Pediatric Critical Care

Altered Mental Status

Robin Craig, DO | Pediatric Critical Care | July 2026

Learning Objectives

By the end of this session, you will recognize, evaluate, and begin managing AMS in pediatric patients

01 **Recognize the spectrum of altered mental status**

02 **Apply a systematic approach to history, exam, and workup**

03 **Identify life-threatening causes of altered mental status**

04 **Basic management of status epilepticus, herniation, and toxidromes**

What Is Altered Mental Status?

AMS = any deviation from a patient's normal level of consciousness

It is always a **symptom** — never a diagnosis

What changes
Awareness, orientation, or behavior from baseline

Spectrum
Subtle confusion → deep coma

Find the cause
Work up every patient — AMS demands a diagnosis

ALWAYS ask: *"What is normal for this child?"*

The Consciousness Spectrum

Understanding the vocabulary of consciousness levels is the foundation of every AMS assessment

LEVEL 1
Alert
GCS 15

Awake, oriented, responds appropriately to environment and questions

LEVEL 2
Confused
GCS 13–14

Awake but disoriented; impaired attention, memory, or judgment

LEVEL 3
Lethargic
GCS 10–12

Drowsy; arousable with verbal stimuli; returns to sleep quickly

LEVEL 4
Obtunded
GCS 8–9

Requires repeated stimulation to arouse; minimal interaction

LEVEL 5
Stuporous
GCS 6–7

Only arousable with painful stimuli; purposeful responses minimal

LEVEL 6
Coma
GCS ≤ 8

Unarousable; no meaningful response to any stimuli

The Glasgow Coma Scale (GCS)

GCS ≤ 8

= Severe impairment — consider airway protection and intubation

Component	Response	Score
Eye Opening		**1–4**
	Spontaneous	**4**
	To voice	**3**
	To pain	**2**
	None	**1**
Verbal Response		**1–5**
	Oriented	**5**
	Confused	**4**
	Inappropriate words	**3**
	Incomprehensible sounds	**2**
	None	**1**
Motor Response		**1–6**
	Obeys commands	**6**
	Localizes pain	**5**
	Withdraws from pain	**4**
	Abnormal flexion (decorticate)	**3**
	Extension (decerebrate)	**2**
	None	**1**
TOTAL SCORE		**3–15**

Knowledge Check

A 7-year-old opens eyes **to pain** , makes **incomprehensible sounds** , and **withdraws from pain** .

What is this patient's GCS?

- **A** GCS 6
- **B** GCS 7
- **C** GCS 8
- **D** GCS 9

Knowledge Check

A 7-year-old opens eyes **to pain** , makes **incomprehensible sounds** , and **withdraws from pain** .

What is this patient's GCS?

- **A** GCS 6
- **B** GCS 7
- **C** GCS 8
- **D** GCS 9

Answer: **C — GCS 8** E2 + V2 + M4 = 8 | Consider airway protection

History-Taking in AMS

A targeted history often reveals the diagnosis before any test result returns

Onset and Progression
Sudden vs. gradual — helps distinguish vascular from infectious or metabolic causes

Infectious Symptoms
Fever, neck stiffness, rash — think meningitis, encephalitis, sepsis

Medications and Exposures
Accidental ingestions, toxins, household chemicals — ask specifically in every age group

Trauma
Witnessed or unwitnessed — consider non-accidental trauma in infants and toddlers

Past Medical History & Family History
Seizure disorder, metabolic disease, diabetes, congenital heart disease

Physical Exam in AMS

Vital signs and the neurological exam together point toward the mechanism of AMS



Vital Signs

- **HR**
- **BP**
- **RR**
- **Temp**
- **SpO_2**
- **Glucose** — check bedside FIRST



Neurological

- **GCS** — score all 3 components
- **Pupils** — size, reactivity, symmetry
- **Fontanelle** — bulging in infants or sunken
- **Tone** — hypo or hypertonia



Skin

- **Color** — pallor, cyanosis, flushing
- **Rash** — petechiae, purpura, maculopapular
- **Diaphoresis** — sweating vs. dry skin
- **Trauma signs** — bruising, lacerations

