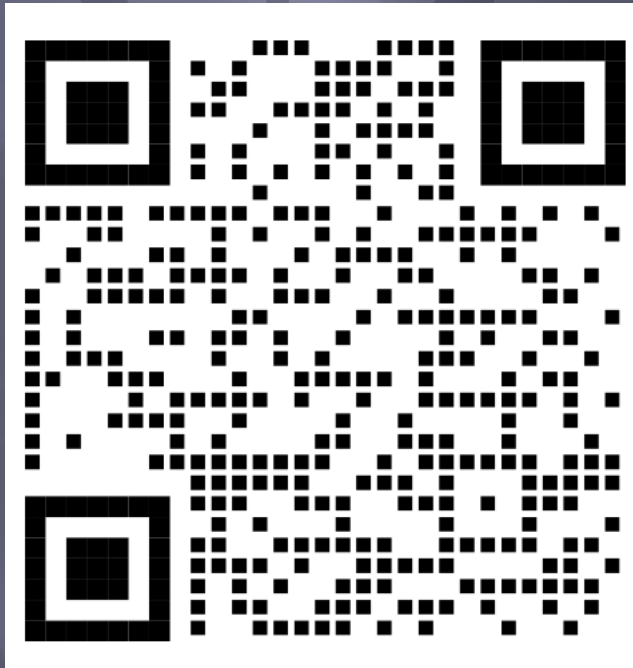
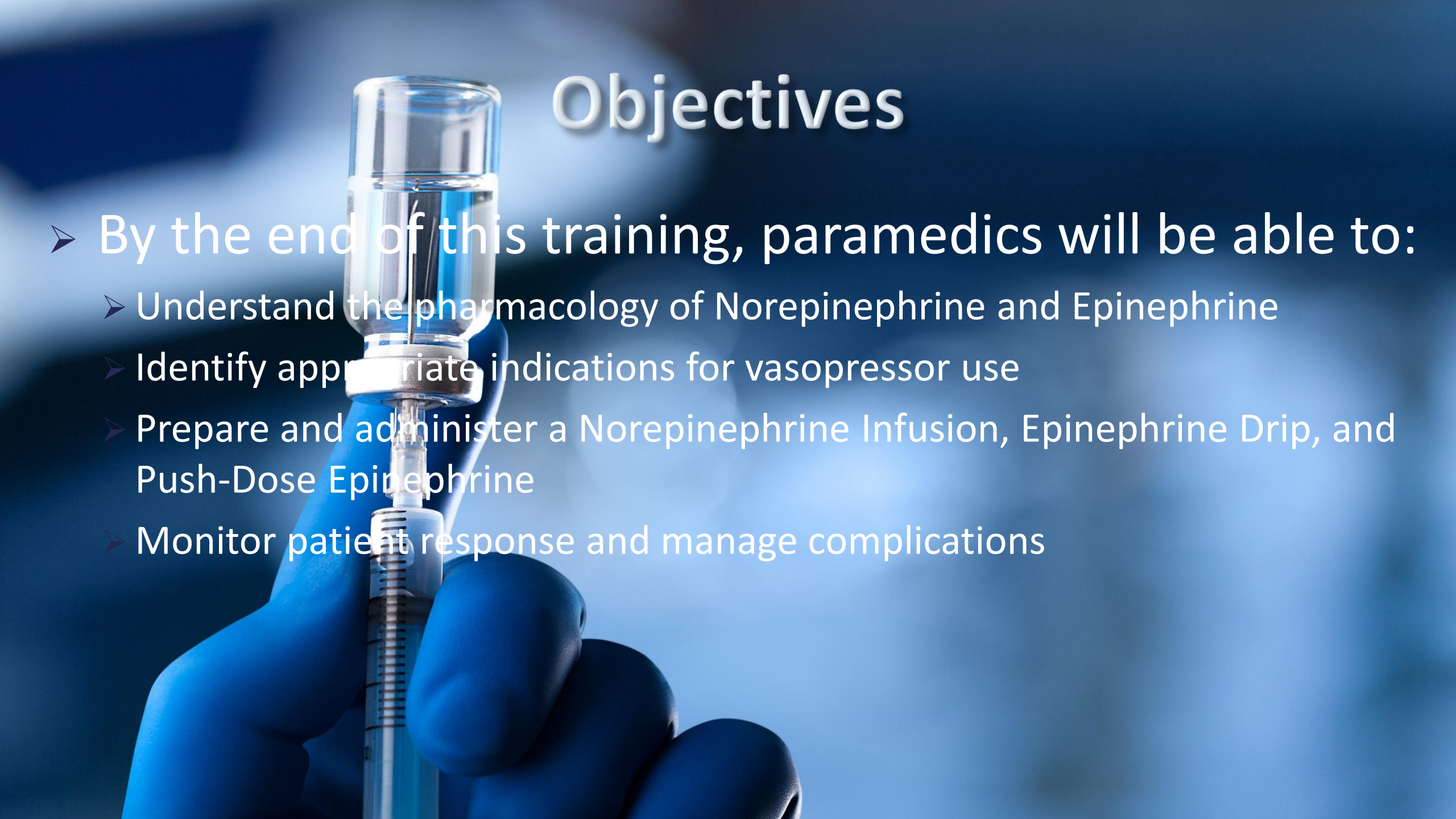


