BEARAMEDICS

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FIELD EDUCATION CARDS

Study Between Calls · The Why Behind the Field Cards

IN THIS SET

- **E1** Ischemic Strokes — Hemorrhagic Strokes
- **E2** Capnography: The Shape — Capnography: The Number
- **E3** Toxidromes — Toxic Agents & Traps
- **E4** Diabetic Emergencies — Diabetes: Meds & Treatment
- **E5** Heart Failure Types — CPAP: Why and How
- **E6** Dialysis Patients — LVADs & Pacemakers
- **E7** Burn Depth & TBSA — Burns: What Kills Them
- **E8** Pediatric Vitals — Pediatric Approach
- **E9** Heat & Cold Exposure — Drowning & Cold Water
- **E10** Rattlesnake Bites — Spiders, Stings & Stingrays

Back of this cover: the crosswalk between this set and Field Reference Cards 1 to 10. **Each card:** two related topics, one per side.

Card key: (P) Pearl, not in county protocol Base Base hospital order only #612 SLOEMSA protocol number

For study and education. Not a protocol and not a treatment guide. Treat per patient presentation, vitals, and current SLO County EMS protocols; when a card and a protocol disagree, the protocol wins. An independent Bearamedics project, not issued or endorsed by any agency or employer.

Prepared by **Thomas Moore, EMT-P**

v1.0 · Oct 2026 · Flip for the Crosswalk

CROSSWALK

STUDY IT HERE, USE IT THERE

Education Set Crosswalk
Bearamedics Reference · not a treatment protocol

TWO SETS, ONE JOB: KNOW IT BEFORE THE CALL, FIND IT DURING THE CALL

- ✦ Education cards (E1 to E10) are for between calls: the why
- ✦ Field Reference Cards (1 to 10) are for the call: the what and the who
- ✦ Every line on this page is pulled from the cards themselves; nothing new is taught here

STEP 1: What Each Education Card Feeds, and the Line to Remember

Education Card	Use It On	If You Remember Nothing Else
E1 **Ischemic Strokes** Hemorrhagic Strokes	7 Stroke 4 Altered Mental Status 8 Trauma	✦ Treatment is the same for every type: BEFAST, BGL, last seen normal, alert, move. ✦ CT tells the difference, not your exam.
E2 **Capnography: The Shape** Capnography: The Number	2 Respiratory 4 Altered Mental Status 5 Shock	✦ The number tells you how much; the shape tells you why. ✦ A wave that looks wrong before the SpO2 moves is the early warning.
E3 **Toxidromes** Toxic Agents & Traps	4 Altered Mental Status 10 STEMI & Mimics 1 Chest Pain	✦ A toxidrome is a vital sign pattern, not a drug name. ✦ Call it by the pattern, not the bottle.
E4 **Diabetic Emergencies** Diabetes: Meds & Treatment	4 Altered Mental Status 7 Stroke	✦ Under 60 gets treated now, whatever else is going on. ✦ Sulfonylurea lows come back: a wake-up is not a cure.
E5 **Heart Failure Types** CPAP: Why and How	2 Respiratory 5 Shock 1 Chest Pain	✦ Wet lungs plus a low BP is cardiogenic shock, and nitro will hurt them. ✦ Blood pressure is the limit.
E6 **Dialysis Patients** LVADs & Pacemakers	10 STEMI & Mimics 9 ECG Basics 6 Syncope	✦ Missed a session: assume high potassium and too much fluid. ✦ Treat the patient, then account for the device.
E7 **Burn Depth & TBSA** Burns: What Kills Them	8 Trauma 2 Respiratory	✦ Depth tells you how bad; TBSA tells you how sick they'll get. ✦ The burn is rarely the immediate problem.
E8 **Pediatric Vitals** Pediatric Approach	5 Shock 8 Trauma 2 Respiratory	✦ Blood pressure is the last thing to fall in a child. ✦ A quiet child who doesn't fight you is a sick child.
E9 **Heat & Cold Exposure** Drowning & Cold Water	4 Altered Mental Status 2 Respiratory 10 STEMI & Mimics	✦ The thermometer matters less than the mental status. ✦ Drowning is a hypoxia problem: fix the oxygen first.
E10 **Rattlesnake Bites** Spiders, Stings & Stingrays	5 Shock 2 Respiratory	✦ It's a destination problem, not a stopwatch problem. ✦ Any sting can cause anaphylaxis: epinephrine early.

STEP 2: Working From a Field Card? Study These

1 **Chest Pain** E3 E5	2 **Respiratory** E2 E5 E7 E8 E9 E10	3 **Abdominal Pain** *no companion card yet*	4 **Altered Mental Status** E1 E2 E3 E4 E9	5 **Shock** E2 E5 E8 E10
6 **Syncope** E6	7 **Stroke** E1 E4	8 **Trauma** E1 E7 E8	9 **ECG Basics** E6	10 **STEMI & Mimics** E3 E6 E9

How to use it After a call, find the field card you used in Step 2 and read the education cards listed with it. Before a shift, pick one row in Step 1 and be able to explain both lines without flipping the card.

ISCHEMIC STROKES

WHAT CHANGES IN THE FIELD, AND WHAT DOESN'T

- ✦ Treatment is the same for every type: BEFAST, BGL, last seen normal, alert, move #621
- ✦ About 85% of strokes are ischemic; the rest bleed (P)
- ✦ What type does change: destination thinking, how closely you watch the airway, and how you word the report (P)
- ✦ Card 7 is the card you use on a call. This one is for study.
- ✦ Cortical signs (aphasia, neglect, gaze) point to a big vessel (P)
- ✦ Posterior strokes fail FAST: balance and eyes catch them #621

STEP 1: Where the Clot Is Shapes What You See

ANTERIOR: MCA

- Most common stroke
- Face and arm weaker than the leg, on the side opposite the stroke
- Left brain: can't find words or follow them (aphasia). Right brain: ignores the weak side and may insist nothing is wrong (neglect)
- Eyes drift toward the injured side of the brain, away from the weak side

Classic Stroke

ANTERIOR: ACA

- Leg weaker than the arm, opposite side
- Awake but won't start anything: little spontaneous speech or movement, long pauses, looks apathetic (abulia)
- Urinary incontinence
- Uncommon on its own

Anterior Cerebral

POSTERIOR: PCA & BASILAR

- Dizziness, double vision, slurred speech, trouble swallowing, unsteady walking
- The same half of the visual field disappears in **both** eyes: half the world is gone (hemianopia)
- Crossed findings: numb face on one side, weak limbs on the other
- Basilar: rapid decline, coma, pinpoint pupils

Posterior: Sneaky

CEREBELLAR (PICA)

- Sudden vertigo, vomiting, cannot walk or sit up unaided
- Eyes jerk back and forth (nystagmus); headache at the back of the head
- Swelling can herniate over 12 to 72 hours
- Often mistaken for vertigo or a stomach bug

Watch for Decline

LACUNAR (small vessel)

- Pure weakness or pure numbness, with no language, vision, or awareness problems
- Long-standing hypertension or diabetes
- Can stutter and fluctuate over hours
- Small, deep, and easy to under-call

Small Vessel

THREE THINGS WORTH KNOWING

Large Vessel Occlusion (LVO)

Eyes pulled to one side, an arm that won't move at all, plus language trouble or ignoring one side: a severe deficit and probably a big vessel. LVO is what a thrombectomy center treats, out to 24 h in selected patients. Your report and your AC IV feed that decision. (P)

Cortical vs. Lacunar

Cortical signs (large vessel): language trouble, ignoring one side, eyes pulled to one side, half the visual field missing. **Lacunar** (small vessel): pure weakness or pure numbness and none of those. Both still get the alert. (P)

Left Brain vs. Right Brain

Left brain (language side for most people): they can't tell you what's wrong. Right brain: they ignore the weak side, may deny anything is wrong, and may refuse transport. Get the story from family. (P)

STEP 2: Compare the Ischemic Syndromes

Syndrome	Vessel	Motor / Sensory	Cortical Signs	Other Clues	Field Note
MCA	Middle cerebral	Face and arm worse than the leg, opposite side	Word trouble (left) or ignoring the weak side (right); eyes pulled toward the stroke	Half the visual field missing on the weak side	The stroke BEFAST was built to catch
ACA	Anterior cerebral	Leg worse than the arm, opposite side	Won't start anything: flat, apathetic, long pauses (abulia)	Incontinence; grasping returns when you touch the palm	Weakness pattern looks backwards from MCA
PCA	Posterior cerebral	Usually spared, or mild numbness	None; vision is the finding	Same half of the field gone in both eyes; if both sides are hit they may be blind and not know it; memory gaps, confusion	They bump into things and never mention weakness
Basilar	Basilar artery	Weak in all four limbs, or both sides at once	None; the brainstem is the problem	Coma, pinpoint pupils, awake but unable to move or speak (locked-in), crossed deficits, vomiting	Airway and breathing fail early: watch them closely
Cerebellar	PICA or SCA	Unsteady walking; limbs overshoot when reaching (dysmetria)	None	Vertigo, vomiting, eyes jerking, cannot stand	Vomiting plus cannot walk is the tell; swelling comes later
Lacunar	Small penetrating branches	Pure motor or pure sensory, or clumsy hand	None	Hypertension, diabetes, prior small strokes	Subtle does not mean minor
Carotid Dissection	Internal carotid	MCA-type deficit	Possible word trouble or ignoring one side	Neck or face pain; droopy lid and small pupil on the same side (Horner's); young patient, recent neck strain	Young stroke with neck pain (P)
Watershed / Hypoperfusion	Border zones between arteries	Both arms and shoulders weaker than the legs	Variable	After arrest, sepsis, or a long stretch of low blood pressure	Fix the pressure and the oxygen first (P)

LVO large vessel occlusion **MCA / ACA / PCA** middle, anterior, posterior cerebral artery **PICA / SCA** cerebellar arteries **aphasia** can't produce or understand words
neglect ignores one side of the body or the room, often denies the deficit **abulia** awake but no drive: doesn't start speech or movement
hemianopia the same half of the visual field missing in both eyes **dysmetria** limbs overshoot the target **Horner's** droopy lid and small pupil on one side

HEMORRHAGIC STROKES

YOU CANNOT SEE A BLEED IN THE FIELD, BUT YOU CAN SUSPECT ONE

- ✦ CT tells the difference, not your exam Ⓟ
- ✦ Leaning hemorrhagic: sudden severe headache, vomiting, very high BP, fast decline Ⓟ
- ✦ There is no field BP treatment for stroke in the county protocols #621
- ✦ Anticoagulants change everything at the hospital: bring the drug name and last dose Ⓟ
- ✦ Rising BP with falling HR is herniation, not a reassuring trend Ⓟ
- ✦ The alert is the same: BEFAST, last seen normal, early transport #621

STEP 1: Four Bleeds and the Way They Present

INTRACEREBRAL (ICH)

- Hypertension is the usual cause
- Deep bleeds: basal ganglia, thalamus, pons, cerebellum
- Deficit plus headache plus vomiting, getting worse
- Falling LOC; very high blood pressure

ICH

SUBARACHNOID (SAH)

- Thunderclap: worst headache of their life, instantly
- Aneurysm rupture, often during exertion
- Neck stiffness, light sensitivity, vomiting
- May have no focal deficit at all
- Sentinel headache days before Ⓟ

SAH

SUBDURAL (SDH)

- Older adults, anticoagulated, after a fall
- Days to weeks of fluctuating confusion
- Mistaken for dementia, UTI, or intoxication
- A low-energy head strike is enough

SDH

EPIDURAL (EDH)

- Younger trauma, temporal bone fracture
- Lucid interval, then rapid decline
- Arterial bleed: minutes to hours matter
- Blown pupil on the side of the bleed

EDH

HERNIATION (any bleed)

- Cushing's: BP up, HR down, breathing irregular
- One pupil blown and sluggish
- Posturing, then flaccid
- Keep SpO2 up; do not hyperventilate Ⓟ

Late Sign

WHAT THE HOSPITAL IS DECIDING WHILE YOU DRIVE

Clot-Busting Drugs

IV thrombolytics run out to about 4.5 h from last seen normal for eligible patients. The checklist you gather (anticoagulants, recent surgery or bleeding, prior stroke or tumor) is what decides eligibility #621.