The MOVE STUPID Differential

Work through every letter — so you don't miss a reversible cause of AMS

M — Metabolic
Glucose, Na, Ca, Mg, NH_3, thyroid, adrenal

O — Oxygen
Hypoxia, hypercapnia, CO poisoning

V — Vascular
Stroke, hypertensive encephalopathy, PRES

E — Epilepsy
Seizure, post-ictal state, status epilepticus

S — Structural / Stroke
Tumor, hydrocephalus, herniation

T — Trauma
TBI, intracranial hemorrhage, non-accidental

U — Uremia / Renal
Uremic encephalopathy, hepatic failure

P — Psychiatric / Psychogenic
Diagnosis of exclusion — rule out organic first

I — Infection
Meningitis, encephalitis, sepsis, abscess

D — Drugs / Toxins
Ingestions, medications, environmental toxins

Workup — Labs

Order labs guided by history and exam — not every test on every patient

Bedside

- **ALWAYS FIRST**
- Glucose (bedside)
- Pulse oximetry
- ECG toxin or arrhythmia concern)

Blood

- CBC
- CMP, LFTs
- Tox levels
- Blood culture
- VBG / ABG

Urine

- Urinalysis (UA)
- Urine tox screen

Consider

- LP (if meningitis concern)
- AED levels
- Thyroid (TSH)
- Cortisol

Workup — Imaging

Get CT head urgently when herniation or trauma is on the differential

CT Head (Non-Contrast)

Trauma, hemorrhage, herniation — order urgently when any of these are on the differential

MRI Brain

Stroke, encephalitis, posterior fossa lesions — better resolution, but slower to obtain

Chest X-Ray (CXR)

Aspiration pneumonia, pulmonary edema — consider when respiratory etiology is suspected

Do NOT Delay Resuscitation for Imaging

Stabilize airway, breathing, and circulation FIRST — imaging never takes priority over the unstable patient

Treatment Principles — ABCs First

No matter the cause, airway protection and hemodynamic stability come before the diagnosis

A **Airway:** Position, suction, O_2 — consider intubation if GCS ≤ 8 or airway not protected

B **Breathing:** Ensure adequate ventilation

C **Circulation:** IV access, fluids, treat shock

D **Disability:** Glucose check, **reassessment**

Reversal Agents

Two reversal agents are available — know their indications and critical contraindications

Agent	Indication	Key Notes
Naloxone (Narcan)	**Opioid Toxicity**	Can give IM / IN / IV Titrate to **respirations** — not full reversal
Flumazenil	**Benzodiazepine Reversal**	**CONTRAINDICATED if seizure history or chronic BZD use** **Risk: precipitates status epilepticus**
Dextrose	**Hypoglycemia**	**Always** correct hypoglycemia immediately — check glucose on every altered patient

Case 1 — Setup

Status Epilepticus

A classic status epilepticus presentation — what do you do?

Patient

12-year-old male — known seizure disorder on valproic acid

Brought in by EMS, seizing for 25 minutes

Vital Signs on Arrival

Temp	HR	BP	SpO_2	O_2 Delivery
37.8°C	120	98/60	94%	NRB

Still seizing on arrival

Status Epilepticus — Definition & Tiers

Status epilepticus is a time-sensitive emergency — treatment follows a tiered protocol

Definition — Seizure > 5 minutes OR ≥ 2 seizures without return to baseline

Tier 1 — 0–5 min

First-Line

Benzodiazepines

Lorazepam · Diazepam · Midazolam

If seizure continues after BZD — escalate

Tier 2 — 5–20 min

Second-Line

Anti-Seizure Medications

Levetiracetam · Fosphenytoin · Valproic acid

If refractory — call PICU, prepare for intubation

Tier 3 — > 20 min

Refractory SE

Phenobarbital, Ketamine, Intubation

Midazolam drip · Pentobarbital drip · Continuous EEG monitoring

Case 1 — Management Answer

Refractory Status Epilepticus

This patient is in refractory SE — escalate to Tier 3 and activate your team

1. **Already failed Tier 1** — 2 benzodiazepines given pre-hospital
2. **Give Tier 2:** Levetiracetam 60 mg/kg IV over 10 min (max 4500 mg)
3. **If fails** → Fosphenytoin 20 mg PE/kg IV
4. **If fails** → Call PICU
5. Send labs, consider LP after patient stabilized

Case 2 — Setup

Neonatal AMS with Fever

High stakes, narrow window

2-week-old male brought in by parents for "not acting right"

Temp	Fontanelle	Feeding
38.6°C	Bulging	Poor × 12 h

- Lethargic
- Irritable when handled
- Hypotonic

Poll

What is your leading diagnosis?

Think: What does the triad of fever + bulging fontanelle + altered neonate mean?