VASOPRESSOR USE IN HYPOTENSION

PARAMEDIC TRAINING MODULE





Objectives

- By the end of this training, paramedics will be able to:
 - Understand the pharmacology of Norepinephrine and Epinephrine
 - Identify appropriate indications for vasopressor use
 - Prepare and administer a Norepinephrine Infusion, Epinephrine Drip, and Push-Dose Epinephrine
 - Monitor patient response and manage complications

Background: Hypotension in the Field

- Hypotension is defined as a Systolic Blood Pressure (SBP) < 90mmHg or Mean Arterial Pressure (MAP) < 65mmHg.
 - MAP Refresher (systolic + (2xDiastolic)) / 3= MAP.....
 - BP 94/30
 - (94+60)=154 divided by 3= MAP of 51
- Potential Causes:
 - Shock (Distributive, Cardiogenic, Hypovolemic)
 - Post-Resuscitation (ROSC)
 - Severe Bradycardia
 - Sepsis or Anaphylaxis
 - Medications given or taken prior to arrival of EMS

Goals of Vasopressor Therapy

- Following fluid bolus may consider vasopressors
- Maintain adequate MAP for perfusion
- Stabilize the patient for transport to definitive care
- Shall not be utilized in traumatic hypotension patients

Norepinephrine (Levophed)

- Norepinephrine is classified as an Alpha 1 and Beta 1 Agonist
 - Alpha 1 Agonist
 - Potent vasoconstrictor, which helps with afterload.
 - Venos constriction, which helps with preload.
 - Beta 1 Agonist
 - Mild increase in heart rate and contractility
- Norepinephrine on target cells by binding to and activating adrenergic receptors.
- Norepinephrine increases heart rate and blood pressure

Norepinephrine Indications:

- Septic Shock (first line vasopressor)
- Neurogenic Shock
- Profound Hypotension Unresponsive to Fluids
- ROSC with persistent hypotension



Norepinephrine Contraindications:

- Low blood pressure due to blood volume deficit
- Peripheral or mesenteric vascular thrombosis



Norepinephrine

DOSING and ADMINISTRATION

- Mixing: 4mg in 250mL D5W or NS = 16mcg/mL
- Initial Rate: 3-10mcg/minute titrated to SBP $\geq$ 90mmHg or
MAP $\geq$ 65mmHg (Max 30mcg/min)
- Titrate every 5 minutes as needed



Norepinephrine Field Considerations:

- IV Pump MUST be utilized
- Central line is preferred, but large bore peripheral line is acceptable for short term use in the field
- Second line for other medications/fluids
- Monitor for extravasation → will cause tissue necrosis