Thrombectomy

For a large vessel occlusion, a catheter pulls the clot, selected out to 24 h. It needs CT angiography, which is why a good AC IV and a clean neuro description help. Ⓟ

If It's a Bleed

Reverse the anticoagulant, control the pressure, call neurosurgery. All three move faster when you hand over the drug name, the last dose, and the exact time things changed. Ⓟ

STEP 2: Compare the Bleeds

Bleed	Where	Typical Story	Course	Pupils / Signs	Field Note
ICH	Into the brain itself	Hypertensive patient, sudden deficit with headache and vomiting	Worsens over minutes to hours as it expands	Pupil changes late; posturing if large	The deficit and the headache arrive together
SAH	Between brain and arachnoid	Thunderclap headache at peak intensity instantly, often on exertion	Sudden, may briefly lose consciousness	Often equal and reactive; neck stiffness, photophobia	Worst headache ever, sometimes with a normal neuro exam
SDH	Under the dura, venous	Older adult on blood thinners, fall days or weeks ago	Slow, fluctuating, waxing and waning	Often normal early; sluggish later	Ask family what changed and when
EDH	Above the dura, arterial	Young patient, blow to the temple	Lucid interval, then fast decline	Blown pupil on the same side as the injury	Time-critical surgical bleed
Cerebellar bleed	Cerebellum	Sudden vertigo, vomiting, cannot walk	Can swell and compress the brainstem	Nystagmus, then falling LOC	Looks like vertigo until it doesn't
Hemorrhagic transformation	An old ischemic stroke that bleeds	Known stroke, then new decline hours to days later	Sudden worsening after improving	Depends on size and location	A stroke patient who gets worse is a new problem Ⓟ
Traumatic ICH	Anywhere, with mechanism	Fall or assault, anticoagulated	Variable; often delayed	Scalp findings, battle signs, raccoon eyes	Card 8 for triage: anticoagulated head injury is a Step 4 consult #153

ICH intracerebral hemorrhage **SAH** subarachnoid hemorrhage **SDH** subdural hematoma **EDH** epidural hematoma
Cushing reflex rising BP, falling HR, irregular breathing **thunderclap** instant maximum-intensity headache

For study and education. Not a protocol and not a treatment guide: treat per SLO County EMS protocols.

BACK

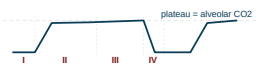
CAPNOGRAPHY: THE SHAPE

THE NUMBER TELLS YOU HOW MUCH; THE SHAPE TELLS YOU WHY

- ✦ Normal is 35 to 45 mmHg with a flat-topped, square wave Ⓟ
- ✦ Document the numbers **and** the waveform on the PCR #701
- ✦ Not just for tubes: use it on anyone in real distress #701
- ✦ It reflects three things at once: ventilation, perfusion, and metabolism Ⓟ
- ✦ Keep it on during nebulized meds #701
- ✦ A wave that looks wrong before the SpO2 moves is the early warning Ⓟ

STEP 1: Read Every Waveform the Same Four Ways

THE FOUR PHASES



- **I** Baseline: exhaling dead-space air, no CO2
- **II** Steep upstroke: alveolar air arrives
- **III** Plateau: the number you read at the end of it
- **IV** Sharp drop: inhalation, back to zero

Anatomy of One Breath

1. IS THERE A WAVE?

- No wave, no ventilation: disconnected, dislodged, obstructed, or no circulation
- Flat line after a tube was placed: the tube is not in the trachea #717
- Check the patient, then the circuit Ⓟ

Present or Absent

2. WHAT SHAPE?

- Square: open airways
- Slanted with no plateau: obstruction
- Notch in the plateau: they tried to breathe against you
- Floor never reaches zero: rebreathing

Shape = Mechanics

3. HOW TALL?

- 35 to 45 mmHg is normal
- High: hypoventilation or CO2 retention
- Low with a good shape: hyperventilation, dead space, or poor perfusion
- Low and shrinking: they're losing ground

Height = CO2 Load

4. WHICH WAY IS IT TRENDING?

- Rising: they're tiring, or circulation is returning
- Falling: perfusion dropping, tube slipping, or you're bagging too fast
- One reading is a snapshot; the trend is the story Ⓟ

Trend = Direction

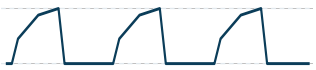
SHAPES WORTH RECOGNIZING ON SIGHT

Normal / Square



Sharp up, flat plateau, sharp down to zero. Air moves and the alveoli empty evenly.

Shark Fin



Slanted upstroke, no flat plateau: air is trapped behind narrowed airways. Asthma or COPD. A steeper slope means worse spasm, and it flattens out as the treatment works.

Curare Cleft



A notch dipping into the plateau: the patient took a breath against the ventilation or the sedation is wearing thin. Reassess sedation and your rate. Ⓟ

Doesn't Return to Baseline



The floor never gets to zero, so they're rebreathing their own CO2. Rate too fast (breath stacking or auto-PEEP), a stuck valve, or a wet sensor. Slow down and look at the circuit. Ⓟ

STEP 2: Shape, Cause, and What to Do About It

Pattern	What You See	What It Means	Common Causes	Your Move
Normal square	Flat plateau, 35 to 45	Ventilation, perfusion, and metabolism all roughly matched	A patient who is doing all right	Trend it anyway
Shark fin	Slanted rise, no plateau	Obstructed exhalation	Asthma, COPD, anaphylaxis with wheeze	Bronchodilators #616; watch the slope flatten
Tall and wide	Plateau over 45, slow rate	Not moving enough air	Sedation, opioids, exhaustion, head injury	Assist ventilations; opioid criteria include EtCO2 over 45 #618
Low with normal shape	Plateau 25 to 30, fast rate	Blowing off CO2, or CO2 isn't reaching the lungs	Anxiety, pain, DKA, PE, early shock	Treat the cause, not the number
Low and falling	Height shrinking breath by breath	Losing perfusion or losing the airway	Hemorrhage, worsening shock, tube migration	Recheck pulses, BP, and tube position
Curare cleft	Notch in the plateau	Spontaneous effort against assisted breaths	Light sedation, returning drive	Reassess sedation #613 and your rate
Sudden loss to zero	Wave gone in one breath	No ventilation or no circulation	Dislodged tube, disconnect, arrest	Look at the patient first, then the circuit #717
Rebreathing pattern	Baseline never reaches zero	Inhaled CO2 back into the lungs	Rate too fast, stuck valve, wet sensor	Slow the rate; allow full exhalation Ⓟ

EtCO2 end-tidal carbon dioxide, measured at the end of exhalation **dead space** air that moves but never reaches the alveoli
auto-PEEP trapped air that builds pressure when breaths come too fast **plateau** the flat top of the wave, where you read the number

CAPNOGRAPHY: THE NUMBER

Field Education Reference
Bearamedics Reference · not a treatment protocol

WHERE THE NUMBER CHANGES WHAT YOU DO

- ✦ Arrest: aim for 10 mmHg or better during compressions #701
- ✦ EtCO2 under 10 after intubation: pull it and oxygenate #717
- ✦ A sudden jump in EtCO2 during CPR means circulation is back #701
- ✦ Opioid criteria include EtCO2 over 45 with poor breathing #618
- ✦ After an advanced airway: waveform plus one other check #717 #718
- ✦ Keep it running through CPAP and nebs #701 #703

STEP 1: Five Situations Where It Earns Its Keep

CARDIAC ARREST



- Compression quality: aim for 10 mmHg or better #701
- Sudden rise means ROSC: check a pulse with the rhythm analysis
- Persistently under 10 after 20 minutes supports termination #641
- No wave with good compressions is a very bad sign

Quality & ROSC

AIRWAY PLACEMENT

- Waveform confirms the tube, and keeps confirming it #717 #718
- Verify with waveform plus one more method: lung and epigastric sounds, colorimetric, or bulb #717
- Under 10 after placement: extubate, oxygenate, retry #717
- Recheck after every move of the patient #701

Confirm & Re-Confirm

DISTRESS & CPAP

- Track shape and height through the treatment #703
- Shark fin flattening means the bronchodilator is working
- Rising number with falling effort means they're tiring
- Keep monitoring while nebs run #701

Response to Treatment

OVERDOSE & SEDATION

- Opioid: RR 8 or less, SpO2 under 94%, or EtCO2 over 45 #618
- Watch it after midazolam for agitation or seizure #613 #620
- EtCO2 climbs before SpO2 drops (P)
- Ventilate first, then Narcan #618

Early Warning

METABOLIC & SHOCK

- DKA: deep fast breathing blows CO2 off, so EtCO2 runs low (P)
- Sepsis: low EtCO2 tracks with a high lactate (P)
- Hemorrhage: falling EtCO2 as perfusion drops
- Low with clear lungs and tachycardia: think PE

A Perfusion Window

FOUR NUMBERS ON A SCREEN

Low and Dropping



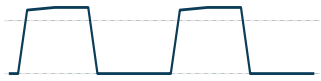
Good shape, shrinking height. Less CO2 arriving at the lungs: bleeding, worsening shock, or a tube on its way out.

Sudden Rise in Arrest



A jump of 10 mmHg or more, often to near-normal, in one or two breaths. That's circulation. Confirm at the next rhythm check, don't stop compressions to celebrate.

Tall Plateau, Slow Rate



Over 45 with a slow rate: hypoventilation. Sedation, opioids, or a patient who is running out of gas.

Short and Fast



Low plateau with a fast rate: blowing CO2 off. Anxiety, pain, acidosis, or dead space. The number is the clue, not the target.