Neonatal Bacterial Meningitis — Organisms & Antibiotics

In neonates, empiric coverage must hit GBS, E. coli, and Listeria — do not delay antibiotics for LP

Organism	Empiric Antibiotic(s)	Key Note
Group B Strep (GBS)	**Ampicillin + Gentamicin Or Vanc and Ceftriaxone**	Most common neonatal meningitis pathogen
E. coli	**Ampicillin + Gentamicin Or Vanc and Ceftriaxone**	Gram-negative; Cefotaxime preferred if <28 days
Listeria monocytogenes	**Ampicillin**	
HSV Encephalitis	**Acyclovir**	Add if HSV encephalitis possible; do not wait for confirmation
LP Timing	**Do NOT delay antibiotics if patient is unstable — treat first, LP second**	

Neonatal Sepsis + Meningitis: Act Now

Move fast — antibiotics and workup happen simultaneously

1. **Blood culture, LP (if safe) , UA/urine culture, CBC, CMP, glucose**
2. **Start (Ampicillin + Gentamicin) or (Ceftriaxone and vancomycin) + Acyclovir immediately**
3. **Fluid resuscitation: 10- 20 mL/kg NS bolus , then reassess**
4. **PICU admission pending clinical status ; neurology consult of seizure concerns**
5. **Monitor for seizures; treat hypoglycemia**

Case 3

Trauma + Herniation

Head trauma with a triad of findings — recognize this pattern immediately

13-year-old male — restrained passenger, MVC

Motor vehicle collision — significant mechanism of injury

Right pupil 7 mm, minimally reactive

Left pupil 3 mm, reactive

GCS 7 on arrival — severe impairment, airway at risk

Vital Signs on Arrival

Blood Pressure
168 / 92
HYPERTENSION

Heart Rate
48 bpm
BRADYCARDIA

Respirations
Irregular
ABNORMAL PATTERN

Cushing's Triad

Hypertension + Bradycardia + Irregular Respirations = Herniation until proven otherwise

Hypertension

Widened pulse pressure

Bradycardia

Reflex slowing of heart rate

Irregular Respirations

Cheyne-Stokes or apneustic

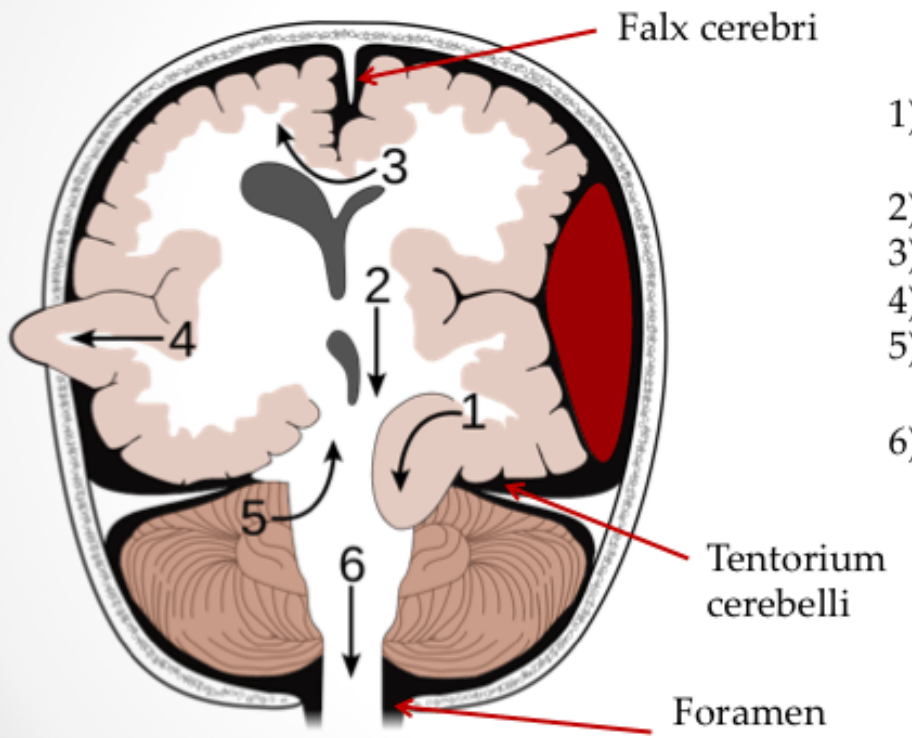
Mechanism: Brainstem compression from rising ICP

