BASTROP COUNTY
EMERGENCY SERVICES DISTRICT NO. 3

ALS Shotgun Scenarios

Equipment familiarization: Zoll Zenix, Zoll Z Vent, Sapphire IV pump

Audience	Paramedic credentials (P-1 and above)
Facilitation	Trainer-led, under one minute per card, two stages
Source	BCEMS Patient Care Guidelines v58 (08/18/2026)
Cards	37 (14 Z Vent, 16 Zenix, 7 Sapphire)
Prepared	September 2026

How to run a card

Read the front of the card aloud: patient, complaint, presentation, vitals, then the Stage 1 task. Stop talking. The crew goes to the device.

The back of the card is the trainer's. It holds the expected answer for both stages, the must-haves, the common misses, cues for when the crew stalls, and the guideline to cite in the wrap-up.

When the Stage 1 task is done, read Stage 2. On the Z Vent, induce the change on the test lung where the cue line says you can: squeeze it for a high pressure alarm, pull the circuit for a low pressure alarm, occlude the outlet briefly for air trapping. Everywhere else, state the change and wait.

Values in the expected answers are computed from the PCG v58 recipes. Vent settings use IBW by height (women 45.5 + 2.3 per inch over 5 ft; men 50 + 2.3 per inch over 5 ft), Vt 6 mL/kg, Mv 100 mL/kg (120 mL/kg with suspected acidosis), rate 16 to 20, PEEP 5, alarms within 10%. Pump rates use the District displacement method: norepinephrine 16 mcg/mL, epinephrine 4 mcg/mL, ketamine 2 mg/mL, amiodarone 1.5 mg/mL in 100 mL D5W, magnesium 20 mg/mL in 100 mL. The Sapphire pumps are not yet programmed with a drug library; every pump card uses the General Medication Infusion workflow.

Accept an answer inside the stated range. Coach the must-haves. Name the common miss if it happens. Close with the PCG reference so the crew knows where to look it up in the MCP app.

Energy on the Zenix: synchronized cardioversion 200 J adult (1 J/kg then 2 J/kg pediatric); manual defibrillation at maximum, which is 200 J on this device (2 J/kg pediatric). Pacing starts at 10 to 20 PPM above the intrinsic rate or 80 PPM, output in 5 mA steps to the lowest current that gives electrical and mechanical capture. The 4-lead must be attached to pace.

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Zoll Z Vent

ALS 01 | Z Vent | Opioid overdose, intubated

Patient: 29 M, 5 ft 10 in, 95 kg

Complaint: Found apneic after heroin use. Intubated by the crew after naloxone failed to restore a respiratory drive.

Presentation: 7.5 ETT at 23 cm, EtCO2 waveform confirmed. Test lung attached.

Vitals: HR 96, BP 118/72, SpO2 97% on BVM, EtCO2 48.

Stage 1: Set up the Z Vent and get this patient on it.

Stage 2: Five minutes on the vent. EtCO2 climbs to 55 and stays there. What changes?

EXPECTED ANSWER

Stage 1: IBW 50 + (2.3 x 10) = 73 kg. Vt 73 x 6 = 440 mL. Mv 73 x 100 = 7.3 L. Rate 7.3 L / 440 mL = 17. PEEP 5. FiO2 100%. Adult start default, pediatric/adult circuit. Alarms: Vt 395 to 485, Mv 6.6 to 8.0 L.

Stage 2: Minute volume is too low (PCG 2.7, High EtCO2). Rate = current EtCO2 x current rate / 40 = 55 x 17 / 40 = 23. Raise the rate to 23, leave Vt at 440.

Must-haves: Circuit check and flow test before connecting. Height used for IBW, actual weight ignored. Alarms set at 10%.

Common misses: Using 95 kg for Vt. Skipping the flow test. Raising Vt instead of rate for the EtCO2.

Trainer cues: If the crew stalls on setup, point to the start menu. On stage 2, ask what the vent is telling them about minute volume before they touch anything.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies; PCG 7.22 Zoll Z-Vent: Setup

ALS 02 | Z Vent | Post-ROSC, small adult

Patient: 71 F, 5 ft 2 in, 58 kg

Complaint: Witnessed VF arrest, ROSC after two shocks. Intubated during the arrest.

Presentation: 7.0 ETT at 21 cm, EtCO2 42 with a good waveform. Test lung attached.

Vitals: HR 108, BP 96/58, SpO2 94%, EtCO2 42.

Stage 1: Set up the Z Vent for this patient.

Stage 2: Ten minutes in, SpO2 drifts from 94 to 88 over several minutes. No alarms. What do you do?

EXPECTED ANSWER

Stage 1: IBW 45.5 + (2.3 x 2) = 50 kg. Vt 300 mL. Mv 5.0 L. Rate 17. PEEP 5. FiO2 100%. Adult default, pediatric/adult circuit (Vt over 200 mL). Alarms: Vt 270 to 330, Mv 4.5 to 5.5 L.

Stage 2: Gradual desaturation presumed from patient pathology (PCG 2.7, Low SpO2). Work D.O.P.E. first, check chest rise, EtCO2, and probe. FiO2 is already 1.0, so increase PEEP per the ARDSnet table (PCG 7.3). Consider a recruitment maneuver and watch the blood pressure.

Must-haves: Vt at 300, no rounding up to a 'normal adult' number. Pulse check at any rapid EtCO2 drop. Pads stay on.

Common misses: Setting Vt 450 to 500 out of habit. Turning up FiO2 that is already at 100%. Jumping to PEEP before D.O.P.E.

Trainer cues: Ask the crew to tell you the IBW before they touch the vent. On stage 2, if they go straight to settings, ask what D.O.P.E. stands for.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies; PCG 7.3 ARDSnet Protocol

ALS 03 | Z Vent | Sepsis with pneumonia, large patient

Patient: 54 M, 6 ft 4 in, 140 kg

Complaint: Three days of productive cough and fever, now obtunded. Drug-assisted intubation completed.

Presentation: 8.0 ETT at 24 cm. Coarse rhonchi bilaterally. Test lung attached.

Vitals: HR 122, BP 92/50, SpO2 91%, EtCO2 46, Temp 39.4 C.

Stage 1: Build the vent settings and connect.

Stage 2: Trainer squeezes the test lung during inspiration. High pressure alarm. Walk it.

EXPECTED ANSWER

Stage 1: IBW 50 + (2.3 x 16) = 87 kg. Vt 520 mL. Mv 8.7 L. Rate 17. PEEP 5. FiO2 100%. Alarms: Vt 470 to 570, Mv 7.8 to 9.5 L. Actual weight 140 kg is not used.

Stage 2: High pressure alarm: D.O.P.E. then D.O.T.T.S. Disconnect, bag on 100%, check tube depth (8.0 x 3 = 24 cm), suction for obstruction, look for pneumothorax, check the circuit for kinks. If pressures persist after the patient is optimized, lower Vt by 1 mL/kg (87 x 5 = 435 mL, floor 4 mL/kg) and reset alarms.

Must-haves: IBW, not 140 kg. Disconnect and bag before troubleshooting. Tube depth rule of three.

Common misses: Vt of 800 mL from actual weight. Silencing the alarm and continuing. Lowering Vt before ruling out the tube and circuit.

Trainer cues: If the crew sets Vt above 600, stop them and ask what weight they used. Release the lung when they disconnect.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies

ALS 04 | Z Vent | DKA, intubated for airway protection

Patient: 38 F, 5 ft 7 in, 70 kg

Complaint: Type 1 diabetic, two days of vomiting, now GCS 7. Intubated. Kussmaul respirations before DAI.

Presentation: 7.0 ETT at 21 cm. Fruity breath. Glucose reads HI. Test lung attached.

Vitals: HR 130, BP 100/60, SpO2 98%, EtCO2 18 before intubation.

Stage 1: Set up the vent. What is different about this patient?

Stage 2: After connection EtCO2 reads 22. Your partner wants to drop the rate to bring it up to 40. Do you?

EXPECTED ANSWER

Stage 1: Suspected acidosis: IBW 45.5 + (2.3 x 7) = 62 kg. Vt 370 mL. Mv 62 x 120 = 7.4 L. Rate 7.4 L / 370 mL = 20. PEEP 5. FiO2 100%. Alarms: Vt 335 to 405, Mv 6.7 to 8.2 L.

Stage 2: No. Respiratory compensation for metabolic acidosis: do not attempt to normalize the patient's breathing without an ABG and expert consultation (PCG 2.7, Low EtCO2). Keep the rate at 20. Contact OLMC if you want to move off the recipe.

Must-haves: The 120 mL/kg multiplier. Rate lands at 20. Refuses to chase EtCO2 to normal.

Common misses: Using 100 mL/kg and rate 17. Dropping the rate because the number looks low.

Trainer cues: If the crew sets rate 17, ask what the pre-intubation EtCO2 was and why the patient was breathing that way.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies

ALS 05 | Z Vent | Status asthmaticus, intubated

Patient: 24 M, 5 ft 6 in, 68 kg

Complaint: Severe asthma, silent chest, exhausted. Intubated after continuous nebs and epinephrine failed.

Presentation: 7.5 ETT at 22 cm. Prolonged expiratory phase. Test lung attached.

Vitals: HR 138, BP 108/66, SpO2 90%, EtCO2 58.

Stage 1: Set the vent up.

Stage 2: Three minutes in: peak pressure alarm, BP drops to 74/40, EtCO2 waveform never returns to baseline between breaths. Go.