STEP 2: Numbers, Meanings, and Protocol Anchors

Reading	Think	Confirm With	Common Traps	Protocol
35 to 45	Normal ventilation and perfusion	Shape is square	A normal number with a shark fin still means bronchospasm	Baseline #701
Over 45 with poor breathing	Hypoventilation; opioid criteria met	Rate, SpO2, pupils	Sedation stacking after midazolam	#618 #613
25 to 34	Hyperventilating, or early perfusion problem	Rate, lung sounds, BP	Treating the number instead of the patient	#701
Under 25 with clear lungs	Dead space or low output: PE, shock, DKA	BP, HR, glucose, lung sounds	Calling it anxiety	#619 #612
Under 10 during CPR	Compressions aren't moving blood, or it's futile	Depth, rate, recoil, pauses	Fixing the number without fixing the CPR	#701 #712 #641
Sudden rise in arrest	ROSC	Pulse at the next rhythm check	Stopping compressions early on the number alone	#701 #641
Sudden loss to zero	No ventilation or no circulation	Look at the patient, then the circuit	Blaming the sensor first	#717 #718
Under 10 right after a tube	The tube is wrong or perfusion is gone	Direct look, sounds, second method	Leaving it in and hoping	#717

ROSC return of spontaneous circulation **dead space** air that moves but never reaches the alveoli **Kussmaul** deep, fast breathing that blows off CO2 in acidosis
lactate an acid that builds when tissue is underperfused

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TOXIDROMES

A TOXIDROME IS A VITAL SIGN PATTERN, NOT A DRUG NAME

- ✦ Scene safety and decontamination come before assessment #614
- ✦ Airway, breathing, and glucose before any theory #612 #614
- ✦ Multiple victims with the same symptoms means an exposure, not a coincidence #614
- ✦ Charcoal only if alert with a gag reflex, within an hour, and not for caustics or hydrocarbons #614
- ✦ Most treatment is supportive; the antidotes that exist are mostly base orders #614
- ✦ Call it by the pattern, not the bottle: patients lie, mix, and misremember Ⓟ

STEP 1: The Five Patterns You Will Actually See

OPIOID



- Pinpoint pupils, slow shallow breathing, sedation
- EtCO2 over 45, SpO2 under 94% #618
- Track marks, patches, pain scripts
- Ventilate first, then Narcan #618

Down & Slow

SEDATIVE-HYPNOTIC

- Sedation with fairly normal pupils
- Breathing slows late, then hypotension
- Alcohol, benzodiazepines, GHB, sleep aids
- Support the airway; there is no field reversal agent

Down, Pupils Normal

SYMPATHOMIMETIC



- Big pupils, **wet** skin, hot, agitated
- Tachycardic, hypertensive, may seize
- Cocaine, methamphetamine, MDMA, cathinones
- Midazolam for agitation #613; cool them; chest pain is demand ischemia (Card 1)

Up & Wet

ANTICHOLINERGIC

- Big pupils, **dry** skin, hot, red, confused
- Urinary retention, absent bowel sounds
- Diphenhydramine, TCAs, scopolamine, jimson weed
- Wide QRS points to TCA: bicarbonate is a base order #614

Up & Dry

CHOLINERGIC

- Pinpoint pupils, soaking wet everywhere
- Drooling, tearing, vomiting, diarrhea, wheezing, bradycardia
- Organophosphates, carbamates, nerve agents
- Decon and protect yourselves first; atropine is a base order #614 #201

Wet & Slow

THREE DISCRIMINATORS THAT SORT ALMOST EVERYTHING

Pupils



Pinpoint: opioid or cholinergic. Big: sympathomimetic or anticholinergic. The rest of the exam tells you which one of the pair.

Skin: Wet or Dry

This is the split most people miss. Sympathomimetic and cholinergic patients are soaked. Anticholinergic patients are bone dry, red, and hot. Same big pupils, opposite skin. Ⓟ

Gut and Bladder

Cholinergic: everything runs out of them, bowel sounds everywhere. Anticholinergic: nothing moves, no bowel sounds, bladder full. Ask about the last time they urinated. Ⓟ

STEP 2: Compare the Toxidromes

Toxidrome	Pupils	Skin	Vitals	Mental Status	Field Anchor
Opioid	Pinpoint	Normal, maybe cool	RR down first, then HR and BP	Sleepy to unresponsive	Ventilate, then Narcan #618
Sedative-Hypnotic	Normal or small	Normal	Slow RR late, hypotension	Slurred, ataxic, then obtunded	Airway support; check glucose and trauma #612
Sympathomimetic	Dilated	Wet, hot	HR and BP up, temp up	Agitated, paranoid, seizing	Midazolam #613, cooling, no restraints without monitoring #711
Anticholinergic	Dilated	Dry, red, hot	HR up, BP variable, temp up	Delirious, picking at the air	Wide QRS or tall R in aVR: TCA (Card 10) #614
Cholinergic	Pinpoint	Soaked	HR down, secretions everywhere	Confused, seizing	Decon, PPE, atropine is a base order #614
Serotonin Syndrome	Dilated	Wet, hot	HR and temp up	Agitated with clonus and hyperreflexia	Onset in hours after a new serotonergic med Ⓟ
Neuroleptic Malignant	Normal	Wet, hot	HR up, BP labile, temp very high	Slowed, mute, rigid	Days after an antipsychotic change; lead-pipe rigidity Ⓟ
Withdrawal (alcohol or opioid)	Dilated (alcohol), dilated (opioid)	Wet	HR and BP up; fever with alcohol	Tremulous, anxious, hallucinating	Alcohol withdrawal can kill; opioid withdrawal is miserable but rarely does #622

SLUDGE salivation, lacrimation, urination, defecation, GI upset, emesis: the cholinergic picture **clonus** rhythmic jerking when a joint is flexed quickly
TCA tricyclic antidepressant **GHB** gamma-hydroxybutyrate **PPE** personal protective equipment

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TOXIC AGENTS & TRAPS

THE EXPOSURES THAT KILL FAST, AND WHAT THEY DO TO THE ECG

- ✦ Beta blocker and calcium channel blocker: slow and hypotensive, and fluids alone won't fix it #614
- ✦ Closed-space fire: assume CO, and consider cyanide #662
- ✦ Tricyclics: wide QRS, tall R in aVR, seizures, then arrest #614
- ✦ Hydrogen sulfide or nerve agent: multiple down victims is your warning #201
- ✦ Carbon monoxide: the pulse oximeter reads normal and lies Ⓟ
- ✦ Acetaminophen looks fine for a day, then kills the liver Ⓟ

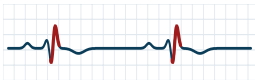
STEP 1: Five Exposures Worth Knowing Cold

BETA BLOCKER / CCB

- Bradycardia and hypotension that don't respond to fluid
- Beta blocker: low glucose. CCB: glucose often high Ⓟ
- Glucagon (BB) or calcium chloride (CCB) are base orders #614
- Push-dose epi for the pressure #619

Slow & Soft

TRICYCLICS



- Anticholinergic look plus a wide QRS
- Terminal R in aVR over 3 mm (Card 10)
- Seizures and wide-complex rhythms come fast
- Sodium bicarbonate is a base order #614

Wide & Wild

SALICYLATE / ACETAMINOPHEN

- Aspirin: ringing ears, fast deep breathing, fever, vomiting
- That fast breathing is compensation: do not sedate it away Ⓟ
- Acetaminophen: nausea early, then nothing, then liver failure
- Both need the hospital, not a field antidote

Quiet Killers

CO / CYANIDE / H2S

- CO: headache, nausea, confusion, normal SpO2 reading
- High-flow O2 regardless of the number #602
- Cyanide: closed-space fire, soot, rapid collapse, high lactate
- H2S: rotten egg smell, sudden collapse in a confined space; do not enter #201

Cellular Suffocation

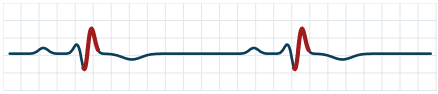
ALCOHOLS & GLYCOLS

- Ethanol: sedation, low glucose, and every other diagnosis hiding behind it
- Methanol: vision changes, blindness
- Ethylene glycol (antifreeze): drunk without the smell, then kidney failure
- All need labs and antidotes at the hospital

Not Just Drunk

WHAT POISONS DO TO THE ECG

Tricyclic Overdose



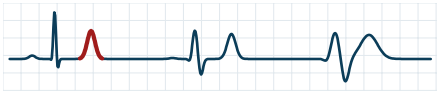
Tachycardia, QRS over 100 ms, terminal R in aVR over 3 mm. The wider it gets, the closer the seizures and arrest. Bicarbonate is a base order #614

Digoxin Effect



Scooped, sagging ST depression with almost any bradycardia or block. Nausea plus yellow-green vision changes is the classic story. Ⓟ

Hyperkalemia (from anything)



Peaked, tented T waves, then flat P waves, then a widening QRS. Missed dialysis, crush injury, or potassium-sparing meds. Calcium chloride is a base order #644

STEP 2: Agents, Findings, and Field Priorities

Agent	Early Findings	What Kills Them	Field Priority	Protocol
Beta blocker	Bradycardia, hypotension, low glucose, drowsy	Pump failure	Fluids, atropine, pacing, pressors; glucagon by base order	#614 #644 #619
Calcium channel blocker	Bradycardia, hypotension, alert early then crashes	Vasodilation and pump failure	Fluids and pressors; calcium chloride by base order	#614 #619
Tricyclic	Dry, hot, confused, tachycardic, wide QRS	Wide-complex arrest and seizures	Airway, monitor, base contact early for bicarbonate	#614
Salicylate	Tinnitus, tachypnea, vomiting, fever	Acidosis and cerebral edema	Fluids, do not suppress the respiratory drive	#601 #619
Acetaminophen	Nausea, then a deceptive quiet phase	Liver failure days later	Transport and a good history: time and amount	#614
Carbon monoxide	Headache, nausea, confusion; SpO2 looks fine	Cellular hypoxia	High-flow O2, remove from the source, multiple victims means the scene	#602 #614
Cyanide (fire smoke)	Soot, closed space, rapid collapse, seizures	Cells cannot use oxygen	High-flow O2, rapid transport, tell the ED it was a closed-space fire	#662 #614
Organophosphate	Soaked, pinpoint, wheezing, bradycardic	Secretions and respiratory failure	Decon and PPE first; atropine by base order	#614 #201

CCB calcium channel blocker **H2S** hydrogen sulfide **tinnitus** ringing in the ears **terminal R in aVR** the last upward deflection of the QRS in lead aVR
decon decontamination

For study and education. Not a protocol and not a treatment guide: treat per SLO County EMS protocols.