Herniation Syndromes

Knowing the type of herniation directs your intervention — each has a distinct clinical picture

Type	Clinical Findings	Management
Uncal	Unilateral fixed, dilated pupil (CN III palsy) Contralateral hemiplegia Decreased LOC — rapid deterioration	HOB 30°, head midline Hyperventilate to PCO_2 35–40 Mannitol or 3% saline Neurosurgery STAT
Central	Bilateral pinpoint pupils → bilateral blown pupils Cushing's triad (HTN, bradycardia, irregular RR) Transtentorial — progressive bilateral signs	HOB 30°, head midline Hyperventilate to PCO_2 35–40 Mannitol or 3% saline Neurosurgery STAT
Tonsillar	Sudden apnea — cerebellar tonsils → foramen magnum Cardiovascular collapse Neck pain / head tilt may precede arrest	HOB 30°, head midline Hyperventilate to PCO_2 35–40 Mannitol or 3% saline Neurosurgery STAT

Herniation



1) Uncal (descending transtentorial)
2) Central
3) Cingulate (subfalcine)
4) Transcalvarial
5) Upward (ascending transtentorial)
6) Tonsillar

Management

⚠ Treat herniation aggressively while getting neurosurgery on the phone

1. **Airway: Intubate immediately (RSI)**
   Target **PCO_2 35–40 mmHg** — brief hyperventilation only if acute neurologic deterioration

2. **HOB 30°, head midline**
   Optimize venous drainage — avoid neck flexion, tight C-collar

3. **Hyperosmolar therapy**
   Mannitol 0.5–1 g/kg IV OR **3% Saline 3–5 mL/kg IV**

4. **Neurosurgery consult STAT**
   Likely needs **emergent craniotomy or EVD** — call now, do not wait for imaging

5. **CT head immediately after stabilized**
   Identify hemorrhage, herniation type, midline shift — guides surgical planning

Case 4

Hypoglycemia

Hypoglycemia is a MUST-NOT-MISS cause of AMS in every age group

Clinical Vignette

- 5-day-old female
- Poor feeding, jittery, then **unresponsive**
- **Bedside glucose**

Bedside Glucose

31

mg/dL

What is the Rule of 50?

What is your next step?

Rule of 50 + Dextrose Dosing

Dextrose % × mL/kg = 50 — match your concentration to the dose

Rule of 50: **Dextrose % × mL/kg = 50** → gives ~0.5–1 g/kg glucose

Concentration	Dose (mL/kg)	Notes
D10W	**5 mL/kg**	**Preferred in neonates — avoid hyperosmolar bolus**
D25W	**2 mL/kg**	**Infants and children — peripheral IV acceptable**
D50W	**1 mL/kg**	**Adolescents / adults — central line preferred**

Goal glucose > 60 mg/dL — recheck in 15 minutes

HOBBIES Mnemonic — Causes of Neonatal Hypoglycemia

HOBBIES helps you remember every cause of persistent neonatal hypoglycemia

H O B B I E S

H — **Hyperinsulinism**

O — **Other** (sepsis, asphyxia, hypothermia)

B — **Beckwith-Wiedemann syndrome**

B — **Beta-blocker or other drug exposure**

I — **Inborn errors of metabolism**

E — **Endocrine** (adrenal insufficiency, panhypopituitarism)

S — **Small for gestational age / prematurity**

Toxicology — Vital Sign Clues

Vital signs alone can narrow your toxidrome before you know what was ingested

Vital Sign Finding	Associated Toxidromes
Tachycardia	Sympathomimetics Anticholinergics Serotonin Syndrome
Bradycardia	Opioids Beta-Blockers Ca-Channel Blockers Clonidine
Hypertension	Sympathomimetics Cocaine
Hypotension	Opioids Sedative-Hypnotics
Hyperthermia	Anticholinergics Sympathomimetics Serotonin Syndrome

Pupillary Exam — COPS / AAAS

The pupils tell you the toxidrome — memorize COPS and AAAS

Miosis — Pinpoint Pupils

COPS

Causes of small / constricted pupils

- **C — Cholinergics**
- **O — Opioids**
- **P — Pontine lesion**
- **S — Sedative-hypnotics**

Mydriasis — Dilated Pupils

AAAS

Causes of large / dilated pupils

- **A — Anticholinergics**
- **A — Antihistamines**
- **A — Adrenergics / Sympathomimetics**
- **S — Serotonin syndrome**