EXPECTED ANSWER

Stage 1: IBW 50 + (2.3 x 6) = 64 kg. Vt 385 mL. Mv 6.4 L. Rate 17. PEEP 5. FiO2 100%. Alarms: Vt 345 to 420, Mv 5.8 to 7.0 L.

Stage 2: Stacked breaths and air trapping (PCG 2.7, High Pressure, Pressure). Disconnect the patient from the circuit and allow a full exhale, then address the cause: high rate, incomplete exhalation, patient triggering. Lengthen expiration by adjusting I:E, lower the rate, address sedation. Rule out tension pneumothorax if the BP does not recover after disconnect.

Must-haves: Disconnect to decompress. Recognizes the EtCO2 waveform shape as trapping. Pulse and BP recheck after disconnect.

Common misses: Treating the hypotension with fluid or pressors first. Raising the rate for the high EtCO2 and making trapping worse.

Trainer cues: Occlude the test lung outlet briefly to simulate trapping if you can. Ask what the waveform looks like.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies; PCG 2.1 Asthma / COPD

ALS 06 | Z Vent | Traumatic brain injury

Patient: 45 F, 5 ft 4 in, 63 kg

Complaint: Restrained driver, frontal impact. GCS 6 with unequal pupils. Drug-assisted intubation completed.

Presentation: 7.0 ETT at 21 cm. Test lung attached.

Vitals: HR 58, BP 168/92, SpO2 99%, EtCO2 44.

Stage 1: Set up the vent.

Stage 2: EtCO2 now reads 28 and the patient is triggering breaths above the set rate. What is happening and what do you change?

EXPECTED ANSWER

Stage 1: IBW 45.5 + (2.3 x 4) = 55 kg. Vt 330 mL. Mv 5.5 L. Rate 17. PEEP 5. FiO2 100%. Alarms: Vt 295 to 365, Mv 4.9 to 6.0 L.

Stage 2: Low EtCO2 with the patient breathing over the vent (PCG 2.7, Low EtCO2, Ventilator Dyssynchrony). On AC every triggered breath delivers full Vt, so the minute volume is above what was set. Address sedation per PCG 2.5 (ketamine bolus 0.5 to 2 mg/kg or infusion, fentanyl 1 to 2 mcg/kg). Recheck EtCO2 after sedation before changing settings.

Must-haves: Recognizes triggering as the cause. Sedation before settings. Checks a pulse if the EtCO2 fall was sudden.

Common misses: Dropping the set rate while the patient is still triggering. No RASS documentation with ketamine.

Trainer cues: If the crew changes settings first, ask what the delivered rate on the screen shows versus the set rate.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies; PCG 2.5 Post-Intubation Care

ALS 07 | Z Vent | COPD, failed BiPAP, now intubated

Patient: 66 M, 5 ft 2 in, 52 kg

Complaint: COPD exacerbation. BiPAP reached IPAP 18 without improvement. Intubated.

Presentation: 7.5 ETT at 22 cm. Barrel chest. Test lung attached.

Vitals: HR 112, BP 138/84, SpO2 92%, EtCO2 62.

Stage 1: Set the vent up.

Stage 2: Trainer pulls the circuit off the test lung. Low pressure alarm. Go.

EXPECTED ANSWER

Stage 1: IBW 50 + (2.3 x 2) = 55 kg. Vt 330 mL. Mv 5.5 L. Rate 17. PEEP 5. FiO2 100%. Alarms: Vt 295 to 365, Mv 4.9 to 6.0 L.

Stage 2: Low pressure alarm (PCG 2.7). Displacement: is the tube still in the trachea? Equipment: cuff leak (cuff 20 to 30 cmH2O), ventilator disconnect or leak. Run a bare hand along the circuit during inhalation, check every connection and valve. Reconnect and confirm EtCO2 waveform.

Must-haves: Looks at the patient and tube first, then the circuit. Confirms EtCO2 after fixing.

Common misses: Silencing the alarm. Assuming the tube is out and pulling it.

Trainer cues: Ask what two things a low pressure alarm can mean before they touch the circuit.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies; PCG 2.1 Asthma / COPD

ALS 08 | Z Vent | Septic shock, suspected lactic acidosis

Patient: 80 F, 5 ft 9 in, 61 kg

Complaint: Nursing facility, urinary source, altered and hypotensive. Intubated for airway protection.

Presentation: 7.0 ETT at 21 cm. Mottled knees. Test lung attached.

Vitals: HR 126, BP 84/46, SpO2 93%, EtCO2 24, Temp 38.9 C.

Stage 1: Set up the vent. Say out loud which multiplier you are using and why.

Stage 2: Immediately after connection BP is 68/38. EtCO2 falls to 15. What now?

EXPECTED ANSWER

Stage 1: Suspected acidosis: IBW 45.5 + (2.3 x 9) = 66 kg. Vt 400 mL. Mv 66 x 120 = 7.9 L. Rate 7.9 L / 400 mL = 20. PEEP 5. FiO2 100%. Alarms: Vt 360 to 440, Mv 7.1 to 8.7 L.

Stage 2: Low EtCO2 with a rapid drop: check the pulse first (PCG 2.7, Low Perfusion States). Positive pressure reduced venous return in a volume-depleted patient. Treat per PCG 3.10.5 Septic Shock: fluid, then norepinephrine 0.05 to 0.15 mcg/kg/min to start. Do not lower the rate in a patient compensating for acidosis.

Must-haves: The 120 mL/kg multiplier stated with a reason. Pulse check on the rapid EtCO2 drop.

Common misses: Rate 17. Treating the low EtCO2 as a settings problem.

Trainer cues: If the crew misses the acidosis, ask what the EtCO2 of 24 in a breathing patient means.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies; PCG 3.10.5 Septic Shock

ALS 09 | Z Vent | Post-ROSC, tall adult, dyssynchrony

Patient: 59 M, 6 ft 0 in, 102 kg

Complaint: Cardiac arrest, ROSC after 12 minutes. Intubated.

Presentation: 8.0 ETT at 24 cm. Test lung attached.

Vitals: HR 92, BP 104/62, SpO2 96%, EtCO2 40.

Stage 1: Set up the vent.

Stage 2: Patient begins to cough against the tube and reach for it. High pressure alarms with each cough. What do you do?

EXPECTED ANSWER

Stage 1: IBW 50 + (2.3 x 12) = 78 kg. Vt 470 mL. Mv 7.8 L. Rate 17. PEEP 5. FiO2 100%. Alarms: Vt 420 to 515, Mv 7.0 to 8.5 L.

Stage 2: Patient arousal (PCG 2.7, High Pressure). Address analgesia and sedation per PCG 2.5: ketamine 0.5 to 2 mg/kg bolus or 1 to 4 mg/kg/hr infusion, or midazolam infusion 0.02 to 0.1 mg/kg/hr, and fentanyl 1 to 2 mcg/kg. Document RASS. Paralytics only with an infusion running, RASS -5, and OLMC.

Must-haves: Sedation and analgesia together. RASS documented. Tube secured and hands controlled.

Common misses: Reaching for rocuronium first. Changing vent settings for a sedation problem.

Trainer cues: Ask what the paralytic prerequisites are if the crew mentions rocuronium.

Wrap-up: PCG 2.6 Mechanical Ventilation; PCG 2.7 Ventilator Emergencies; PCG 2.5 Post-Intubation Care

ALS 10 | Z Vent | Pediatric drowning

Patient: 6 y/o M, 41 in tall (Blue zone), 22 kg

Complaint: Pulled from a pond. ROSC after bystander CPR and one shock. Intubated.

Presentation: 5.5 cuffed ETT at 16 cm. Pink frothy sputum. Test lung attached.

Vitals: HR 130, BP 88/50, SpO2 90%, EtCO2 38.

Stage 1: Set up the vent for this child.

Stage 2: High pressure alarm, worsening frothy secretions after suction. What do you adjust?

EXPECTED ANSWER

Stage 1: Pediatric Mechanical Ventilation Reference, Blue (6 to 8 years, 39 to 44 in): IBW 21 kg, Vt 130 mL, Mv 2.1 L, rate 26. Infant/pediatric circuit (Vt 50 to 300 mL). Pediatric start default. PEEP 3 to 5. FiO2 100%. Alarms: Vt 117 to 143, Mv 1.9 to 2.3 L.

Stage 2: Pulmonary edema (PCG 2.7, High Pressure, Pulmonary Circuit). Increase Ti by adjusting I:E from 1:3 toward 1:2 or 1:1. Increase PEEP and FiO2 per ARDSnet as SpO2 dictates. Consider lowering Vt by 1 mL/kg to a floor of 4 mL/kg. Rule out pneumothorax.

Must-haves: Uses the color reference, not adult math. Correct circuit. PEEP 3 to 5.

Common misses: Devine formula on a child. Adult circuit. Grey or Pink zone check: no vent under Red (9 kg).

Trainer cues: Have the color reference available. Ask which zone before they set anything.

Wrap-up: PCG 2.6 Mechanical Ventilation (Pediatric); Pediatric Mechanical Ventilation Reference; PCG 2.7 Ventilator Emergencies

ALS 11 | Z Vent | CHF, acute pulmonary edema, CPAP

Patient: 68 F, 5 ft 5 in, 84 kg

Complaint: Woke up unable to breathe. Two-pillow orthopnea, worse tonight.