BACK

DIABETIC EMERGENCIES

THREE DIFFERENT PROBLEMS THAT ALL LOOK LIKE ALTERED MENTAL STATUS

- ✦ Under 60 gets treated now, whatever else is going on #612
- ✦ Both DKA and HHS are profoundly dry: think liters, not milliliters Ⓟ
- ✦ Low sugar can look exactly like a stroke, and it clears with treatment #612
- ✦ A normal glucose does not rule out DKA in patients on the newer pills Ⓟ
- ✦ DKA is an acid problem; HHS is a water problem Ⓟ
- ✦ Always ask what they take and when they last took it #612

STEP 1: Five Presentations, Sorted

HYPOGLYCEMIA

- Under 60 by meter #612
- Minutes to hours: sweaty, shaky, combative, then seizing or unresponsive
- May look like stroke, intoxication, or psychiatric
- Treat and it resolves in front of you

Sugar Too Low

DKA

- Usually type 1; glucose often over 250
- Hours to a day: vomiting, belly pain, deep fast breathing, fruity breath
- Dry, tachycardic, may be hypotensive
- Trigger is usually infection or missed insulin

Acid & Ketones

HHS

- Usually type 2 and older; glucose often over 600
- Days: progressive confusion, profound dehydration, little or no ketosis
- No Kussmaul breathing, no fruity breath
- Often a stroke mimic in a nursing-home patient

Water & Sugar

ALCOHOLIC KETOACIDOSIS

- Heavy drinking, then vomiting and no food
- Ketones with a normal or low glucose
- Deep breathing and belly pain like DKA
- Thiamine and dextrose at the hospital Ⓟ

Ketones, Normal Sugar

EUGLYCEMIC DKA

- On an SGLT2 drug: empagliflozin, dapagliflozin, canagliflozin
- Acidotic and ketotic with glucose near normal
- Vomiting, breathing fast, and a meter that looks fine
- Easy to write off; the acid is still there Ⓟ

The One You'd Miss

THREE THINGS THAT SORT THEM ON SCENE

The Meter

Under 60: treat. Over 250 with vomiting and fast breathing: DKA. Over 600 with days of decline and no ketosis: HHS. Near normal with vomiting on an SGLT2 drug: still could be DKA. Ⓟ

The Breathing



Deep, fast, sighing breaths mean the body is blowing off acid. Capnography shows it: EtCO2 runs low. Sedating that breathing makes the acidosis worse. Ⓟ

The Water Deficit

Dry tongue, sunken eyes, no tears, poor turgor, tachycardia. DKA loses liters over hours; HHS loses more over days. Both need fluid, with care in heart and renal failure #619

STEP 2: Compare the Diabetic Emergencies

Condition	Glucose	Onset	Breathing	Mental Status	Field Note
Hypoglycemia	Under 60	Minutes to hours	Normal	Anything: combative, focal, seizing, unresponsive	Oral glucose if awake and able to swallow; D10 if not #612
DKA	Often 250 to 600	Hours to a day	Deep and fast, fruity breath	Alert to obtunded, usually tracking early	Fluids and transport; belly pain is common #619
HHS	Often over 600	Days	Normal rate, no fruity breath	Progressive confusion, may look like a stroke	The driest patients you will see
Euglycemic DKA	Near normal	Hours to a day	Deep and fast	Alert but unwell	Ask specifically about SGLT2 drugs Ⓟ
Alcoholic ketoacidosis	Low or normal	Days of drinking, then vomiting	Deep and fast	Alert to confused	Give sugar, and expect the hospital to add thiamine Ⓟ
Hypoglycemia from a sulfonylurea	Under 60, and it comes back	Hours, recurrent	Normal	Improves with sugar, then slides again	These patients need transport even after they wake up Ⓟ
Insulin pump failure or misdose	Very high or very low	Hours	Depends	Depends	Pumps keep delivering: note the site and the last bolus Ⓟ
Pediatric DKA	High	Hours	Deep and fast	Irritable, sleepy, then obtunded	Fluid carefully; cerebral edema risk is real #612

DKA diabetic ketoacidosis **HHS** hyperosmolar hyperglycemic state **SGLT2** a class of diabetes pills that dump sugar into the urine
Kussmaul deep, fast breathing that blows off acid **turgor** skin elasticity when pinched

DIABETES: MEDS & TREATMENT

Field Education Reference
Bearamedics Reference · not a treatment protocol

WHAT THEY TAKE CHANGES HOW LONG THE PROBLEM LASTS

- ✦ Short insulin wears off in hours; long insulin and pills do not #612
- ✦ Sulfonylurea lows come back: a wake-up is not a cure Ⓟ
- ✦ Oral glucose needs an awake patient who can swallow and follow commands #612
- ✦ Recheck the glucose 5 minutes after dextrose #612
- ✦ Glucagon only after two failed IV attempts #612
- ✦ Pediatric dosing is weight-based: use the tape #601 #612

STEP 1: The Medications, and How They Fail

RAPID & SHORT INSULIN

- Lispro, aspart, regular
- Peaks in 1 to 3 hours, gone in 4 to 8
- Missed meal after a dose is the classic low
- Treat, feed, and the problem usually stays fixed

Short Trouble

LONG-ACTING INSULIN

- Glargine, detemir, degludec
- Flat effect over 12 to 42 hours
- A low from these keeps coming back all day
- Transport even if they feel fine Ⓟ

Long Trouble

SULFONYLUREAS

- Glipizide, glyburide, glimepiride
- Squeeze insulin out of the pancreas for many hours
- Sugar rebounds down after dextrose wears off
- The refusal after a wake-up is the dangerous call Ⓟ

Rebound Risk

METFORMIN & SGLT2

- Metformin rarely causes lows; it can cause lactic acidosis in renal failure
- SGLT2 drugs can cause DKA with a normal glucose
- Both are easy to skip in a med list
- Read the bottles, don't just ask Ⓟ

Different Failures

PUMPS & SENSORS

- A pump keeps infusing unless it is stopped or removed
- Site problems and kinked tubing cause DKA in hours
- CGM readings lag behind the blood: confirm with a fingerstick
- Note the site, the last bolus, and the sensor reading Ⓟ

Technology Traps

THE COUNTY TREATMENT, IN ORDER #612

Awake and Able to Swallow

Oral glucose 15 g, assisted self-administration, repeat as needed. They have to be awake, able to swallow, and able to follow commands #612

Unstable or Can't Swallow

D10 150 mL IV, recheck at 5 minutes, another 100 mL if still under 60. Or D50 25 g slow IV. No IV after two attempts: glucagon 1 mg IM #612

Pediatric and Newborn

D10 0.5 g/kg (5 mL/kg) IV, 150 mL max, recheck at 5 minutes. Newborn threshold is under 40. Glucagon 0.1 mg/kg IM, 1 mg max #612 #651

STEP 2: Traps, and What They Look Like

Trap	How It Presents	Why It Happens	What To Do	Protocol
The wake-up refusal	Alert, hungry, wants to stay home	Long insulin or a sulfonylurea is still working	Push transport; document the med, the dose, and the time	#612 #203
Recheck skipped	Improves, then slides on the way in	Dextrose is a bolus, not a drip	Recheck at 5 minutes and again before handoff	#612
Sensor trusted over blood	"My CGM says 55" with a normal fingerstick	Sensors lag and drift	Confirm with a meter before treating	Ⓟ
Pump left running	High sugar and ketones, or a low that keeps going	Site failure, or basal still infusing	Note the site and last bolus; the hospital decides on stopping it	Ⓟ
Normal sugar, real DKA	Vomiting, fast breathing, meter near normal	SGLT2 drug	Treat as DKA: fluids and transport	#619
Alcohol on board	Drunk and hypoglycemic together	Alcohol blocks new glucose production	Treat the sugar, and don't stop looking for trauma	#612
Dialysis patient	Lows that linger, or fluid overload if you bolus	Insulin clears slowly, and they can't offload volume	Small fluid volumes, frequent rechecks	#619
Kid with DKA	Irritable, breathing fast, sleepy	Insulin deficiency plus dehydration	Careful fluids, watch mental status, go	#612 #601

CGM continuous glucose monitor, the sensor worn on the arm or belly **basal** the slow background insulin a pump delivers
lactic acidosis acid buildup from poor perfusion or metformin in renal failure **D10 / D50** dextrose 10% and 50%

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HEART FAILURE TYPES

WHICH SIDE FAILED, AND HOW FAST, CHANGES WHAT YOU SEE

- ✦ Left side backs up into the lungs; right side backs up into the body Ⓟ
- ✦ SCAPE is minutes-old flash edema with a very high BP Ⓟ
- ✦ Wet lungs plus a normal or high BP is the CPAP and nitro patient #617
- ✦ Right-sided failure and RV infarct are preload-dependent: fluids help, nitro hurts #640
- ✦ Wet lungs plus a low BP is cardiogenic shock, and nitro will hurt them #619 #640
- ✦ 12-lead on every one: ischemia is the most common trigger #707

STEP 1: Name the Failure

LEFT-SIDED

- Fluid backs up into the lungs
- Crackles, orthopnea, waking up gasping at night
- Pink frothy sputum when it's severe
- Worse lying flat, better sitting up

Wet Lungs

RIGHT-SIDED

- Fluid backs up into the body
- JVD, pedal edema, big tender liver, weight gain
- Lungs often clear
- Common causes: COPD, PE, RV infarct

Wet Body

REDUCED EF (HFrEF)

- A weak, dilated pump
- Prior MI, cardiomyopathy, low ejection fraction on their records
- Poor forward flow: tired, cold, low output
- The classic “heart failure” patient

Weak Squeeze

PRESERVED EF (HFpEF)

- A stiff pump that squeezes fine but won't fill
- Older, hypertensive, often female, often diabetic
- Floods quickly with salt, fluid, or a fast rate
- Ejection fraction looks normal on paper

Stiff Fill

SCAPE

- Sympathetic crashing acute pulmonary edema
- Minutes: severe HTN, soaked, gasping, drowning in their own fluid
- Total body water may be normal: fluid shifted into the lungs
- CPAP plus nitro per protocol; **no higher nitro doses** #617 #703

Flash Edema

THE TWO QUESTIONS THAT DRIVE TREATMENT

Wet or Dry, Warm or Cold

Wet and warm: congested with decent perfusion. The CPAP and nitro patient. **Wet and cold:** congested and underperfusing, which is cardiogenic shock: pressure support, not nitro. **Dry and cold:** underfilled, low output. **Dry and warm:** compensated. Ⓟ

Preload-Dependent Traps

RV infarct, tamponade, and massive PE all need volume to work. They look like heart failure with JVD, but nitro and CPAP can drop their pressure hard. Inferior STEMI: check V4R before nitro #640

STEP 2: Compare the Presentations

Type	Lungs	Neck & Legs	Blood Pressure	Story	Field Note
Acute left-sided (pulmonary edema)	Crackles, maybe wheeze	JVD common	Normal or high	Hours to days of worsening breathlessness	CPAP plus nitro if SBP 100 or higher #617 #703
SCAPE	Drowning, frothy	JVD	Very high	Sudden, minutes	CPAP early; nitro per protocol only #617
Cardiogenic shock	Wet	JVD	Low, narrow pulse pressure	Recent MI or long-standing failure	Fluids cautiously, pressors, 12-lead #619 #640
Right-sided failure	Often clear	JVD, pedal edema, ascites	Normal or low	Weight gain, swelling, COPD history	Fluids may help; be careful with nitro
RV infarct	Clear	JVD	Low and drops further with nitro	Inferior STEMI on the 12-lead	V4R, hold nitro, consult base #640
HFrEF exacerbation	Wet	JVD	Variable	Known low EF, med or diet lapse	Classic CPAP and nitro candidate
HFpEF exacerbation	Wet	JVD	Usually high	Hypertensive, floods fast with salt or a fast rate	Rate control matters; treat the pressure per protocol #617
Failure with AFib and RVR	Wet	JVD	Variable	Rate over 150 and worsening breathing	Rate is the trigger: #645; nitro with RVR is a base order #617