Skin Exam — SOAP

Look at the skin — it gives away the toxidrome before the tox screen comes back

S | **Sweating**
Cholinergics, sympathomimetics, serotonin syndrome

O | **Out (dry skin)**
Anticholinergics — "dry as a bone"

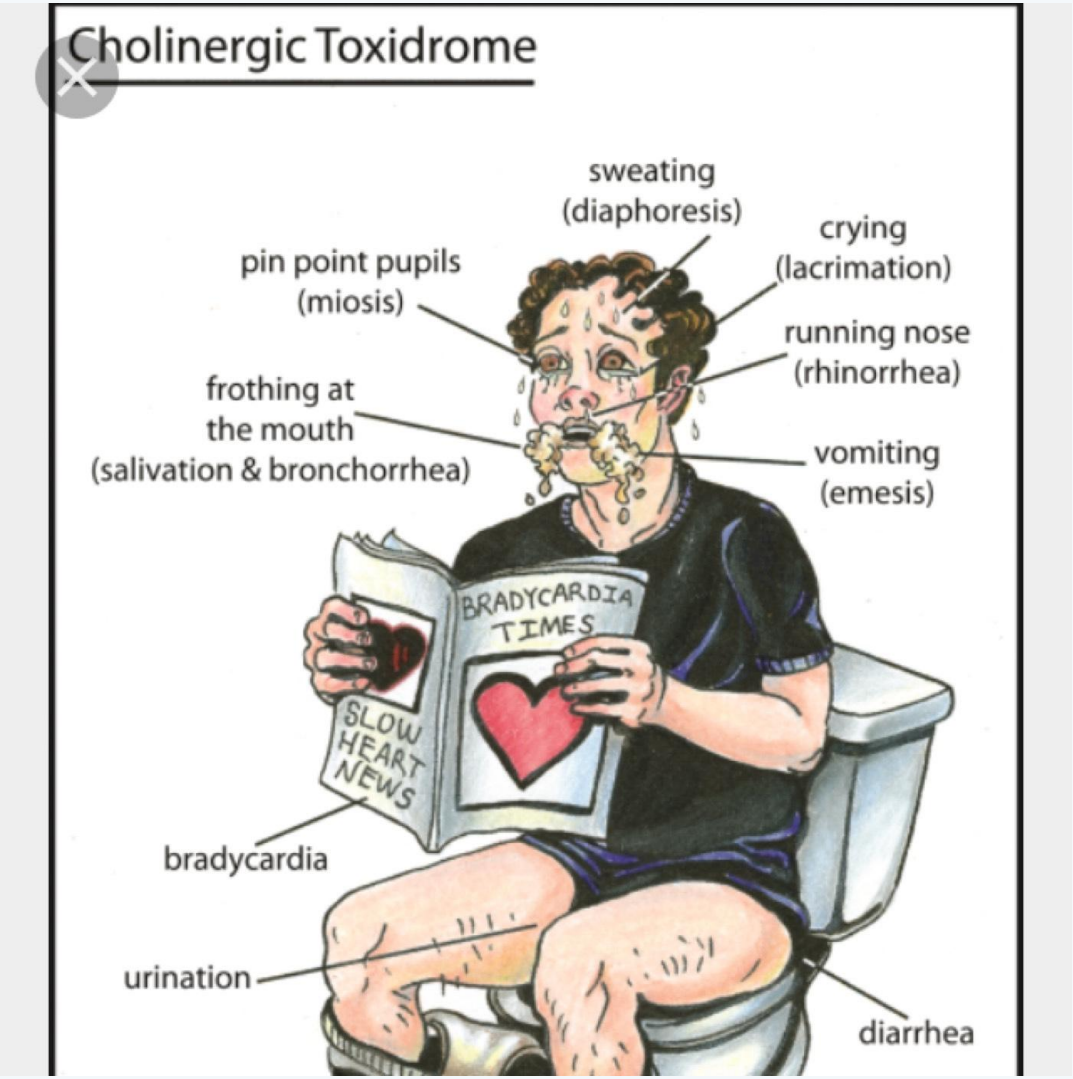
A | **Alopecia/ needle marks**
Chronic drug use clues

P | **Pallor / Cyanosis**
Methemoglobinemia, CO poisoning

Cholinergic Toxidrome — DUMBBBELS

Muscarinic & Nicotinic Overload

- **D** — Defecation / Diarrhea
- **U** — Urination
- **M** — Miosis
- **B** — Bradycardia
- **B** — Bronchospasm
- **B** — Bronchorrhea
- **E** — Emesis
- **L** — Lacrimation
- **S** — Salivation / Seizures