Presentation: Awake, oriented, tripoding, rales to the scapulae, speaking two words at a time.

Vitals: HR 118, BP 178/104, SpO2 84% RA, RR 32, EtCO2 34.

Stage 1: Get this patient on ventilator CPAP.

Stage 2: Five minutes in, still working hard, SpO2 89%. What is your next move on the vent and on the drugs?

EXPECTED ANSWER

Stage 1: Meets NIPPV criteria (awake, SBP over 90, fits the mask). Mask CPAP start default. Adult CPAP: PEEP 5, rate 2. FiO2 to SpO2 over 90%. Alarms and extended menu: low peak pressure 0, low minute volume 0, rise time 1, flow termination 40%. Coach the patient, hand-hold the mask before strapping, monitor EtCO2 for the whole transport.

Stage 2: Titrate in 2 cmH2O increments toward comfort and physiologic response; consider switching to BiPAP (IPAP 10 / EPAP 5) if CPAP alone is not enough. Remove the mask briefly for nitroglycerin per PCG 3.9. Notify the receiving hospital. Intubation is considered at 18 to 20 cmH2O without improvement.

Must-haves: Contraindication screen spoken aloud. Alarm menu settings. EtCO2 on. Coaching before straps.

Common misses: Starting at PEEP 10. Forgetting the alarm and extended menu changes. Leaving the mask on for the whole nitro dose.

Trainer cues: If the crew straps the mask immediately, ask how the patient is tolerating it.

Wrap-up: PCG 2.8 Non-Invasive Positive Pressure Ventilation; PCG 3.9 Pulmonary Edema and Acute Decompensated Heart Failure; PCG 7.22 Zoll Z-Vent: Setup

ALS 12 | Z Vent | COPD exacerbation, BiPAP

Patient: 72 M, 5 ft 8 in, 66 kg

Complaint: Three days of worsening dyspnea, home nebs not working.

Presentation: Awake, anxious, pursed lips, prolonged expiration, accessory muscle use.

Vitals: HR 110, BP 152/88, SpO2 86% on 2 L home O2, RR 28, EtCO2 68.

Stage 1: Set up BiPAP on the Z Vent.

Stage 2: Ten minutes in, EtCO2 66, still retracting. Your partner wants to raise EPAP to 10 with the IPAP. Correct them and set the next step.

EXPECTED ANSWER

Stage 1: Adult BiPAP: IPAP 10 / EPAP 5 / rate 2. FiO2 to SpO2 over 90%. Mask CPAP start default, BL mode. Alarms: low peak pressure 0, low minute volume 0, rise time 1, flow termination 40%. EtCO2 on throughout.

Stage 2: Raise IPAP by 2 (to 12, then 14) until EtCO2, work of breathing, and comfort improve. In asthma and COPD an EPAP of 5 to 6 is usually therapeutic and higher levels increase difficulty exhaling CO2, so EPAP stays at 5 to 6. Consider intubation if IPAP reaches 18 to 20 without improvement (PCG 2.3).

Must-haves: Starting pair 10/5. EPAP cap explained. EtCO2 trend used as the titration signal.

Common misses: Raising EPAP in step with IPAP on a COPD patient. Titrating without an EtCO2 trend.

Trainer cues: Ask why EPAP has a ceiling in COPD before you accept the answer.

Wrap-up: PCG 2.8 Non-Invasive Positive Pressure Ventilation; PCG 2.1 Asthma / COPD; PCG 2.3 Drug Assisted Intubation

ALS 13 | Z Vent | Pediatric asthma, BiPAP

Patient: 9 y/o F, 52 in, 30 kg

Complaint: Asthma attack at school, two albuterol treatments given by the nurse.

Presentation: Awake, speaking short phrases, retractions, wheezing throughout.

Vitals: HR 134, BP 104/66, SpO2 90%, RR 34, EtCO2 48.

Stage 1: Set up NIPPV for this child.

Stage 2: She vomits into the mask. What now?

EXPECTED ANSWER

Stage 1: Pediatric SBP floor 70 + (2 x 9) = 88; she is at 104 and meets criteria. Pediatric (under 12) BiPAP: IPAP 5 / EPAP 2 / rate 2. FiO2 to SpO2 over 90%. Alarms: low peak pressure 0, low minute volume 0, rise time 1, flow termination 40%. Pediatric mask, EtCO2 on.

Stage 2: Active vomiting is an absolute contraindication. Mask off, suction, position, reassess airway. Consider antiemetic per PCG 5.6. Reapply only if she is awake, airway clear, and no further vomiting. Continue bronchodilators per PCG 2.1.

Must-haves: Pediatric pressure pair, not adult 10/5. Pediatric SBP formula. Mask off immediately on vomiting.

Common misses: Adult settings on a 30 kg child. Leaving the mask on while suctioning.

Trainer cues: Ask for the SBP floor before they connect. Say 'she just vomited' with no other warning.

Wrap-up: PCG 2.8 Non-Invasive Positive Pressure Ventilation; PCG 2.1 Asthma / COPD; PCG 5.6 Nausea / Vomiting

ALS 14 | Z Vent | NIPPV contraindication trap

Patient: 55 M, 5 ft 11 in, 90 kg

Complaint: COPD, dyspnea for two days, family says he has been 'sleepy' since this morning.

Presentation: Responds to voice only, then drifts. Weak cough. Diaphoretic.

Vitals: HR 124, BP 82/48, SpO2 85%, RR 30 shallow, EtCO2 74.

Stage 1: Your partner hands you the BiPAP mask. Do you set it up? Say what you will do instead.

Stage 2: After 500 mL of fluid and BVM assist, BP 106/64, he is awake and following commands. Now what?

EXPECTED ANSWER

Stage 1: No. Hemodynamic instability (SBP 82) is an absolute contraindication and altered level of consciousness is a relative one. Manage the airway: BVM with PEEP valve, adjuncts, suction. Treat the pressure per PCG 3.10 and prepare for drug-assisted intubation (PCG 2.3) if he does not improve.

Stage 2: He now meets criteria: awake, SBP over 90, can protect his airway. Adult BiPAP IPAP 10 / EPAP 5 / rate 2, FiO2 to SpO2 over 90%, alarm and extended menu set, EtCO2 on. Titrate IPAP by 2, EPAP held at 5 to 6 for COPD. Stay ready to intubate.

Must-haves: Names the contraindications. Does not start CPAP or BL on a patient who may stop breathing.

Common misses: Starting BiPAP on a hypotensive, obtunded patient. Skipping the recheck once he improves.

Trainer cues: If the crew reaches for the mask, ask for the SBP and the GCS.

Wrap-up: PCG 2.8 Non-Invasive Positive Pressure Ventilation; PCG 7.22 Zoll Z-Vent: Setup; PCG 2.3 Drug Assisted Intubation

Zoll Zenix monitor

ALS 15 | Zenix | Complete heart block, syncope

Patient: 74 M, 5 ft 9 in, 82 kg

Complaint: Passed out at the kitchen table. Second episode today.

Presentation: Pale, cool, confused. Third-degree AV block on the monitor.

Vitals: HR 32, BP 70/40, SpO2 93%, RR 18.

Stage 1: Get this patient paced.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Capture at 65 mA. Crew moves him to the cot and the pacer spikes stop capturing. Go.

EXPECTED ANSWER

Stage 1: Atropine 1 mg IV/IO while preparing to pace (repeat to a max of 3 mg, then TCP). 4-lead on (the Zenix will not pace without it), pads on clean dry skin, lead I, II, or III with the largest QRS. Select PACER; demand mode is the default. Rate: 10 to 20 above intrinsic or 80 PPM. Output up in 5 mA steps until electrical capture, then confirm mechanical capture with a femoral pulse and a rising BP. Keep the lowest current that gives both. Sedation per PCG 5.7.1 (ketamine 0.5 to 1 mg/kg IV, or midazolam 1 to 10 mg IV).

Stage 2: Loss of capture: check pad contact and lead contact after the move, confirm the pacer is still on, then increase output in 5 mA steps until capture returns. Recheck a pulse at the new output. Consider a pressor per PCG 3.10.1 if BP stays low with capture.

Must-haves: Four-lead attached. Mechanical capture confirmed by pulse, not by the screen. Sedation offered.

Common misses: Pacing without the 4-lead and wondering why nothing happens. Calling capture from the ECG alone. Leaving the pacer at 80 mA 'to be safe.'

Trainer cues: If the crew announces capture, ask how they know. On stage 2, say 'the spikes are still there.'

Wrap-up: PCG 8.42 Transcutaneous Pacing; PCG 3.3 Dysrhythmia (Symptomatic Bradycardia); PCG 5.7.1 Light Procedural Analgesia and Sedation

ALS 16 | Zenix | Beta-blocker overdose, pseudocapture

Patient: 58 F, 5 ft 4 in, 70 kg

Complaint: Intentional metoprolol ingestion 90 minutes ago.

Presentation: Drowsy, cool, diaphoretic. Sinus bradycardia.

Vitals: HR 38, BP 78/50, SpO2 95%, RR 14, glucose 92.

Stage 1: Pace her.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Wide complexes follow every spike at 50 mA. Your partner says 'we have capture.' BP is unchanged at 78/50. What do you check?