EF ejection fraction, the percentage the ventricle pumps out **JVD** jugular venous distension **orthopnea** breathlessness lying flat
PND waking at night gasping for air **SCAPE** sympathetic crashing acute pulmonary edema

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CPAP: WHY AND HOW

CPAP BUYS TIME BY DOING THREE THINGS AT ONCE

- ✦ It holds alveoli open so oxygen can cross #703
- ✦ It lowers preload and afterload, which helps the failing left heart Ⓟ
- ✦ It pushes fluid out of the alveoli and back into the vessels Ⓟ
- ✦ Start low, titrate in 3 cm steps, 15 cm max #703 #617
- ✦ It drops the work of breathing, which is often what's exhausting them Ⓟ
- ✦ Notify the base hospital when you use it #703

STEP 1: What It Actually Does

IN THE LUNGS

- Holds collapsed alveoli open through the whole breath
- Recruits lung that wasn't participating
- Pushes edema fluid back into the capillaries
- Improves oxygen crossing, not just oxygen delivered

Recruitment

ON THE HEART

- Higher chest pressure means less blood returning: preload drops
- Lower afterload means the weak left ventricle empties easier
- In pulmonary edema, both effects help
- In a dry or preload-dependent patient, both effects hurt

Preload & Afterload

ON THE PATIENT

- Less work of breathing means less oxygen demand
- Talks them off the edge of intubation
- Coaching matters: in through the nose, out through the mouth #703
- Expect fear; the mask feels like a lot at first

Work of Breathing

SETTINGS #703

- Asthma or anaphylaxis: 3 to 5 cm H2O
- COPD or pneumonia: 5 to 7.5 cm H2O
- Pulmonary edema or drowning: 7.5 to 10 cm H2O
- Maximum 15 cm H2O; titrate in 3 cm steps #617

Start Low, Titrate

WHEN TO STOP #703

- SBP under 90: stop and remove any nitro paste
- Increasing distress or a dropping respiratory drive
- Falling level of consciousness
- Vomiting, or can't handle secretions
- Air under the skin or pneumothorax signs

Bag Them Instead

THREE THINGS PEOPLE GET WRONG

Blood Pressure Is the Limit

CPAP plus nitro both drop preload. Watch the pressure after every change and after every nitro dose. Under 90: mask off, nitro paste off, support with a BVM #703 #617

It Isn't Just for CHF

Pneumonia, COPD, asthma, drowning, and anaphylaxis all have a CPAP pressure range in the protocol. The pressure differs because the problem differs #703

Contraindications Are Real

Unresponsive or can't protect the airway, respiratory or cardiac arrest, tracheostomy, pneumothorax signs, major facial or chest trauma, vomiting or upper GI bleed, moderate to severe epistaxis, uncooperative after coaching, SBP under 90 #703

STEP 2: Condition, Pressure, and What to Watch

Condition	Pressure #703	Why That Range	Watch For	Pair It With
Pulmonary edema	7.5 to 10	Highest pressure: driving fluid out of the alveoli	Blood pressure dropping as preload falls	Nitro if SBP 100 or higher #617
SCAPE	7.5 to 10	Same as edema, applied fast	They may fight the mask; coach hard	Nitro per protocol only #617
Drowning	7.5 to 10	Washed-out surfactant and flooded alveoli	Vomiting, and hypothermia	Warming #632
COPD	5 to 7.5	Splints airways open and offloads the work	Air trapping if you go too high	Albuterol and ipratropium #616
Pneumonia	5 to 7.5	Recruits consolidated lung	Secretions, and fatigue	Fluids if septic #619
Asthma	3 to 5	Lowest range: they already have trapped air	Breath stacking; watch the capnography floor	Albuterol, ipratropium, magnesium #616
Anaphylaxis	3 to 5	Bridge while epinephrine works	Swelling that keeps progressing: this is an airway	Epinephrine first #611
Any of the above, failing	Stop	Pressure isn't the answer anymore	Falling LOC, rising CO2, dropping drive	BVM, then advanced airway #717 #718

CPAP continuous positive airway pressure **preload** blood returning to the heart **afterload** the pressure the heart pumps against
cm H2O the pressure unit CPAP is set in **recruitment** reopening alveoli that had collapsed

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BACK

DIALYSIS PATIENTS

THE MACHINE DOES WHAT THEIR KIDNEYS DON'T, AND MISSING IT IS THE EMERGENCY

- ✦ Missed a session: assume high potassium and too much fluid Ⓟ
- ✦ Peaked T waves with a widening QRS is hyperkalemia until proven otherwise #644
- ✦ Calcium chloride for wide-complex bradycardia with suspected hyperkalemia is a base order #644
- ✦ No BP, IV, or tourniquet on the access arm Ⓟ
- ✦ They cannot pee off a fluid bolus: give small volumes and reassess #619
- ✦ Ask when they last dialyzed and whether they finished the session Ⓟ

STEP 1: Know the Access and the Timeline

HEMODIALYSIS ACCESS

- Fistula or graft in an arm: feel for a **thrill**, listen for a **bruit**
- No thrill or bruit means it may be clotted: tell the receiving staff
- Tunneled chest catheter in newer or failing patients
- Nothing on that arm: no cuff, no stick, no tourniquet Ⓟ

Protect the Arm

PERITONEAL DIALYSIS

- Catheter in the belly, exchanges done at home
- Cloudy drainage, belly pain, and fever mean peritonitis
- Usually less swing in electrolytes than hemodialysis
- Bring the drain bag description with you Ⓟ

Belly, Not Arm

MISSED SESSIONS

- Potassium climbs: weakness, then ECG changes, then arrest
- Fluid climbs: short of breath, wet lungs, can't lie flat
- Acid builds: fast deep breathing
- Often 2 to 3 days after the last session

The Common Call

DURING & AFTER DIALYSIS

- Hypotension from pulling fluid too fast
- Cramps, nausea, and weakness are common after
- Disequilibrium: headache and confusion after a long or first run
- Low blood sugar can follow too Ⓟ

Post-Run Problems

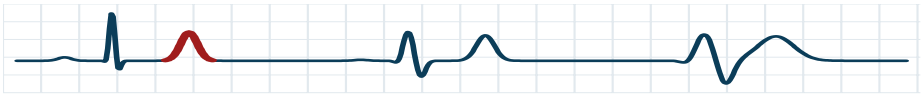
BLEEDING FROM ACCESS

- Needle sites can bleed hard after a run
- Direct pressure on the site, not the whole arm
- Keep the thrill if you can: don't clamp the fistula off
- Tourniquet only if they are exsanguinating #706

Pressure, Not Panic

THE ONE ECG PATTERN TO KNOW COLD

Hyperkalemia



Peaked, tented T waves first. Then P waves flatten and the QRS widens. Then a sine wave, then arrest. Wide-complex bradycardia in a dialysis patient is this until proven otherwise. Calcium chloride is a base order #644

Fluid Overload

Wet lungs, JVD, weight gain since the last session. CPAP and nitro per protocol #617 #703. The definitive fix is dialysis, so the destination decision matters: tell the ED early they need a machine. Ⓟ

STEP 2: Problems, Causes, and Field Moves

Problem	Looks Like	Why	Field Move	Protocol
Hyperkalemia	Weak, peaked T waves, wide QRS, bradycardia	Potassium cannot be excreted	12-lead early, pads on, base contact for calcium	#644 #707
Fluid overload	Crackles, JVD, can't lie flat, weight up	Water with nowhere to go	CPAP and nitro per protocol; expect emergent dialysis	#617 #703
Post-dialysis hypotension	Pale, dizzy, cramping right after a run	Too much volume pulled too fast	Small fluid boluses, recheck often	#619
Access bleeding	Steady bleeding from needle sites	Anticoagulated during the run	Direct pressure on the site; preserve the fistula	#706
Clotted access	No thrill, no bruit, arm aches	Thrombosis	Note the time you checked; it is a same-day problem	Ⓟ
Peritonitis (PD)	Cloudy drainage, abdominal pain, fever	Infection through the catheter	Fluids for sepsis; transport	#619
Uremia	Confusion, nausea, itching, pericardial rub	Waste products building	Support and transport; watch for tamponade signs	#612 #619
Cardiac arrest	Any rhythm, often PEA	Potassium, acidosis, or both	Standard care plus early base contact about calcium	#641 #644

thrill the buzzing you feel over a working fistula **bruit** the whooshing you hear over it **PD** peritoneal dialysis
uremia buildup of waste the kidneys would normally clear **PEA** pulseless electrical activity

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LVADs & PACEMAKERS

Field Education Reference
Bearamedics Reference · not a treatment protocol

TREAT THE PATIENT, THEN ACCOUNT FOR THE DEVICE

- ✦ Many LVAD patients have no palpable pulse and no readable BP, and are fine Ⓟ
- ✦ Listen over the chest for the hum: no hum means the pump has stopped Ⓟ
- ✦ Every LVAD patient travels with a bag, a controller, spare batteries, and a coordinator phone number: bring all of it Ⓟ
- ✦ A pacemaker does not prevent MI, arrest, or a treatable rhythm Ⓟ
- ✦ Pacer spikes without a QRS after them means failure to capture Ⓟ
- ✦ Keep pads a hand's width from an implanted device #716

STEP 1: The Devices You'll Meet

LVAD BASICS

- A continuous-flow pump helping the left ventricle
- Often no pulse, no reliable SpO2, no cuff pressure
- Perfusion is judged by mental status, skin, and capnography Ⓟ
- Doppler MAP at the hospital is the real number

Flow, Not Pulse

LVAD PROBLEMS

- Alarms on the controller: read them out loud to the coordinator
- Low flow: bleeding, dehydration, arrhythmia, or a clot
- Bleeding is common: they are anticoagulated
- Driveline infection: redness and drainage where the cable exits

Call the Coordinator

CPR & THE LVAD

- First: listen for the hum and check the controller
- If the pump runs and they perfuse, don't compress Ⓟ
- If the pump is stopped and they are unresponsive, follow the coordinator and your protocol #641
- Defibrillate normally for VF or VT: pads clear of the device

Assess Before Compressing

PACEMAKERS

- Spikes before the complex they create
- Failure to capture: spikes with no QRS after them
- Failure to sense: spikes landing in the wrong place
- Syncope with a device is a rhythm problem until proven otherwise

Spike, Then Beat

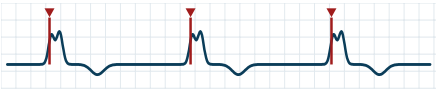
ICDs

- Shocks the patient for VF or fast VT
- One shock and they feel fine: still transport
- Repeated shocks (electrical storm) is an emergency
- You can touch a patient mid-shock; it feels like a jolt, not a hazard Ⓟ

Shocks & Storms

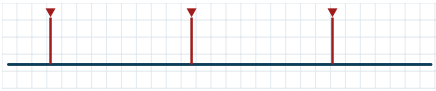
WHAT THE MONITOR SHOWS YOU

Paced Rhythm, Capturing



A spike, then a wide QRS that follows it every time. This is the device working. The underlying rhythm may be much slower or absent.