Case 5

15-year-old female, found unresponsive — empty bottle of diphenhydramine (Benadryl) nearby

T 39.2°C | **HR 148** | **BP 110/70** | **Dry, flushed skin** | **Pupils 8mm bilateral**

> ***Mad as a hatter, red as a beet, hot as a hare, dry as a bone, blind as a bat***

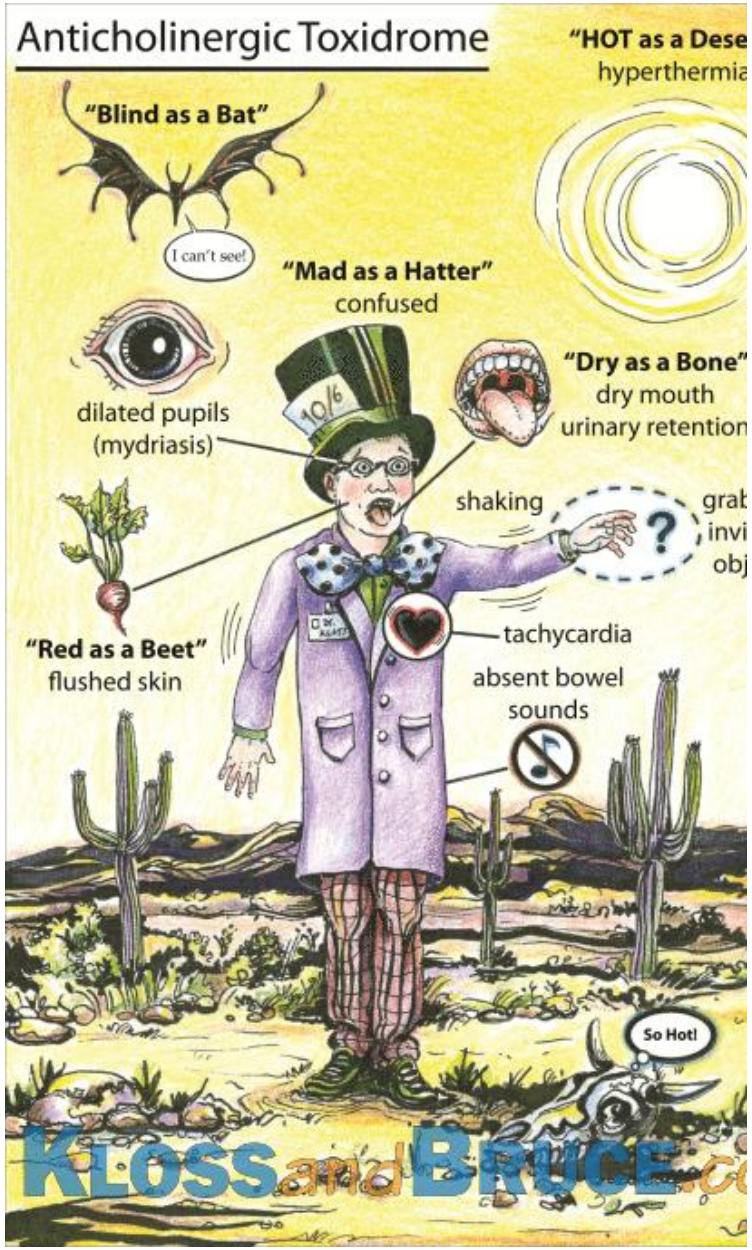
Management

Supportive Care
Airway protection, cardiac monitoring, IV access, cooling measures for hyperthermia

Physostigmine
Cholinesterase inhibitor — use with caution; contraindicated with TCA co-ingestion

Benzodiazepines
First-line for agitation, seizures, and hyperthermia management

Anticholinergic Toxidrome



Case 6 —e

A 3-Year-Old Found with Grandmother's Medication

3-year-old male

Found unresponsive / agitated — grandmother's medication found at scene

Heart Rate	Blood Pressure	Temperature	Pupils	Skin
178 bpm	128/88 mmHg	38.8°C Febrile	7 mm Bilateral	Diaphoretic Agitated

Tachycardia | Hypertension | Hyperthermia | Mydriasis | Diaphoresis

Poll

What toxidrome is this? What medication class is most likely responsible?