EXPECTED ANSWER

Stage 1: Atropine 1 mg (max 3 mg) while setting up. 4-lead, pads, largest-QRS lead. PACER, demand mode, rate 80 (or 10 to 20 above intrinsic). Output in 5 mA steps to electrical and mechanical capture. Sedation per PCG 5.7.1. Consider push-dose epinephrine 5 to 20 mcg while pacing is established.

Stage 2: Electrical capture without mechanical capture. Palpate a femoral pulse and match it to the paced rate; check SpO2 pleth and NIBP. If no mechanical capture, increase output in 5 mA steps and recheck the pulse at each step. Vasopressor support per PCG 3.10.1 and PCG 7.21 until hemodynamically stable.

Must-haves: Pulse check against the paced rate. Output increased until BP responds.

Common misses: Accepting a wide complex as capture. Stopping at the first output that changes the screen.

Trainer cues: Say the BP has not changed and wait. Do not volunteer the word 'pulse.'

Wrap-up: PCG 8.42 Transcutaneous Pacing; PCG 3.3 Dysrhythmia (Symptomatic Bradycardia); PCG 7.21 Vasopressors

ALS 17 | Zenix | Junctional bradycardia, pacer will not start

Patient: 81 M, 5 ft 7 in, 75 kg

Complaint: Weak and dizzy for two hours, nearly fell in the bathroom.

Presentation: Junctional rhythm, no P waves. Pads already on from the first-arriving crew.

Vitals: HR 28, BP 74/42, SpO2 91%, RR 16.

Stage 1: Pace him. The trainer has removed the 4-lead cable from the patient before you arrive.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Capture achieved at 70 mA. He is now screaming with each pace. What do you do?

EXPECTED ANSWER

Stage 1: Atropine 1 mg (max 3 mg). Recognize the pacer cannot run without the 4-lead: attach the ECG electrodes and cable, select lead I, II, or III with the largest QRS, then PACER, rate 80, output in 5 mA steps to electrical and mechanical capture.

Stage 2: Pain from pacing is expected. Light procedural analgesia and sedation per PCG 5.7.1: ketamine 0.5 to 1 mg/kg IV/IO (RASS documented) or midazolam 1 to 10 mg IV. Do not reduce output below the capture threshold to make him comfortable.

Must-haves: Finds the missing 4-lead without prompting. Sedates without losing capture.

Common misses: Pressing PACER repeatedly with no leads on. Backing off output to reduce pain.

Trainer cues: Say nothing about the missing cable. Let them find it.

Wrap-up: PCG 8.42 Transcutaneous Pacing; PCG 5.7.1 Light Procedural Analgesia and Sedation

ALS 18 | Zenix | Atrial fibrillation with RVR, unstable

Patient: 62 M, 5 ft 10 in, 96 kg

Complaint: Palpitations since last night, now lightheaded and confused.

Presentation: Irregularly irregular, narrow complex, no P waves.

Vitals: HR 172, BP 76/44, SpO2 92%, RR 24.

Stage 1: Cardiovert him.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Converts to sinus at 90. Two minutes later back in AF at 168, BP 80/50. Go.

EXPECTED ANSWER

Stage 1: Unstable tachycardia (HR over 150 with hypotension and altered mentation). Pads and 3/4-lead on. Sedation per PCG 5.7.1 if time allows. Press SYNC, confirm a marker above every R wave. Adult 200 J. Charge, clear, press and HOLD the shock button until the energy delivers. Reassess.

Stage 2: Repeat synchronized cardioversion, 200 J, increasing energy as needed (the Zenix maximum is 200 J, so repeat at 200 J). Re-press SYNC: sync does not persist after a shock on most monitors, so verify markers again. Consider OLMC after multiple failed attempts.

Must-haves: Sync markers verified before charging. Hold the button. Re-verify sync before the second shock.

Common misses: Pressing and releasing the button, then wondering why nothing fired. Delivering an unsynchronized 200 J to a patient with a pulse.

Trainer cues: Watch the button press. If they tap it, let the monitor sit there and say 'nothing happened.'

Wrap-up: PCG 8.39 Synchronized Cardioversion; PCG 3.6 Dysrhythmia (Unstable Tachycardia); PCG 5.7.1 Light Procedural Analgesia and Sedation

ALS 19 | Zenix | SVT with chest pain, no sync markers

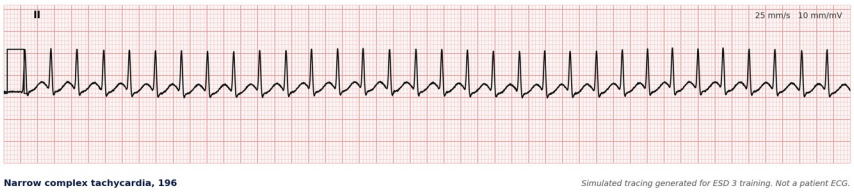
Patient: 34 F, 5 ft 6 in, 60 kg

Complaint: Sudden racing heart 40 minutes ago, now chest pressure and near-syncope.

Presentation: Regular narrow complex, no visible P waves. Vagal maneuvers already failed.

Vitals: HR 196, BP 82/50, SpO2 96%, RR 22.

Stage 1: Cardiovert her.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: You press SYNC and the markers land on only every third R wave. What do you do before you charge?

EXPECTED ANSWER

Stage 1: Unstable SVT. Pads and 3/4-lead. Sedation per PCG 5.7.1 if time allows. SYNC on, markers above each R wave, 200 J, charge, clear, press and hold. Reassess.

Stage 2: Improve the signal: change the displayed lead to the one with the tallest R wave, adjust ECG size or gain, confirm lead contact and reduce motion. Do not deliver an unsynchronized shock to a patient with a pulse. Once every R wave carries a marker, proceed.

Must-haves: Refuses to shock without markers on each R wave. Knows where lead and gain live on the Zenix.

Common misses: Charging anyway. Turning sync off to make the shock fire.

Trainer cues: Point at the screen and ask how many complexes have a marker.

Wrap-up: PCG 8.39 Synchronized Cardioversion; PCG 3.6 Dysrhythmia (Unstable Tachycardia); PCG 3.4 Dysrhythmia (Stable, Symptomatic Narrow Complex Tachycardia)

ALS 20 | Zenix | VT with a pulse becomes pulseless

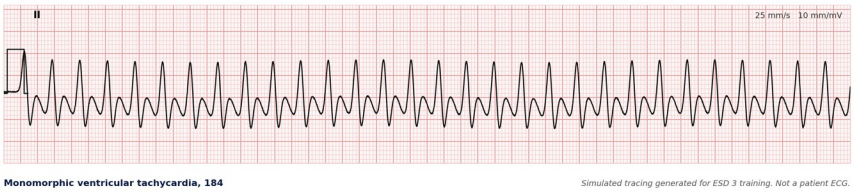
Patient: 70 M, 5 ft 8 in, 88 kg

Complaint: Prior MI, chest pain and dizziness for 20 minutes.

Presentation: Regular wide complex tachycardia, radial pulse present but weak.

Vitals: HR 184, BP 78/46, SpO2 91%, RR 20.

Stage 1: Treat this rhythm.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: As you charge, the monitor shows coarse VF and he has no pulse. Go.

EXPECTED ANSWER

Stage 1: Unstable wide complex tachycardia with a pulse: synchronized cardioversion at 200 J. Pads, 3/4-lead, sedation if time allows, SYNC with markers, charge, clear, press and hold.

Stage 2: Turn SYNC off. Manual defibrillation at maximum joules (200 J on the Zenix), CPR immediately after, 2-minute cycles. Epinephrine 1 mg after the second defibrillation. Amiodarone 300 mg after the third shock, repeat 150 mg once. Primary pad placement is anterior/posterior; after the third shock without a second monitor, change vectors.

Must-haves: Recognizes that a synced shock will not fire on VF and turns sync off. Starts compressions.

Common misses: Holding the shock button on VF with sync still on. Delaying CPR to re-analyze.

Trainer cues: Change the rhythm on the simulator, or announce 'no pulse, VF on the screen' mid-charge.

Wrap-up: PCG 8.39 Synchronized Cardioversion; PCG 8.22 Manual Defibrillation; PCG 3.6 Dysrhythmia (Unstable Tachycardia); PCG 3.1 Cardiac Arrest (Non-Traumatic)

ALS 21 | Zenix | Witnessed VF arrest

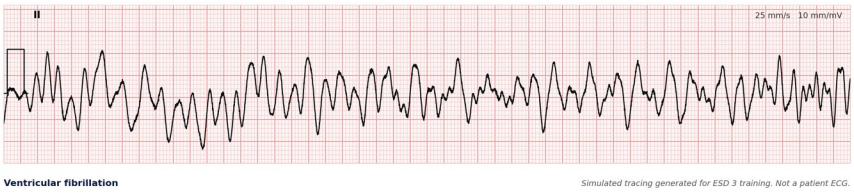
Patient: 55 M, 6 ft 1 in, 100 kg

Complaint: Collapsed at a restaurant, bystander CPR in progress on your arrival.

Presentation: VF on the pads.

Vitals: Pulseless, apneic.

Stage 1: Defibrillate.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Rhythm check after the third shock: still VF. You are the only unit. What changes on your next cycle?

EXPECTED ANSWER

Stage 1: Pads anterior/posterior (primary placement). Confirm VF on the monitor, select 200 J (maximum), charge during compressions, clear, press the shock button, resume compressions immediately. Epinephrine 1 mg IV/IO once after the second defibrillation; withhold further epi unless the rhythm becomes non-shockable.