Failure to Capture



Spikes with nothing after them. The device is firing but the heart isn't answering. Treat the patient's rate and perfusion: atropine, pacing, or pressors as indicated #644 #716

Pads and Pacing

Place pads at least a hand's width from the generator, or use anterior-posterior placement. Transcutaneous pacing still works over an implanted device #716

STEP 2: Device Problems and What to Do

Situation	Findings	What It Means	Field Move	Protocol
LVAD, awake, no pulse	Talking, warm, hum present	Normal for continuous flow	Treat the complaint, not the missing pulse	Ⓟ
LVAD, unresponsive, no hum	No hum, alarms sounding	The pump stopped	Check power and connections; call the coordinator; resuscitate per protocol	#641
LVAD with bleeding	GI bleed, epistaxis, bruising	Anticoagulation plus pump-related bleeding tendency	Control what you can; transport to their VAD center if possible	#706 #619
Pacer, syncope	Spikes without capture, or bradycardia	Device or lead failure	Pads on, atropine and pacing as indicated	#644 #716
Pacer, tachycardia	Fast paced rate	Rate-response or a device problem	Treat symptoms; 12-lead; transport	#707
ICD, one shock	Feels fine now, sore chest	It worked	12-lead, monitor, transport	#707
ICD, repeated shocks	Shock after shock, anxious, may be in VT between	Electrical storm	12-lead, pads on, treat the underlying rhythm	#643 #716
ICD shocking an alert patient with a normal rhythm	Shocks with no matching rhythm	Inappropriate shocks from lead or sensing failure	Magnet application happens at the hospital, not in the field	Ⓟ

LVAD left ventricular assist device **MAP** mean arterial pressure, the number that matters with continuous flow
driveline the cable from the pump out through the skin **ICD** implantable cardioverter-defibrillator **electrical storm** three or more shocks in 24 hours

For study and education. Not a protocol and not a treatment guide: treat per SLO County EMS protocols.

BURN DEPTH & TBSA

DEPTH TELLS YOU HOW BAD; TBSA TELLS YOU HOW SICK THEY'LL GET

- ✦ Stop the burning: cool with tepid water, never ice #662
- ✦ Burned patients lose heat fast: cover and keep them warm #662
- ✦ Remove rings, constricting clothing, and synthetics #662
- ✦ Burns with a trauma mechanism follow trauma triage #153 #662
- ✦ Count second and third degree only in TBSA Ⓟ
- ✦ A calm patient with a huge burn may just have destroyed the nerves Ⓟ

STEP 1: Depth, by What You See and Feel

SUPERFICIAL (1st)

- Epidermis only
- Red, dry, no blisters
- Painful and tender
- Blanches and refills
- Sunburn; heals in days

Not Counted in TBSA

SUPERFICIAL PARTIAL (2nd)

- Into the upper dermis
- Blisters, wet and shiny, bright red
- **Very** painful
- Blanches briskly
- Heals in 2 to 3 weeks

Counted

DEEP PARTIAL (2nd)

- Into the deeper dermis
- Blisters that may be broken, mottled red and white
- Less painful than it looks: nerve endings dying
- Slow or absent blanching
- Often needs grafting

Counted

FULL THICKNESS (3rd)

- Through the dermis
- Leathery, waxy white, tan, or charred, dry
- Painless in the center, painful at the edges
- No blanching, no refill
- Always needs surgery

Counted

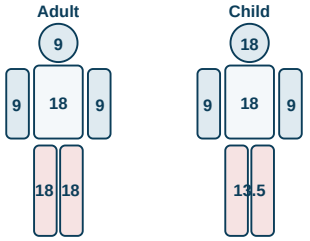
FOURTH DEGREE

- Through fat into muscle, tendon, or bone
- Charred, exposed deep structures
- Usually electrical or prolonged flame
- Limb-threatening and life-threatening
- Trauma center decision #153

Counted

COUNTING TBSA: THE RULE OF NINES

Adult and Child



Front torso 18
Back torso 18
Perineum 1

Palm (patient's)
= about 1%

Count 2nd and 3rd degree only

How to Count It

Add only second and third degree areas. The patient's own palm with fingers is about 1%. Children have proportionally bigger heads and smaller legs, which is why the numbers shift. Estimate, don't agonize: the hospital will redo it. Ⓟ

STEP 2: Depth Comparison

Depth	Appearance	Pain	Blanching	Healing	Field Note
Superficial (1st)	Red, dry, no blisters	Painful	Brisk	Days, no scar	Not counted in TBSA
Superficial partial (2nd)	Blisters, wet, bright red	Severe	Brisk	2 to 3 weeks	The most painful burns you'll treat #603
Deep partial (2nd)	Mottled red and white, may be dry	Less than expected	Sluggish or absent	Weeks, often grafted	Pain out of proportion in reverse: quiet is worse
Full thickness (3rd)	Leathery, waxy, charred	Painless centrally	None	Surgery	Edges still hurt: treat the pain #603
Fourth degree	Exposed muscle, tendon, bone	Painless	None	Surgery, often amputation	Electrical or prolonged flame
Circumferential	Any depth, all the way around	Varies	Distal pulses fade	Depends	Check pulses and breathing; chest burns restrict ventilation
Chemical	Depends on agent, keeps burning	Varies	Varies	Depends	Brush dry powder, then flush 15 minutes #662 #614
Electrical	Small entry and exit wounds	Varies	Varies	Depends	The damage is on the inside; monitor the rhythm #662

TBSA total body surface area burned **blanching** skin whitening under pressure, then refilling
dermis the layer under the epidermis, where nerves and vessels live **escharotomy** hospital incision to relieve a circumferential burn

BURNS: WHAT KILLS THEM

Field Education Reference
Bearamedics Reference · not a treatment protocol

THE BURN IS RARELY THE IMMEDIATE PROBLEM

- ✦ Airway first: soot, singed hairs, hoarseness, stridor #602 #662
- ✦ Hypotension early is trauma or another cause, not the burn Ⓟ
- ✦ Closed space means carbon monoxide, and possibly cyanide #614
- ✦ Wet dressings only under 10% TBSA; otherwise dry and warm #662
- ✦ The pulse oximeter reads normal in carbon monoxide poisoning Ⓟ
- ✦ Pain control is part of the treatment, not a luxury #603

STEP 1: The Five That Kill First

AIRWAY & INHALATION

- Soot around the mouth or nose, singed nasal hairs, hoarse voice
- Stridor, drooling, or brassy cough
- Swelling gets worse over hours: earlier is better
- Facial burns with enclosed-space exposure #602

Time-Critical

CARBON MONOXIDE & CYANIDE

- CO: headache, nausea, confusion; SpO2 reads normal
- High-flow O2 regardless of the number #602
- Cyanide: closed-space fire, rapid collapse, seizures
- Both need the hospital; tell them it was a closed space #614

Invisible Poisons

SHOCK & FLUIDS

- Burn shock builds over hours; early hypotension means look for trauma
- Hypotension: normal saline 500 mL, may repeat #662 #601
- Large-bore IV; through burned skin if you must
- Keep them warm: they lose heat through the wound

Hours, Not Minutes

CHEMICAL & ELECTRICAL

- Dry chemical: brush it off first, then flush #662
- Liquid: remove clothing, flush 15 minutes or longer
- Eyes: flush continuously with saline #660-A
- Electrical: entry and exit, rhythm monitoring, hidden deep injury

Keeps Burning

CIRCUMFERENTIAL & HYPOTHERMIA

- Around a limb: check pulses and capillary refill often
- Around the chest: it restricts ventilation
- Cooling too long drops core temperature fast
- Cool briefly, then cover dry and warm #662

Two Quiet Killers

THE COUNTY TREATMENT, IN ORDER #662

Stop and Cool

Stop the burning process, cool initially with tepid water, no ice, no ice packs. Remove rings, constricting clothing, and synthetics. Cover with clean dry dressings or a sheet; moist or gel dressings only when the area is under 10% #662

Fluids and Pain

Hypotension (SBP 90 or less, or no palpable peripheral pulses): normal saline up to 500 mL, may repeat once #662. Pain per #603: fentanyl, or ketamine when fentanyl is a poor choice. Burns hurt for a long time: dose and reassess.

Destination

Burn with a trauma mechanism: trauma triage and destination #153 #662. Burn with no associated trauma: nearest hospital for evaluation and stabilization #662. Burns plus a trauma mechanism are also a Step 4 consideration #153

STEP 2: Complications and Priorities

Problem	Clues	Why It Matters	Field Priority	Protocol
Inhalation injury	Soot, singed hairs, hoarseness, stridor, closed space	The airway swells shut over hours	Oxygen, early transport, tell the ED	#602 #662
Carbon monoxide	Headache, confusion, multiple victims, normal SpO2	Oxygen can't be carried	High-flow O2, remove from the scene	#602 #614
Cyanide	Closed-space fire, collapse, seizures, severe acidosis	Cells can't use oxygen	High-flow O2, rapid transport, tell the ED it was a closed space	#662 #614
Burn shock	Tachycardia, then hypotension over hours	Plasma leaks out of the vessels	Fluids per protocol; early hypotension means look for trauma	#662 #601
Hypothermia	Shivering early, then cold and quiet	Huge evaporative heat loss	Cool briefly, then dry, cover, and warm the compartment	#662 #631
Circumferential chest burn	Rising resistance to bagging, poor chest rise	The chest wall can't expand	Support ventilation; the hospital may need to release it	#662
Chemical exposure	Ongoing pain, powder or liquid on the skin	It burns until it's removed	Brush, then flush 15 minutes; protect yourselves	#662 #614
Electrical injury	Small wounds, big mechanism, dysrhythmias	The current damages what you can't see	Monitor the rhythm, look for trauma from the fall	#662 #707

TBSA total body surface area burned **inhalation injury** heat and soot damage to the airway
burn shock fluid shifting out of the vessels after a large burn **escharotomy** hospital incision to release a constricting burn

For study and education. Not a protocol and not a treatment guide: treat per SLO County EMS protocols.