Sympathomimetics Toxicity

Everything turned up — treat agitation and prevent end-organ damage

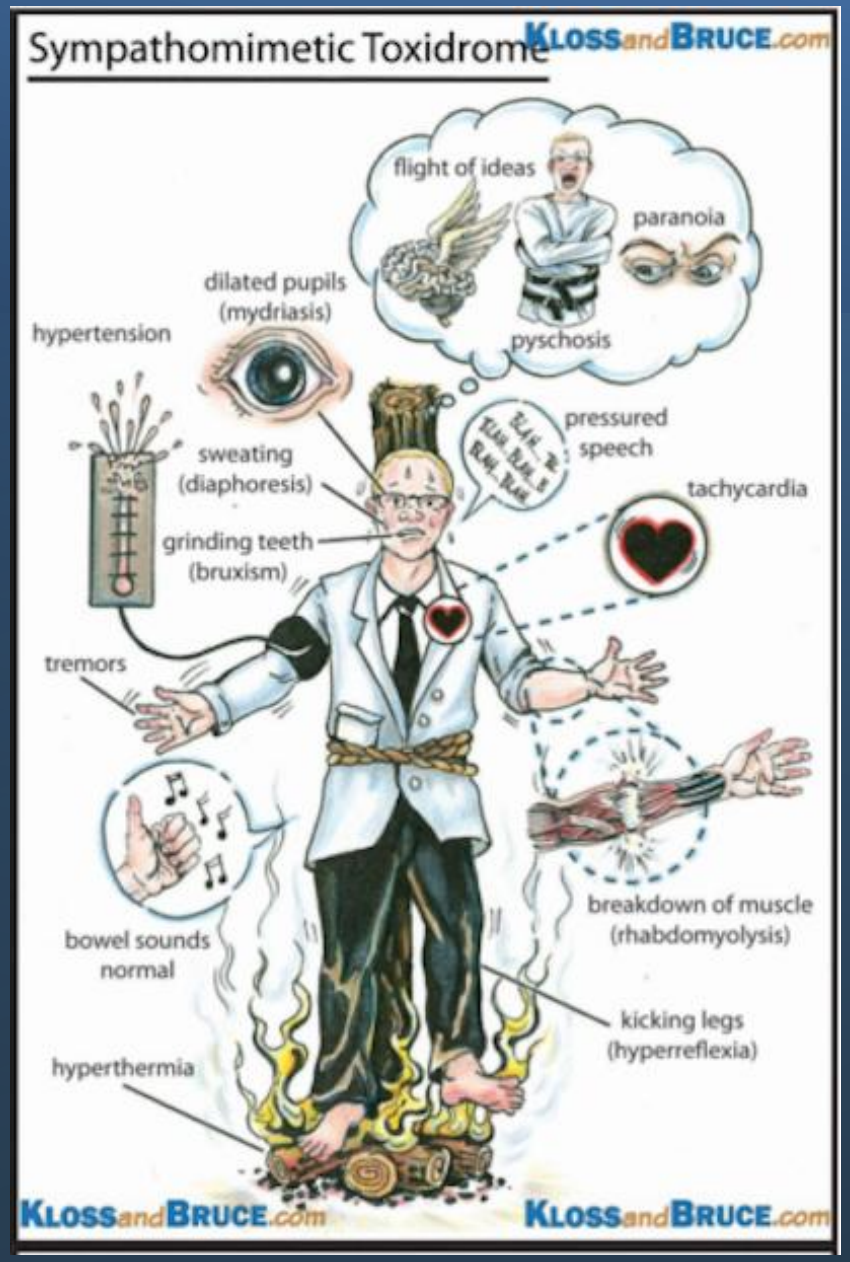
Sympathomimetic Toxidrome — Classic Picture

- Tachycardia, hypertension, hyperthermia, diaphoresis, mydriasis, agitation
- Agents: cocaine, amphetamines, pseudoephedrine, MDMA, synthetic cathinones

BZDs first | **Cooling if hyperthermic** | **Supportive care**

⚠ Cocaine-Specific Note

- Also causes **coronary vasospasm** — can present with chest pain or MI in young patients
- **AVOID BETA-BLOCKERS** — beta-blockade causes unopposed alpha stimulation → worsened vasospasm and hypertension
- Treat chest pain with benzodiazepines + nitroglycerin instead