Stage 2: After the third defibrillation without a second monitor, change vectors (move from anterior/posterior to anterior/lateral or the reverse) and keep the new vector until a second monitor arrives. Amiodarone 300 mg IV/IO, repeat 150 mg in 3 to 5 minutes. Lidocaine 1 to 1.5 mg/kg (max 100 mg) if still refractory after amiodarone.

Must-haves: Charges during compressions. Pauses under 10 seconds. Epi timing after shock two, not shock one.

Common misses: Epinephrine on the first cycle. Stopping compressions to charge. Forgetting the vector change.

Trainer cues: Time the pause with your watch and tell them the number.

Wrap-up: PCG 8.22 Manual Defibrillation; PCG 3.1 Cardiac Arrest (Non-Traumatic)

ALS 22 | Zenix | Refractory VF, dual sequential defibrillation

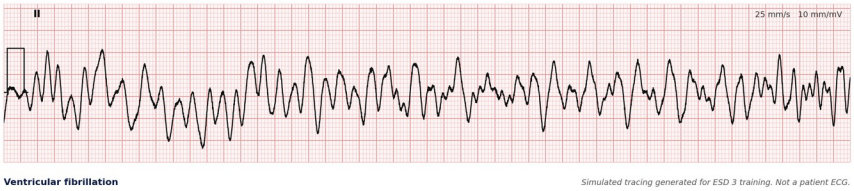
Patient: 48 M, 5 ft 11 in, 92 kg

Complaint: Arrest in progress, first unit has delivered three shocks at 200 J and one round of amiodarone. Your Tahoe brings the second Zenix.

Presentation: VF persists. Pads anterior/posterior on the first monitor.

Vitals: Pulseless, EtCO2 22 with compressions.

Stage 1: Set up dual sequential defibrillation.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Both monitors charged. Compressions stop and the rhythm is now organized at 40 with no pulse. What do you do with the charge?

EXPECTED ANSWER

Stage 1: Indicated: VF on or after the second attempt with two monitors present, age 15 or older. Place the second pad set anterior/lateral, no contact between sets, prepare the skin. Second monitor controls visible to a second provider. Maximum energy on both (200 J each). Charge both 15 seconds before the planned pause, CPR continues during charging. At the pause, assess, state CLEAR, visualize head to toe, deliver both shocks in rapid sequence, resume compressions immediately. Pulse and rhythm check after 2 minutes, repeat every 2 minutes as indicated.

Stage 2: PEA. Do not deliver the shocks. Disarm or dump the charge on both monitors, resume compressions, epinephrine 1 mg (now allowed since the rhythm is non-shockable), work reversible causes, calcium for wide complex PEA per PCG 3.1.

Must-haves: Two providers, one per monitor. Pads do not touch. Charge timed to the CPR cycle. Knows how to dump a charge.

Common misses: Pads overlapping. Charging after the pause starts. Shocking PEA because the monitors were already charged.

Trainer cues: Assign yourself as the second-monitor provider and do exactly what they tell you.

Wrap-up: PCG 8.11 Dual Sequential Defibrillation; PCG 3.1 Cardiac Arrest (Non-Traumatic); PCG 8.22 Manual Defibrillation

ALS 23 | Zenix | Pediatric VF, drowning

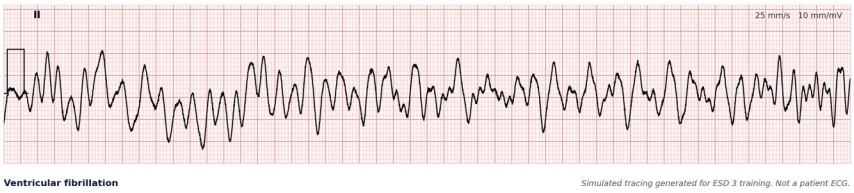
Patient: 7 y/o F, 45 in, 24 kg

Complaint: Pulled from a backyard pool, unknown downtime. CPR in progress by parents.

Presentation: VF on the pads.

Vitals: Pulseless, apneic.

Stage 1: Defibrillate this child.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Second shock delivered, still VF. Drug plan and next energy?

EXPECTED ANSWER

Stage 1: Pediatric pads, anterior/posterior. 2 J/kg = 48 J, round to the nearest Zenix setting (50 J). Charge during compressions, clear, shock, resume CPR at 15:2 until an advanced airway is placed.

Stage 2: Repeat at 2 J/kg (50 J), repeat PRN. Epinephrine 0.01 mg/kg = 0.24 mg (2.4 mL of 1:10,000) once after the second defibrillation, withheld thereafter unless the rhythm becomes non-shockable. Amiodarone 5 mg/kg = 120 mg after continued VF, may repeat once. Dual sequential is contraindicated under age 15.

Must-haves: Weight-based energy stated in joules, not J/kg. Pediatric pad placement. 15:2 ratio.

Common misses: 200 J on a 24 kg child. Adult epi dose. Attempting DSD.

Trainer cues: Ask for the number of joules, then ask how they got it.

Wrap-up: PCG 8.22 Manual Defibrillation; PCG 3.1 Cardiac Arrest (Non-Traumatic); PCG 8.11 Dual Sequential Defibrillation

ALS 24 | Zenix | Chest pain, 12-lead and transmit

Patient: 58 M, 5 ft 9 in, 90 kg

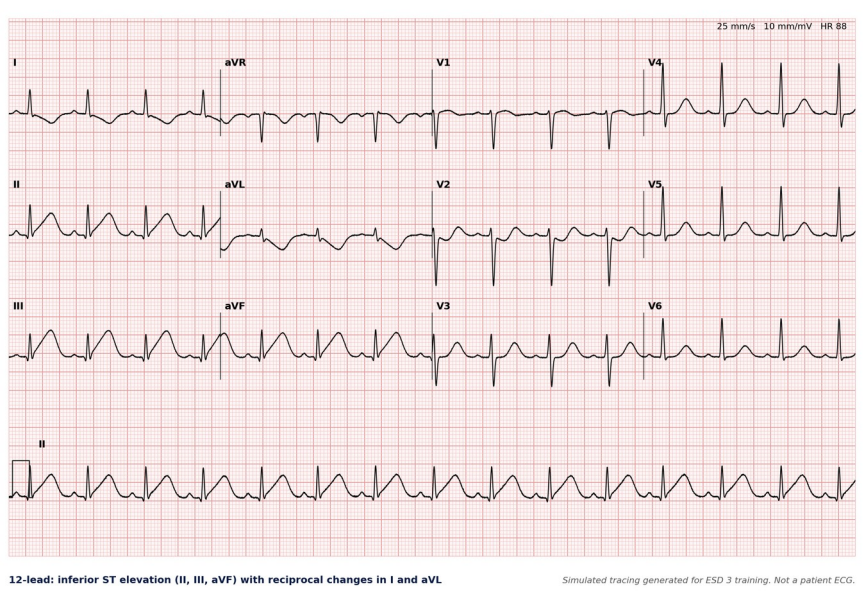
Complaint: Substernal pressure for 45 minutes, radiating to the left arm, nauseated.

Presentation: Diaphoretic, clutching chest. Took 81 mg aspirin at home an hour ago.

Vitals: HR 88, BP 142/90, SpO2 96%, RR 20.

Stage 1: Acquire and transmit a 12-lead.

Stage 2: The 12-lead shows 2 mm ST elevation in II, III, and aVF. What is your next lead and your next action?



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

EXPECTED ANSWER

Stage 1: 12-lead within 5 minutes of patient contact. Skin prep, limb leads on the limbs, V1 and V2 at the fourth intercostal space either side of the sternum, V4 at the fifth intercostal space midclavicular, V3 between V2 and V4, V5 and V6 at the anterior and midaxillary lines level with V4. Acquire, check for artifact, transmit to the receiving facility. Aspirin to a total of 324 mg (he took 81 mg, give the balance to reach 324 mg unless the full 324 mg was taken within the last hour). Oxygen only if SpO2 is below 94%.

Stage 2: Inferior STEMI: V4R is required (move V4 to the right fifth intercostal space midclavicular, relabel the tracing). Defibrillation pads on. Nitroglycerin only after the 12-lead and V4R, and withheld if RV involvement or SBP under 100 or MAP under 65. STEMI notification and transmit the new tracing.

Must-haves: Lead placement by landmark, transmit confirmed, V4R on inferior elevation, pads on.

Common misses: Nitro before the 12-lead. Skipping V4R. Placing V1 and V2 too high.

Trainer cues: Ask where V4 goes before they place it. On stage 2, ask which lead comes next.

