential for toxic presentations in pediatric patients.
- Be able to differentiate the need for emergent intervention and supportive care based on ingestant.
- THC toxicity is becoming a more common presentation in pediatrics and should be taken into consideration in any accidental ingestion case.

Learning points:
-Marijuana is being legalized around the country and it is being sold in more forms including gummies and candies. The accidental exposure in children has soared.
- Over 140 million people use cannabis worldwide.
-Based on the National Poison Data System, calls for pediatric marijuana exposure have increased by 30% in legalized states following legalization.[5]
-Cannabis items are increasing in concentration and purity.
- Emergency physicians are mandatory reporters and the laws for mandated reporting vary by state. Know the laws in your state and how substance ingestion in pediatrics applies.

Pharmacokinetics
- Toxic effects of cannabinoids are secondary to overstimulation of the endocannabinoid system by exogenous cannabinoids.
- Peak concentration for inhalation is less than 30 minutes. Ingestion is 2-4 hours (or longer) based on the amount consumed.
- Duration of toxicity for inhalation is 2-6 hours. Ingestion is 8-12 hours.
- Cannabinoids will accumulate in adipose tissue with repeat exposures.
- Hepatic Cytochrome p450 system primarily metabolizes THC. It takes hours to days to be present in urine or feces.

Toxic Dose:
- There is no evidence of a lethal dose in humans.
- Animal models have shown 40 mg/kg to 130 mg/kg IV to be lethal.

Clinical Presentation
- Ingestion usually occurs due to the exploratory nature of the pediatric population.
- Initial presentation will include elevated heart rate, decreased concentration, nystagmus, lethargy and general psychomotor impairment.
- Slowed heart rate can occur with chronic use and severe intoxication.
- Sympathomimetic symptoms including psychosis, agitation and seizures.

Testing:
- UDS testing for THC metabolite can be useful in a pediatric patient when there is concern of unknown ingestion.
- Synthetic cannabinoids have lower detection rate on routine drug screening.
- The inactive metabolite can be found on UDS in as little as 6 hours and as long as 7 days for one time use.
- False positives are rare.

Diagnosis
Acute AMS
Cannabinoid toxicity

Emergency and Supportive Care

Decontamination
No need for decontamination
No role of the use of activated charcoal

Specific Drugs and Antidotes
No antidote
Supportive care only

Prognosis
Treatment is overall limited to supportive care. Most patients can be observed for 6 hours, but if patients experience central nervous system symptoms, including but not limited to, altered mental status, CNS depression, seizures, or continued hemodynamic instability, it is recommended to admit for continued monitoring. Longer periods of toxicity can be expected with edible ingestions. It can take hours to days for the child to return to baseline depending on the amount ingested.

Resources

1. Tweet MS, Nemanich A, Wahl M. Pediatric edible cannabis exposures and acute toxicity: 2017–2021. American Academy of Pediatrics. January 3, 2023. Accessed November 7, 2023.

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