BACK

PEDIATRIC VITALS

KIDS COMPENSATE BEAUTIFULLY, UNTIL THEY DON'T

- ✦ Blood pressure is the last thing to fall in a child Ⓟ
- ✦ Under 34 kg follows the pediatric columns of the protocols #601
- ✦ Tachycardia and poor perfusion are the early signs #601-A
- ✦ Use the length-based tape for weight, doses, and equipment #601
- ✦ Minimum systolic 1 to 10 years: 70 + (2 × age) #601-A
- ✦ Most pediatric arrests start as respiratory problems #712

STEP 1: What Normal Looks Like by Age

NEWBORN (under 1 mo)

- HR 100 to 180
- RR 30 to 60
- Minimum SBP 60 #601-A
- About 3 to 5 kg
- Nose breathers: suction matters #651

Fragile & Fast

INFANT (1 to 12 mo)

- HR 100 to 160
- RR 25 to 50
- Minimum SBP 70 #601-A
- About 4 to 10 kg
- Grunting and head bobbing are distress

Watch the Work

TODDLER (1 to 3 yr)

- HR 90 to 150
- RR 20 to 30
- Minimum SBP 70 + (2 × age) #601-A
- About 10 to 15 kg
- Peak age for foreign bodies and poisonings

Into Everything

PRESCHOOL & SCHOOL (4 to 12 yr)

- HR 70 to 140, slowing with age
- RR 18 to 25
- Minimum SBP 70 + (2 × age), then 90 at 11 to 14 #601-A
- About 15 to 40 kg
- Can give a history; ask them directly

Reasonable Reporters

ADOLESCENT (13 to 18 yr)

- HR 60 to 100
- RR 12 to 20
- Minimum SBP 90 #601-A
- Adult-sized dosing above 34 kg #601
- No TXA under 15 #714; no ketamine for pediatrics in this county #603

Adult Numbers, Kid Risks

THREE TOOLS THAT DO THE THINKING FOR YOU

The County Instability Numbers #601-A

GCS 13 or less · poor perfusion · RR over 60 or apnea, or under 20 in infants under 1 · HR under 80 or over 180 at 5 and under (under 22 kg), under 60 or over 160 at 6 and up (23 to 34 kg) · SBP: newborn under 60, infant under 70, 1 to 10 years under 70 + (2 × age), 11 to 14 years under 90

Length-Based Tape

Weight, drug doses, tube and equipment sizes, and defibrillation energies, all from one measurement. Use it at 34 kg and under #601. Guessing weight is the most common pediatric medication error. Ⓟ

STEP 2: Vitals and Equipment by Age

Age	Heart Rate	Resp Rate	Minimum SBP #601-A	Weight	Notes
Newborn (under 1 mo)	100 to 180	30 to 60	60	3 to 5 kg	Dry, warm, stimulate; APGAR at 1 and 5 min #651
Infant (1 to 12 mo)	100 to 160	25 to 50	70	4 to 10 kg	Brachial pulse; distress shows as grunting and flaring
Toddler (1 to 3 yr)	90 to 150	20 to 30	72 to 76	10 to 15 kg	Foreign bodies, ingestions, febrile seizures
Preschool (4 to 5 yr)	80 to 140	20 to 25	78 to 80	15 to 20 kg	Will tell you a story, and may make one up
School age (6 to 12 yr)	70 to 120	18 to 25	82 to 94	20 to 40 kg	Instability thresholds shift at 6 years #601-A
Adolescent (13 to 18 yr)	60 to 100	12 to 20	90	over 40 kg	Adult protocols above 34 kg #601
Any age: compensated shock	Fast for age	Fast	Still normal	any	Tachycardia with poor perfusion is shock #619
Any age: decompensated	Fast, then slow	Slow or irregular	Below the age minimum	any	Bradycardia in a sick child means hypoxia: ventilate #644 #712

SBP systolic blood pressure **length-based tape** the color-coded tape used for weight, doses, and equipment
APGAR newborn scoring at 1 and 5 minutes **grunting** an infant's way of holding alveoli open: always significant

PEDIATRIC APPROACH

HOW YOU WALK IN DECIDES HOW THE REST OF THE CALL GOES

- ✦ Form a general impression from the doorway before you touch them Ⓟ
- ✦ Toe to head for the little ones; head to toe for teenagers Ⓟ
- ✦ Appearance, work of breathing, and skin color, in that order Ⓟ
- ✦ Distraction is a real intervention: video, a calm room, a caregiver's voice #603
- ✦ Keep the child with the caregiver whenever you safely can Ⓟ
- ✦ A quiet child who doesn't fight you is a sick child Ⓟ

STEP 1: Who You're Talking To

INFANT (under 1 yr)

- No stranger fear early, plenty by 8 months
- Warm hands, warm stethoscope, keep them with the caregiver
- Assess while they're held
- Cries when handled and settles when comforted is reassuring

Comfort First

TODDLER (1 to 3 yr)

- Fears separation and anything on their face
- Toe to head so the scary parts come last
- Offer simple choices: which arm, which finger
- Do not ask permission for things you must do Ⓟ

Choices, Not Questions

PRESCHOOL (3 to 5 yr)

- Magical thinking: may believe the injury is punishment
- Tell them what you're doing in short, literal words
- No metaphors: “a little stick” beats “a bee sting”
- Let them hold equipment to demystify it

Literal Minds

SCHOOL AGE (6 to 12 yr)

- Can give an accurate history, and wants to be heard
- Explain before you do, and keep promises
- Modesty starts to matter a lot
- Ask directly about pain; they often understate it

Ask Them

ADOLESCENT (13 to 18 yr)

- Wants control, privacy, and to be treated as an adult
- Ask some questions with the caregiver out of the room
- Consider pregnancy, substances, and self-harm risk quietly and respectfully
- Explain confidentiality limits honestly Ⓟ

Privacy Matters

THE THINGS THAT TELL YOU IT'S BAD

Work of Breathing

Nasal flaring, head bobbing, grunting, retractions, tripoding, or belly breathing. Grunting is the one people miss: it is the child holding their own alveoli open. A falling respiratory rate in a tired child is not improvement. Ⓟ

Appearance and Tone

Won't make eye contact, won't reach for a caregiver, limp or floppy, weak cry, inconsolable, or unusually still. “Not acting right” from a parent is data, not anxiety. Ⓟ

Circulation and Skin

Mottling, pallor, delayed capillary refill, cool extremities, no tears, dry diapers. Tachycardia with poor perfusion is shock even with a normal pressure #619 #601-A

STEP 2: Age, Behavior, Approach, and Red Flags

Age Group	What's Normal	How to Approach	Red Flags	Field Note
Infant	Tracks faces, strong cry, feeds well	Assess in the caregiver's arms; keep them warm	Weak cry, poor feeding, grunting, floppy, no tears	Fever under 3 months is always significant Ⓟ
Toddler	Fights exams, clings, curious	Toe to head; offer small choices	Not fighting you; won't look at the caregiver	Foreign body and ingestion age #614
Preschool	Talks, imagines, fears the unknown	Short literal explanations; demonstrate on the caregiver	Withdrawn, quiet, won't engage with a toy	Febrile seizures peak in this window #620
School age	Reports symptoms fairly well	Explain, then do; protect modesty	Won't answer, guarding, understating obvious pain	Ask about the mechanism directly
Adolescent	Independent, private, self-conscious	Speak to them first; some questions without the caregiver	Evasive history, inconsistent story, hopelessness	Pregnancy and substances belong in the history #610
Any age: respiratory distress	Working harder but still pink	Position of comfort, blow-by if masks scare them #616	Falling rate, silent chest, altered	Most pediatric arrests are respiratory #712
Any age: shock	Tachycardic, pressure holding	Warm, supine, fluids per weight	Pressure below the age minimum	20 mL/kg boluses, reassess #619
Any age: injury that doesn't fit	Story matches the injury	Document what you see and what you're told	History that changes or doesn't match the injury	Document objectively; report per policy Ⓟ

retractions skin pulling in between or under the ribs **grunting** short noise at the end of each breath to hold alveoli open
mottling blotchy skin from poor perfusion **blow-by** oxygen held near the face instead of a mask

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HEAT & COLD EXPOSURE

THE THERMOMETER MATTERS LESS THAN THE MENTAL STATUS

- ✦ Hot plus altered is heat stroke until proven otherwise Ⓟ
- ✦ Exertional heat stroke patients can still be sweating Ⓟ
- ✦ Remove from the environment first, then cool or warm #631
- ✦ Cold patient: check the pulse for 30 to 45 seconds #631
- ✦ Cooling is the treatment: start on scene, keep it going en route Ⓟ
- ✦ Handle cold patients gently: rough movement can trigger VF #631

STEP 1: Five Presentations, Hot to Cold

HEAT EXHAUSTION

- Weak, dizzy, nauseated, headache
- Sweaty, tachycardic, may be orthostatic
- **Mental status is normal**
- Improves with rest, shade, and fluids

Mind Is Clear

EXERTIONAL HEAT STROKE

- Young and fit, working or exercising hard
- Confused, combative, collapses, or seizes
- Skin hot, often still sweating
- Core usually above 104°F (40°C)

Cool Now

CLASSIC HEAT STROKE

- Elderly or chronically ill, heat wave, no AC
- Meds that blunt sweating or heat response: diuretics, anticholinergics, beta blockers
- Skin hot and often dry
- Builds over days, so they are dry too

Found Down, Hot

MILD HYPOTHERMIA

- About 90 to 95°F (32 to 35°C)
- Shivering hard, clumsy, poor judgment
- Tachycardic, pale, cold skin
- Can still generate their own heat

Still Shivering

MODERATE TO SEVERE

- Below about 90°F (32°C) shivering stops
- Confused, then unresponsive
- Bradycardia, slow breathing, J waves
- Below about 82°F (28°C) VF risk climbs

Handle Gently

WHY THESE PATIENTS GET WORSE

Heat: The Brain Is the Clock

Damage depends on how hot and for how long, so every minute of cooling counts. Strip, soak the whole body, and move air across it; ice packs at the neck, armpits, and groin are an add-on, not the whole plan #631 Ⓟ

Cold: Afterdrop

Moving a cold patient or rubbing their limbs sends cold blood back to the core, and the core temperature can keep falling after rescue. Keep them flat, still, dry, and insulated, and warm the trunk before the limbs #631 Ⓟ

The Mimic: Too Much Water

Endurance athletes who drank heavily can be confused and nauseated from low sodium, not heat. Alert patients get up to 1 liter of water or half-strength sports drink, in small amounts #631; check a glucose #612 Ⓟ

STEP 2: Compare the Presentations

Condition	Mental Status	Skin	Key Clue	Field Priority	Protocol
Heat cramps	Normal	Sweaty	Cramping after exertion	Rest, shade, oral fluids	#631
Heat exhaustion	Normal	Cool, sweaty	Recovers with rest	Remove, cool, oral fluids if alert	#631
Exertional heat stroke	Altered, may seize	Hot, may be sweaty	Collapse during exertion	Aggressive whole-body cooling; seizures per protocol	#631 #620
Classic heat stroke	Altered	Hot, often dry	Elderly, heat wave, medications	Cool, watch for hypotension	#631 #619
Mild hypothermia	Clumsy, poor judgment	Cold, shivering	Wet, windy, exposed	Remove wet clothing, insulate, warm	#631
Moderate to severe hypothermia	Confused to unresponsive	Cold, not shivering	Bradycardia, J waves	Gentle handling, long pulse check, warm the trunk	#631 #641
Frostbite	Normal	White, hard, numb	Fingers, toes, ears, nose	Rewarm in tepid water only if refreezing is impossible; pad between digits	#631

core temperature temperature of the organs, not the skin **J wave** extra hump at the end of the QRS in hypothermia, also called an Osborn wave
afterdrop core temperature still falling after rescue **hyponatremia** low blood sodium, often from overdrinking water