Wrap-up: PCG 3.7 Acute Coronary Syndrome; PCG 8.1 12-Lead ECG Interpretation

ALS 25 | Zenix | 12-lead artifact troubleshooting

Patient: 45 F, 5 ft 5 in, 68 kg

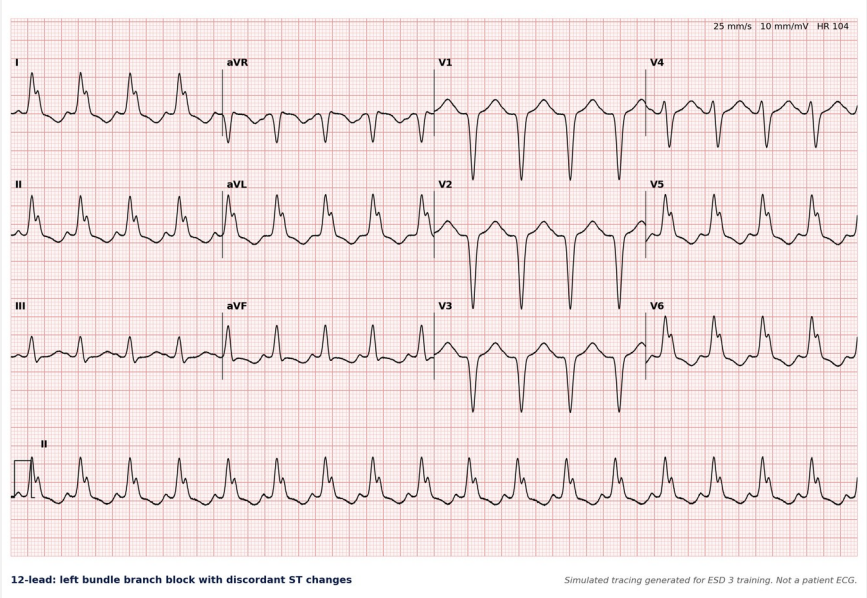
Complaint: Epigastric pain and sweating for an hour. Cold and shivering in an unheated house.

Presentation: Anxious, shivering, wet skin.

Vitals: HR 104, BP 130/82, SpO2 97%, RR 22.

Stage 1: Get a 12-lead. The first acquisition is unreadable from baseline wander and muscle tremor (trainer states this).

Stage 2: Clean tracing now shows LBBB with ST elevation in V1 through V3. Is this a STEMI activation?



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

EXPECTED ANSWER

Stage 1: Fix the source, not the filter. Dry the skin, shave or abrade where needed, fresh electrodes, limb leads on the limbs away from large muscles, warm and reassure the patient, ask her to relax her arms and hold still, wait for the baseline to settle, reacquire. Check the cable connections at the monitor.

Stage 2: LBBB is a STEMI confuser under PCG 3.7. Anterior elevation with LBBB does not meet criteria on its own; an inferior STEMI may be called with LBBB present. Transmit the tracing, treat as ACS, aspirin 324 mg, serial 12-leads, and let the receiving physician make the activation call.

Must-haves: Skin prep and patient comfort before reacquisition. Names LBBB as a confuser.

Common misses: Turning on more filtering and reading through the noise. Calling a STEMI through LBBB.

Trainer cues: Say 'the baseline is all over the place' and let them work it.

Wrap-up: PCG 8.1 12-Lead ECG Interpretation; PCG 3.7 Acute Coronary Syndrome

ALS 26 | Zenix | Syncope, normal 12-lead, serial tracings

Patient: 30 M, 6 ft 0 in, 80 kg

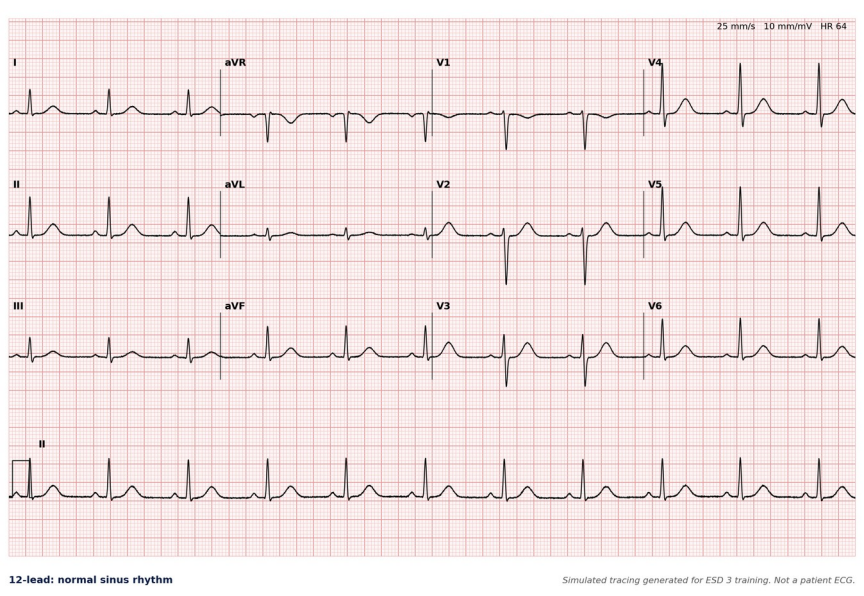
Complaint: Passed out during a run, woke up in under a minute.

Presentation: Now alert and embarrassed, wants to refuse.

Vitals: HR 64, BP 118/74, SpO2 99%, RR 14, glucose 88.

Stage 1: Acquire a 12-lead and tell me what you are looking for.

Stage 2: The 12-lead is normal. He still wants to refuse. Your partner says 'we did the 12-lead, he is fine.' What else does the monitor owe this patient before that conversation?



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

EXPECTED ANSWER

Stage 1: 12-lead within 5 minutes. Look for ST changes, intervals (long QT, short PR with delta wave), Brugada pattern in V1 and V2, hypertrophy, and rhythm on a printed strip. Transmit if anything is abnormal.

Stage 2: A single normal tracing does not clear exertional syncope. Continuous 3/4-lead monitoring, a repeat 12-lead before any refusal, a printed strip for the chart, orthostatic vitals. Exertional syncope in a young adult is high risk; the refusal conversation follows PCG 1.8 with a P-3 or OLMC consult if he still declines.

Must-haves: Names at least three things to look for. Repeat 12-lead before refusal.

Common misses: One tracing and done. No printed strip.

Trainer cues: Play the partner. Push the 'he is fine' line once.

Wrap-up: PCG 8.1 12-Lead ECG Interpretation; PCG 8.2 3/4-Lead ECG Interpretation; PCG 1.8 Consent and Refusal

ALS 27 | Zenix | Capnography after iGel placement

Patient: 63 F, 5 ft 3 in, 72 kg

Complaint: Cardiac arrest, iGel placed by the EMT, compressions ongoing.

Presentation: PEA on the monitor. iGel size 4 in place.

Vitals: Pulseless.

Stage 1: Set up EtCO2 on the Zenix and tell me what number and waveform you expect.

Stage 2: Waveform drops to zero on the next ventilation. Go.

EXPECTED ANSWER

Stage 1: In-line adapter between the iGel and the BVM, cable to the Zenix CO2 port, confirm the waveform on the screen and set EtCO2 to display with the trend. With good compressions expect a square waveform and a value above 10; a sustained rise above 40 suggests ROSC. Document the value and waveform, keep it in place for the whole resuscitation.

Stage 2: Sudden drop to zero: airway problem until proven otherwise (PCG 8.8). Check the iGel for displacement, kink, or obstruction; check the adapter and cable; reseat or replace the airway if needed. Rule out an analyzer fault only after the airway is confirmed.

Must-haves: Adapter placed at the airway, not at the bag. Recognizes zero as an airway emergency.

Common misses: Treating a zero as a monitor glitch. Nasal cannula sampling on a supraglottic airway.

Trainer cues: Disconnect the adapter yourself on stage 2 and see who notices first.

Wrap-up: PCG 8.8 Capnography / Capnometry Monitoring; PCG 8.37 Supraglottic Airway Insertion - iGel; PCG 3.1 Cardiac Arrest (Non-Traumatic)

ALS 28 | Zenix | Post-ROSC monitoring bundle

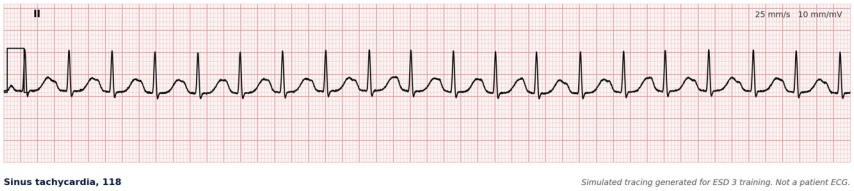
Patient: 67 M, 5 ft 10 in, 94 kg

Complaint: ROSC two minutes ago after VF arrest, three shocks, epinephrine once, amiodarone 300 mg.

Presentation: Sinus tachycardia, weak radial pulse, iGel in place, EtCO2 jumped to 48.

Vitals: HR 118, BP 84/50, SpO2 93%, EtCO2 48.

Stage 1: Set the Zenix up for the transport. Everything the monitor should be doing, say it as you do it.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: NIBP reads 68/40 on the next cycle. What is your first check and your drug?

EXPECTED ANSWER

Stage 1: 12-lead as soon as practical (STEMI after ROSC), transmit. Pads stay on. Continuous EtCO2 with alarms. NIBP on an automatic interval of 3 to 5 minutes. SpO2 with the alarm limits set, HR alarm limits set around the current rhythm. Print a strip. Record the time of ROSC.

Stage 2: Confirm the reading: palpate a pulse, check the cuff position and size, repeat NIBP, correlate with the pleth and EtCO2. If real: norepinephrine 0.05 to 0.15 mcg/kg/min to start (94 kg, 16 mcg/mL: 0.1 mcg/kg/min = 9.4 mcg/min = 564 mcg/hr = 35 mL/hr), or push-dose epinephrine 5 to 20 mcg every 2 to 3 minutes until the infusion is up. Consider the cardiac arrest epinephrine infusion titrated to effect if it is already running.

Must-haves: 12-lead after ROSC. NIBP interval set. Alarm limits touched. Pulse check before treating a cuff number.

Common misses: Removing the pads. Leaving NIBP on manual. Treating the first low cuff reading without a pulse check.