BOX 128.2

Sympathomimetic Toxidrome Features

Sympathomimetic Toxidrome	Causative Agents
Agitation	Albuterol
Seizures	Amphetamines
Mydriasis	Caffeine
Tachycardia	Catecholamines
Hypertension	Cocaine
Diaphoresis	Ephedrine
Pallor	Ketamine
Cool skin	Phencyclidine (PCP)
Fever	Phenylephrine
	Phenylpropanolamine
	Pseudoephedrine
	Terbutaline
	Theophylline

Carbon Monoxide + Cyanide Poisoning

House fire + AMS = CO and cyanide until proven otherwise — do not wait for levels

Smoke inhalation victims: both toxins can co-exist — treat empirically

Carbon Monoxide CO

Symptoms

Headache → confusion → coma

Key Trap

SpO2 reads falsely normal — standard pulse ox cannot detect COHgb

Mechanism

CO binds hemoglobin with 250× affinity of O2 — blocks O2 delivery

Treatment

100% O2 via NRB

Hyperbaric O2 if severe (coma, cardiac involvement, pregnancy)

Cyanide HCN

Symptoms

Rapid cardiovascular collapse, profound lactic acidosis

Key Clue

High anion gap lactic acidosis out of proportion to clinical picture

Mechanism

Blocks cytochrome c oxidase — cells cannot use O2 (histotoxic hypoxia)

Treatment

Hydroxocobalamin (Cyanokit)

70 mg/kg IV; binds cyanide directly — give early, do not wait for levels

Methemoglobinemia

Chocolate-brown blood + normal SpO_2 reading = methemoglobinemia — treat with methylene blue

Clinical Case

2-month-old with cyanosis after EMLA cream application — SpO_2 reads 85% but infant appears well otherwise

Chocolate-Brown Blood

Classic finding on ABG sample — blood does not turn red with O_2 exposure

SpO_2 reads falsely normal — pulse oximetry is UNRELIABLE in MetHgb

Common Causes in Kids

- **EMLA cream (lidocaine/prilocaine)**
- **Dapsone cream**
- **Nitrates (well water, foods)**
- **Benzocaine**

MetHgb: hemoglobin is oxidized to Fe^{3+} — cannot bind or carry O_2

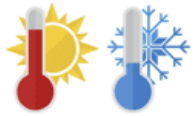
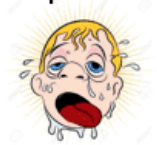
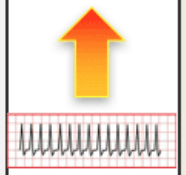
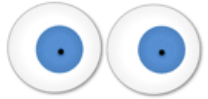
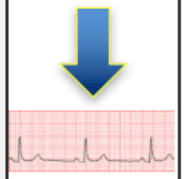
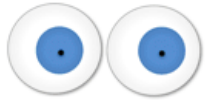
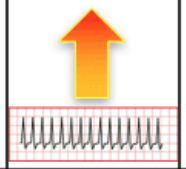
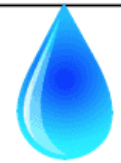
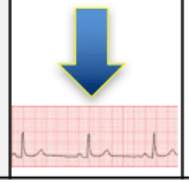
Treatment

Methylene Blue

1–2 mg/kg IV over 5 minutes — reduces MetHgb back to functional hemoglobin

Toxidromes Summary Table

Use this table as your toxicology cheat sheet at the bedside

	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 		

Key Pearls — Take-Home Points

If you remember nothing else, remember these

1. AMS is always a **symptom** — find the cause
2. Check glucose on **EVERY** altered patient — immediately
3. **GCS ≤ 8:** think about airway protection
4. **MOVE STUPID:** don't miss a reversible cause
5. Status epilepticus is **time-sensitive** — escalate tiers quickly
6. Neonatal fever + AMS = **sepsis/meningitis** until proven otherwise
7. Cushing's triad = **herniation** until proven otherwise
8. Know your toxidromes by **vital signs + pupils + skin**
9. **NEVER** give Flumazenil if seizure history
10. CO + cyanide — treat **empirically** in smoke inhalation

Clinical Pearls!

1. If something doesn't make sense- keep looking
2. Reassess! One time point will not give you all the answers
3. If the parents, nurses, other team members are worried- assess! Take it seriously
4. Keep your differentials broad
5. Ask for help! Never worry alone!
6. Common things are common, but kids can surprise you
7. Don't be afraid to admit you don't know
8. Treat the patient not the monitor
9. Good communication prevents bad outcomes
10. Slow down and take a breath! Check your pulse first!

Questions?

Robin Craig, DO | Pediatric Critical Care

July 2026 Resident Educational Sessions