DROWNING & COLD WATER

DROWNING IS A HYPOXIA PROBLEM: FIX THE OXYGEN FIRST

- ✦ Hypoxia is the primary reversible cause of death #632
- ✦ SMR only with strong evidence of trauma, like diving or surf impact #632
- ✦ Apnea or arrest: 5 rescue breaths before compressions #632
- ✦ Transport all symptomatic patients: they can worsen over 6 hours #632
- ✦ Ventilate through the foam; don't stop to chase it with suction #632
- ✦ Known submersion of 25 minutes or less: resuscitate, whatever the water temperature #632

STEP 1: What Happens Underwater

1. SURPRISE & BREATH-HOLD

- Sudden immersion, panic, breath-hold
- Cold water triggers a gasp and rapid breathing
- Swallowing water is common

Seconds

2. ASPIRATION

- The breath-hold breaks and water enters the airway
- A small volume is enough to injure the lungs
- Some have laryngospasm first

Seconds to Minutes

3. LUNG INJURY

- Water washes out surfactant
- Alveoli collapse and flood: noncardiogenic pulmonary edema
- Blood passes lungs that can't oxygenate it

Why PEEP Works

4. HYPOXIC ARREST

- Bradycardia, then PEA or asystole
- VF is uncommon unless cold or cardiac
- The heart stops because the lungs did

Breathing Fails First

5. THE ALERT SURVIVOR

- Cough, crackles, fast breathing, low SpO2
- Can look fine, then decline over hours
- Salt or fresh water doesn't change field care

Watch 6 Hours

WHY THE ORDER IS DIFFERENT

Breaths Before Compressions

In most cardiac arrests the blood is still oxygenated when the heart stops. In drowning it isn't, so compressions alone circulate empty blood. Five rescue breaths, then ventilation with minimal interruptions, BVM with PEEP when available #632

CPAP for the Wet Lung

Without surfactant the alveoli collapse; PEEP holds them open so oxygen can cross. Alert and short of breath: CPAP at 7.5 to 10 cm H2O and monitor ETCO2 #632 #703

Cold Water: 1, 10, 1

Roughly 1 minute of cold shock and gasping, about 10 minutes of useful movement before the arms fail, and up to an hour before hypothermia takes consciousness. Most cold-water deaths are early drownings, not hypothermia Ⓟ

STEP 2: Presentations and Priorities

Presentation	What You See	What It Means	Field Priority	Protocol
Rescued, no symptoms	Normal breathing, clear lungs, normal SpO2	Low risk right now	Assess and document; returning symptoms need care	#632
Cough or mild SOB	Persistent cough, scattered crackles	Aspiration happened	Oxygen, ALS assessment, transport	#632 #602
Hypoxic but alert	Low SpO2, crackles, tachypnea	Surfactant washout	CPAP 7.5 to 10, ETCO2	#632 #703
Altered or hypotensive	Confused, low pressure	Hypoxic brain, possible hypothermia	Ventilate and oxygenate, treat hypotension	#632 #619
Apnea or arrest	Not breathing, usually PEA or asystole	Hypoxic arrest	5 breaths, ventilation-focused CPR, early airway, consult base	#632 #641
Cold-water immersion	Cold, shivering or not	Hypothermia on top of hypoxia	Warm and handle gently	#632 #631
Diving or surf injury	Neck pain, neuro deficit	Possible spinal injury	SMR without delaying ventilation	#632 #702
SCUBA	Chest pain or neuro signs after ascent	Barotrauma or decompression illness	Bring the dive computer or dive plan; tell the ED	#632

surfactant film that keeps alveoli from collapsing **PEEP** pressure held at the end of exhalation to keep alveoli open
drowning respiratory impairment from submersion or immersion; skip 'near,' 'dry,' or 'secondary' drowning #632 **SMR** spinal motion restriction

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RATTLESNAKE BITES

IT'S A DESTINATION PROBLEM, NOT A STOPWATCH PROBLEM

- ✦ Call ahead: confirm the hospital has antivenom before you commit Ⓟ
- ✦ Remove rings and constricting items; mark the swelling edge and the time #630
- ✦ No ice, no incision, no suction #630
- ✦ Don't bring the snake; a photo from a safe distance is plenty Ⓟ
- ✦ Code 2 unless shock, airway involvement, altered mental status, or rapid spread Ⓟ
- ✦ Watch for anaphylaxis and treat it per protocol #630 #611

STEP 1: The Antivenom Timeline

THE BITE	THE FIELD	THE ED, HOURS 1 TO 6	OBSERVATION	AFTER DISCHARGE
• Our local snake is the Northern Pacific rattlesnake • Some bites are dry: no venom injected • Pain and swelling usually start within minutes • A child gets the same venom dose in a smaller body	• Mark and time the swelling edge #630 • Systemic clues: metallic or rubbery taste, tingling around the mouth, vomiting, twitching • Irrigate, keep them still and calm • Treat the pain #603	• Labs: platelets, clotting times, fibrinogen • Antivenom (CroFab or Anavip) for progressing swelling or bad labs • Repeated about hourly until swelling slows to under an inch an hour • Most bitten patients end up needing it	• Even with no symptoms, expect 6 to 8 hours of watching and repeat labs • Treated patients are usually admitted • Swelling can progress for hours to days	• Clotting problems can come back days later • Bleeding gums, nosebleeds, or blood in urine mean return • Follow-up labs are common
Minutes	**Your Window**	**Hospital Only**	**Not a Quick Visit**	**Late Bleeding**

WHY THE HOSPITAL MATTERS MORE THAN THE SIRENS

Not Every ED Has Enough

Antivenom is expensive, and a moderate bite can use a lot of vials. Call the receiving hospital early. If they're short, reroute now, not by interfacility transfer three hours later Ⓟ

Code 2 or Code 3?

A stable patient with local swelling gains nothing from lights and sirens; the treatment is hours of hospital care. Upgrade for hypotension, facial or airway swelling, anaphylaxis, altered mental status, or swelling racing up the limb #601-A Ⓟ

What Antivenom Can't Do

It neutralizes venom that's still active and stops progression. It doesn't undo tissue that's already damaged. Your marked, timed swelling edge is the ED's first data point for how fast it's moving #630 Ⓟ

STEP 2: Myths, Why They're Wrong, and What to Do Instead

What People Do	Why It's Wrong	Do This Instead	Protocol
Ice the bite	Cold adds injury to tissue the venom is already damaging	No ice; irrigate and keep the limb still	#630
Cut and suck	Removes almost no venom; adds bleeding and infection	Don't incise or suction	#630
Tourniquet or tight band	Concentrates venom and tissue damage in the limb	Remove constricting items. A tourniquet already on stays on: removal is a base hospital consult #706	#630 #706
Bring in the snake	A dead or decapitated snake can still bite by reflex	Photo from a safe distance, or a good description	Ⓟ
Extractor pump	Doesn't remove meaningful venom	Leave it in the kit	Ⓟ
"No swelling, no bite"	Signs can lag; dry bites and slow starters look the same early	Mark, time, reassess, transport	#630
"A baby snake is weaker"	Juveniles can deliver a full envenomation	Treat every bite the same	Ⓟ

dry bite a strike that injects little or no venom **coagulopathy** blood that can't clot normally
control swelling stopped or slowed and labs stable or improving **anaphylactoid** allergic-looking reaction to venom or antivenom

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SPIDERS, STINGS & STINGRAYS

Field Education Reference
Bearamedics Reference · not a treatment protocol

THE SCARY ONE ISN'T HERE; THE ONE THAT IS RARELY KILLS

- ✦ No established brown recluse population on the Central Coast Ⓟ
- ✦ Pain control is most of the treatment for a widow bite #603
- ✦ Most "spider bites" turn out to be skin infections, often MRSA Ⓟ
- ✦ Stingray: hot water fixes it; remove the barb only if needed #630 Ⓟ
- ✦ Black widows are here: severe pain and cramping, rarely fatal Ⓟ
- ✦ Any sting can cause anaphylaxis: epinephrine early #611

STEP 1: Five You'll Actually Be Called For

BLACK WIDOW

- Pinprick bite, then spreading pain within an hour
- Cramping in the belly, back, chest, and thighs
- Rigid abdomen that mimics a surgical belly
- Sweating, hypertension, tachycardia
- Peaks in hours, resolves over 1 to 3 days

Miserable, Rarely Fatal

"BROWN RECLUSE"

- Lives in the central and south-central US, not here
- California's desert recluse lives in the southern deserts
- A necrotic wound with no spider seen is usually infection
- Chart "wound," not "spider bite"

Probably Not

STINGRAY

- Stepped on in shallow surf, usually foot or ankle
- Pain out of proportion within minutes
- The venom breaks down with heat
- Deep punctures can hide barb fragments

Hot Water Fixes It

JELLYFISH

- Welts or stinging lines
- No heat #630
- Rinse with saline; vinegar or baking soda if available #630
- Watch for systemic symptoms

Rinse, Don't Rub

BEES & WASPS

- Scrape out the stinger #630
- Ice for pain #630
- Many stings raise systemic risk
- Anaphylaxis is the real killer #611

Watch the Airway

THE CALLS YOU CAN MOSTLY FIX ON SCENE

Stingray: How Hot, How Long

Immerse the wound in water as hot as the patient tolerates without burning, around 110 to 113°F (43 to 45°C), for 30 to 90 minutes or until the pain breaks. Test it with a hand that can feel, not the injured limb. County says warm compresses #630; immersion is the same idea done better Ⓟ

Stingray: Still Needs the ED

Barb or fragment in the wound, a wound to the chest, abdomen, or neck (stabilize it, don't pull it #660-A), a deep laceration, pain heat won't fix, systemic symptoms, or a diabetic or immunocompromised patient. Tell everyone to watch for infection over the next few days Ⓟ

Widow Pain Is Real

These patients are often told it's nothing and get undertreated. Fentanyl per protocol #603; contact base for anything beyond it. The rigid belly is muscle spasm, but let the ED rule out the surgical abdomen Ⓟ

STEP 2: Compare the Exposures

Exposure	Local Signs	Systemic Risk	Field Treatment	Protocol
Black widow	Small bite, spreading pain	Cramps, rigid abdomen, hypertension	Pain control, transport	#630 #603
"Brown recluse"	Necrotic wound, bite rarely witnessed	Usually infection instead	Wound care, transport for evaluation	Ⓟ
Stingray	Puncture, severe pain	Rarely systemic	Hot water immersion; remove barb only if needed	#630
Jellyfish	Welts, burning	Rare	No heat; rinse with saline	#630
Bee or wasp	Stinger, local swelling	Anaphylaxis	Scrape stinger, ice, watch the airway	#630 #611
Anaphylaxis	Hives, facial or tongue swelling	Airway loss, hypotension	IM epinephrine early, diphenhydramine, albuterol if wheezing	#611
Dog or cat bite	Puncture or laceration	Infection	Hemorrhage control, irrigate, note the animal and owner	#630 #706

latrodectism the syndrome of pain and cramping from a widow bite **MRSA** drug-resistant staph skin infection often blamed on spiders
heat-labile broken down by heat **anaphylaxis** severe allergic reaction affecting more than the skin

For study and education. Not a protocol and not a treatment guide: treat per SLO County EMS protocols.