Trainer cues: Ask what the NIBP interval is set to. If they cannot answer, they did not set it.

Wrap-up: PCG 3.1 Cardiac Arrest (Non-Traumatic); PCG 3.7 Acute Coronary Syndrome; PCG 3.10.1 Cardiogenic Shock; PCG 7.21 Vasopressors

ALS 29 | Zenix | LTOWB, blunt trauma, score the patient

Patient: 44 M, 5 ft 10 in, 90 kg

Complaint: Restrained driver, T-bone at 50 mph, prolonged extrication. Injury 40 minutes ago.

Presentation: Pale, anxious, abdomen rigid, pelvis unstable on gentle compression. Supervisor unit with blood is 4 minutes out.

Vitals: HR 132 sustained, BP 84/60, SpO2 95%, RR 26, EtCO2 22, GCS 14.

Stage 1: Run the Adult Blood Product Inclusion Criteria out loud on the Zenix numbers. Does he get blood, and what do you set up before the bag arrives?

Stage 2: First unit is in. Vitals now HR 118, BP 98/66, EtCO2 29. What comes next, and what do you record?

EXPECTED ANSWER

Stage 1: Score: SBP 84 (90 or under, +1). Pulse pressure 24 (45 or more, 0). HR 132 (125 or more, +1). Shock index 132/84 = 1.57 (1 or more, +1). EtCO2 22 (25 or under, +1). Total 4. Blunt trauma needs 2 to 5: meets criteria. LTOWB 1 unit IV/IO, P-2 credential. Before the bag: large-bore access above the diaphragm (humeral IO or antecubital), blood tubing primed with normal saline (never LR), medication cross-check, pelvic binder, TXA 2 g (injury under 3 hours), keep him warm. Record the baseline vitals and temperature.

Stage 2: After the first unit: calcium gluconate 100 mg/kg to a max of 3 g (3 g for 90 kg) over 10 minutes in a pulsatile patient, diluted in 100 mL. Reassess against the same criteria; repeat LTOWB PRN to sustain the improvement. Vitals and temperature at start, 15 minutes, 30 minutes, and the end of each unit. Watch for fever, chills, low back pain, urticaria. No medications through the blood line. Trauma Red, Level I or II.

Must-haves: All five criteria scored with numbers. Names the 2 to 5 threshold for blunt. Saline, not LR. Calcium after the first unit. Vitals schedule.

Common misses: Skipping the score and 'just giving blood.' Priming with LR. Forgetting calcium. Pushing TXA through the blood line.

Trainer cues: Have the criteria card in hand. Ask for each score item by name if they skip one.

Wrap-up: PCG 3.10.6 Blood Product Administration; PCG 9.30 Low-Titer Whole Blood (LTOWB); Adult Blood Product Inclusion Criteria; PCG 3.10.2 Hemorrhagic Shock; PCG 1.4 General Management of Trauma Emergencies

ALS 30 | Zenix | LTOWB, penetrating trauma, score of one

Patient: 27 F, 5 ft 5 in, 62 kg

Complaint: Single stab wound to the left upper abdomen 15 minutes ago. Bleeding controlled with a pressure dressing.

Presentation: Alert, pale, cool hands, thirsty. Supervisor unit with blood on scene.

Vitals: HR 118, BP 96/70, SpO2 97%, RR 24, EtCO2 30.

Stage 1: Score her. Does she meet criteria? Would the same numbers meet criteria if this were a fall from a ladder?

Stage 2: Ten minutes into the unit: chills, temp 101.2 F, low back pain. Go.

EXPECTED ANSWER

Stage 1: Score: SBP 96 (0). Pulse pressure 26 (0). HR 118 (0). Shock index 118/96 = 1.23 (+1). EtCO2 30 (0). Total 1. Penetrating trauma needs only 1: meets criteria. The same score of 1 in blunt trauma, GI bleeding, or obstetric hemorrhage does not meet criteria (2 to 5 required). LTOWB 1 unit, P-2, saline-primed blood tubing, cross-check, TXA 2 g. Female of childbearing potential: the PCG supports RhD-positive product in an emergent setting; document it. Trauma Red (penetrating torso), Level I or II.

Stage 2: Transfusion reaction. Stop the blood, keep the bag and tubing, start normal saline through a fresh line, treat per PCG 5.1 (Allergic Reaction / Anaphylaxis) as the symptoms dictate, notify the receiving facility, document the time and the signs. Reassess the inclusion criteria; a second unit is an OLMC conversation now.

Must-haves: Knows the penetrating threshold is 1. States the blunt contrast without being asked twice. Stops the unit and saves the bag on reaction signs.

Common misses: Withholding blood because the score 'is only 1.' Discarding the bag. Running the reaction through the same line.

Trainer cues: Ask the ladder question and wait. On stage 2, give one sign at a time.

Wrap-up: PCG 3.10.6 Blood Product Administration; PCG 9.30 Low-Titer Whole Blood (LTOWB); Adult Blood Product Inclusion Criteria; PCG 5.1 Allergic Reaction / Anaphylaxis; PCG 7.18 Trauma Alert Criteria

Sapphire IV pump

ALS 31 | Sapphire | Norepinephrine, septic shock

Patient: 76 M, 5 ft 8 in, 80 kg

Complaint: Urosepsis, still hypotensive after 30 mL/kg of fluid.

Presentation: Warm, flushed, confused.

Vitals: HR 118, BP 78/40 (MAP 53), SpO2 95%, Temp 39.1 C.

Stage 1: Mix and start norepinephrine at 0.1 mcg/kg/min.

Stage 2: Five minutes later MAP is 58. Titrate.

EXPECTED ANSWER

Stage 1: Displacement: withdraw 4 mL from a 250 mL NaCl bag, add 4 mg/4 mL norepinephrine, 16 mcg/mL, VTBI 250 mL. Dose 0.1 mcg/kg/min x 80 kg = 8 mcg/min = 480 mcg/hr. 480 / 16 = 30 mL/hr. General Medication Infusion workflow: enter concentration 16 mcg/mL, weight 80 kg, dose 0.1 mcg/kg/min, confirm the pump displays 30 mL/hr. Label the bag and line. Dedicated line, no other medications mixed.

Stage 2: Titrate every 5 minutes within 0.05 to 0.3 mcg/kg/min. Step to 0.15 mcg/kg/min = 12 mcg/min = 720 mcg/hr = 45 mL/hr. Recheck MAP in 5 minutes. Watch the IV site for extravasation (PCG 7.20).

Must-haves: Bag volume held at 250 mL. mL/hr stated. Five-minute titration interval. Site checked.

Common misses: Adding 4 mL without withdrawing first (concentration drifts). Titrating every minute. Piggybacking on a line with other drugs.

Trainer cues: Ask for the mL/hr before they touch the pump, then have them program it and compare.

Wrap-up: PCG 3.10.5 Septic Shock; PCG 7.21 Vasopressors; PCG 9.35 Norepinephrine (Levophed); PCG 7.20 Vasopressor Extravasation

ALS 32 | Sapphire | Norepinephrine ceiling

Patient: 52 F, 5 ft 6 in, 110 kg

Complaint: Cardiogenic shock after an anterior STEMI, on norepinephrine from the sending facility.

Presentation: Cool, mottled, drowsy. Norepinephrine running at 0.3 mcg/kg/min on their pump. You are switching to the Sapphire for transport.

Vitals: HR 124, BP 76/48 (MAP 57), SpO2 92% on NRB.

Stage 1: Program the Sapphire to take over this infusion at the current dose.

Stage 2: MAP falls to 52 on the road. Your partner says 'go up on the Levophed.' What do you do?

EXPECTED ANSWER

Stage 1: 16 mcg/mL bag. 0.3 mcg/kg/min x 110 kg = 33 mcg/min = 1,980 mcg/hr. 1,980 / 16 = 124 mL/hr. Program: concentration 16 mcg/mL, weight 110 kg, dose 0.3 mcg/kg/min, confirm 124 mL/hr. Note the 250 mL bag lasts about 2 hours at this rate; bring a second bag.

Stage 2: The PCG range tops out at 0.3 mcg/kg/min. She is at the ceiling. Do not exceed it. Add a second agent: epinephrine infusion 0.05 to 0.15 mcg/kg/min to start (4 mcg/mL: 0.05 x 110 = 5.5 mcg/min = 330 mcg/hr = 83 mL/hr), or push-dose epinephrine 5 to 20 mcg every 2 to 3 minutes while it is mixed. P-2 credential for both. Consider OLMC.

Must-haves: States the ceiling out loud. Second pressor instead of exceeding the range. Bag duration considered.

Common misses: Programming 0.4 mcg/kg/min. Not noticing the bag will run out mid-transport.

Trainer cues: Play the partner and push once for 'a little more.' Accept the answer only when they name the max.

Wrap-up: PCG 7.21 Vasopressors; PCG 3.10.1 Cardiogenic Shock; PCG 9.35 Norepinephrine (Levophed); PCG 9.17 Epinephrine Infusion

ALS 33 | Sapphire | Amiodarone maintenance after conversion

Patient: 66 M, 5 ft 11 in, 85 kg

Complaint: Stable wide complex tachycardia converted after 150 mg amiodarone over 10 minutes.

Presentation: Sinus rhythm at 92, comfortable. Interfacility transport time 55 minutes.

Vitals: HR 92, BP 124/78, SpO2 97%.

Stage 1: Set up the amiodarone maintenance infusion.

Stage 2: The receiving hospital calls and asks what rate the patient will arrive on and how long the bag will last. Answer them.

EXPECTED ANSWER

Stage 1: Displacement into 100 mL D5W: withdraw 3 mL, add 150 mg/3 mL, 1.5 mg/mL, VTBI 100 mL. Dose 1 mg/min = 60 mg/hr. 60 / 1.5 = 40 mL/hr. Program concentration 1.5 mg/mL, dose 1 mg/min (not weight based), confirm 40 mL/hr.

Stage 2: 40 mL/hr, 100 mL bag, about 2.5 hours. Dose drops to 0.5 mg/min (20 mL/hr) after the first 6 hours of maintenance, which will be the hospital's change to make. D5W, not saline, for amiodarone.

Must-haves: D5W. Non-weight-based entry. mL/hr and bag duration stated.

Common misses: Mixing in NaCl. Entering a weight and a mg/kg/min dose. Confusing the loading dose with the drip.

Trainer cues: Hand them a 250 mL saline bag and see whether they take it.

Wrap-up: PCG 3.5 Dysrhythmia (Stable, Symptomatic Wide Complex Tachycardia); PCG 9.5 Amiodarone (Cordarone)

ALS 34 | Sapphire | Ketamine post-intubation infusion

Patient: 41 M, 6 ft 2 in, 90 kg

Complaint: Intubated after a house fire, on the Z Vent. Ketamine bolus given 15 minutes ago, now moving and fighting the tube.

Presentation: RASS +2. Vent high pressure alarms with movement.

Vitals: HR 122, BP 148/90, SpO2 97%, EtCO2 38.

Stage 1: Start a ketamine infusion at 1 mg/kg/hr.

Stage 2: Twenty minutes in, RASS is still +1. Titrate, and say what the top of the range is in mL/hr for this patient.

EXPECTED ANSWER

Stage 1: Displacement into 250 mL NaCl: withdraw 5 mL, add 500 mg/5 mL, 2 mg/mL, VTBI 250 mL. 1 mg/kg/hr x 90 kg = 90 mg/hr. 90 / 2 = 45 mL/hr. Program concentration 2 mg/mL, weight 90 kg, dose 1 mg/kg/hr, confirm 45 mL/hr. RASS documented. Fentanyl 1 to 2 mcg/kg for analgesia alongside.

Stage 2: Titrate to effect within 1 to 4 mg/kg/hr. Step to 2 mg/kg/hr = 180 mg/hr = 90 mL/hr. Maximum 4 mg/kg/hr = 360 mg/hr = 180 mL/hr. Reassess RASS after each change. Bag lasts under 3 hours at the ceiling; note the volume.

Must-haves: mg/kg/hr entered as an hourly dose, not per minute. RASS before and after. Analgesia addressed.

Common misses: Entering mg/kg/min and delivering 60 times the dose. No fentanyl. Reaching for a paralytic.

Trainer cues: Ask what the pump will do if they pick mcg/kg/min by mistake.

Wrap-up: PCG 2.5 Post-Intubation Care; PCG 9.24 Ketamine (Ketalar); PCG 7.13 Richmond Agitation-Sedation Scale (RASS)

ALS 35 | Sapphire | Magnesium for polymorphic VT

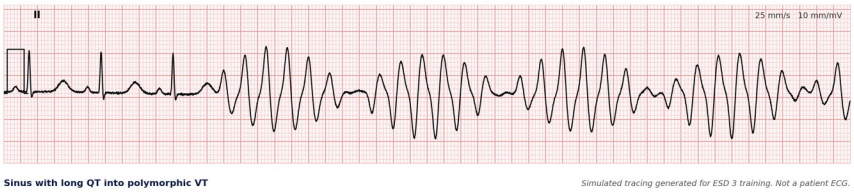
Patient: 58 F, 5 ft 4 in, 64 kg

Complaint: Syncope with runs of polymorphic VT on the monitor, now in sinus with a long QT.

Presentation: Awake, anxious, radial pulse present. Methadone on her medication list.

Vitals: HR 78, BP 112/70, SpO2 98%.

Stage 1: Give magnesium on the pump.



Simulated tracing generated for ESD 3 training, not a patient ECG. Replace with a licensed tracing when available.

Stage 2: Halfway through the bag her BP is 84/50 and she feels flushed. What do you do?

EXPECTED ANSWER

Stage 1: 2 g magnesium sulfate in 100 mL D5W (20 mg/mL), VTBI 100 mL, over 10 minutes. 100 mL / 10 min = 600 mL/hr. Program as a volume over time or a rate of 600 mL/hr with VTBI 100. Pads on, continuous monitoring.

Stage 2: Slow or pause the infusion, reassess BP and rhythm, fluid bolus if needed. Flushing and hypotension are rate-related effects. Watch for loss of deep tendon reflexes and respiratory depression (PCG 5.13.8 Magnesium Toxicity). Calcium gluconate is the reversal agent if toxicity develops.

Must-haves: VTBI 100 with a 600 mL/hr rate, or an equivalent volume-over-time entry. Pads on before the drug.

Common misses: Running 2 g as a push. Forgetting to stop the pump at 100 mL. No pads.

Trainer cues: Ask how the pump will know when to stop.

Wrap-up: PCG 3.5 Dysrhythmia (Stable, Symptomatic Wide Complex Tachycardia); PCG 9.31 Magnesium Sulfate; PCG 5.13.8 Magnesium Toxicity

ALS 36 | Sapphire | Diltiazem infusion after two boluses

Patient: 70 M, 5 ft 9 in, 82 kg

Complaint: AF with RVR, rate controlled to 118 after diltiazem 0.25 mg/kg then 0.35 mg/kg. P-3 consulted and the infusion is approved.

Presentation: Alert, mild dyspnea, palpitations improving.

Vitals: HR 118, BP 128/80, SpO2 96%.

Stage 1: Start the diltiazem infusion.

Stage 2: Fifteen minutes later HR is 122. Titrate, and say when you stop going up.

EXPECTED ANSWER

Stage 1: Diltiazem 5 mg/hr. District mix: diltiazem into a 250 mL NaCl bag by displacement (withdraw the drug volume first, VTBI stays 250 mL). Concentration = mg added / 250 mL; label the bag. With 125 mg (five 25 mg/5 mL vials) the bag is 0.5 mg/mL and 5 mg/hr = 10 mL/hr. Program the concentration as mixed, dose 5 mg/hr (not weight based), confirm the mL/hr. Continuous monitoring, NIBP every 5 minutes. Infusion allowed only after two boluses and P-3 consult.

Stage 2: Titrate by 2.5 mg/hr every 15 minutes to a HR under 110. Step to 7.5 mg/hr (15 mL/hr at 0.5 mg/mL). Maximum 15 mg/hr (30 mL/hr). Stop titrating at 15 mg/hr or when SBP falls; hold for hypotension. Not indicated in pediatrics.

Must-haves: Prerequisites stated (two boluses, P-3). Titration step and interval. Ceiling named.

Common misses: Starting the infusion before the second bolus. Titrating every 5 minutes.

Trainer cues: Ask what had to happen before this infusion was allowed.

Wrap-up: PCG 3.4 Dysrhythmia (Stable, Symptomatic Narrow Complex Tachycardia)

Note: Diltiazem is mixed in a 250 mL NaCl bag per District practice. The number of vials added (125 mg shown) is pending confirmation.

ALS 37 | Sapphire | Epinephrine infusion in cardiac arrest

Patient: 63 M, 5 ft 10 in, 88 kg

Complaint: Asystolic arrest, 12 minutes of CPR, epinephrine 1 mg given twice. The In-Charge orders the cardiac arrest epinephrine infusion in place of further pushes.

Presentation: Asystole, iGel in place, mechanical CPR running.

Vitals: Pulseless, EtCO2 14.

Stage 1: Mix and run the epinephrine infusion for cardiac arrest.

Stage 2: ROSC at 8 minutes into the infusion, BP 92/58. What happens to the pump?

EXPECTED ANSWER

Stage 1: 1 mg/1 mL of epinephrine 1:1,000 into 250 mL NaCl by displacement, 4 mcg/mL, VTBI 250 mL. Dose 40 mcg/min = 2,400 mcg/hr. 2,400 / 4 = 600 mL/hr. Program concentration 4 mcg/mL, dose 40 mcg/min (not weight based), confirm 600 mL/hr. The bag lasts 25 minutes. Adults only.

Stage 2: Do not leave it at 40 mcg/min with a pulse. Titrate to effect as a vasopressor in the range 0.05 to 0.3 mcg/kg/min: 0.1 mcg/kg/min x 88 kg = 8.8 mcg/min = 528 mcg/hr = 132 mL/hr. Reassess every 5 minutes, add norepinephrine if needed. If the bag finishes with no ROSC, that is the trigger to consider termination of resuscitation when the other criteria are met.

Must-haves: 600 mL/hr stated. Knows the bag is a 25-minute clock. Titrates down at ROSC.

Common misses: Weight-based entry for the arrest dose. Running the arrest rate into a perfusing patient. Using 1:10,000 to mix.

Trainer cues: Announce ROSC and watch whether anyone looks at the pump.

Wrap-up: PCG 3.1 Cardiac Arrest (Non-Traumatic); PCG 9.17 Epinephrine Infusion; PCG 1.7 Withholding CPR and Termination of Resuscitation