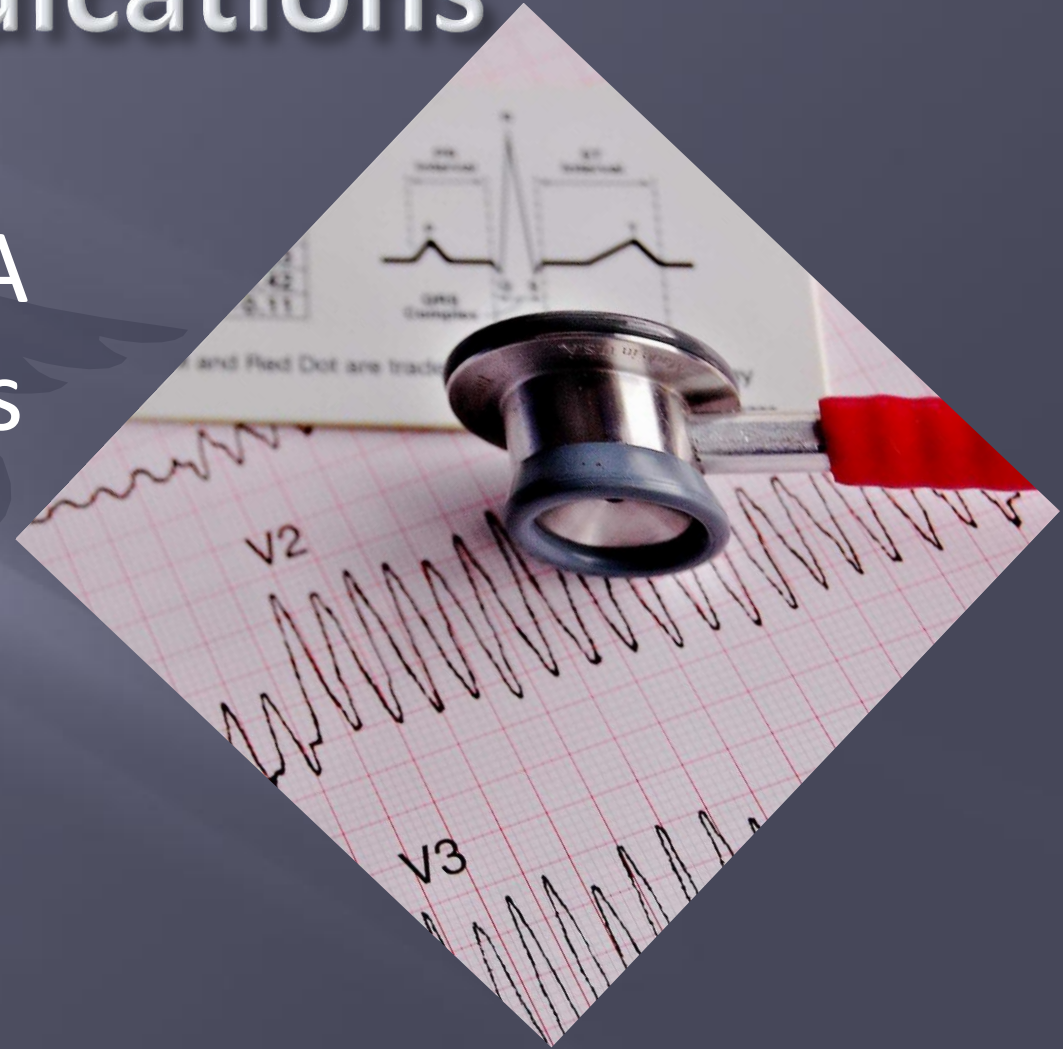
Norepinephrine PRECAUTIONS



- Correct hypovolemia first with an adequate fluid challenge.
- Monitor Blood Pressure, ECG, and Mental Status
- Avoid prolonged use through a peripheral IV

Epinephrine Indications

- VF, Asystole, Pulseless VT, PEA
- Allergic reaction, Anaphylaxis
- Post Intubation Hypotension
- ROSC with unstable BP
- Asthma



Epinephrine Contraindications

- Tachyarrhythmia
- No contraindications in cardiac arrest or anaphylactic shock

Push Dose EPINEPHRINE DOSING and ADMINISTRATION

- 0.5-1mL (5-10 mcg) IV every 5 minutes PRN
 - Take Epinephrine 1:10,000 concentration (1 mg/10 ml) and waste 9 ml of Epinephrine
 - In same syringe draw 9 ml of saline from the patient's IV bag & shake well
 - Mixture now provides 10 ml of Epinephrine at 10mcg/ml (0.01 mg/ml) concentration
 - Label syringe Epi 10mcg/ml
- Titrate to MAP $\geq$ 65mmHg or SBP $\geq$ 90mmHg

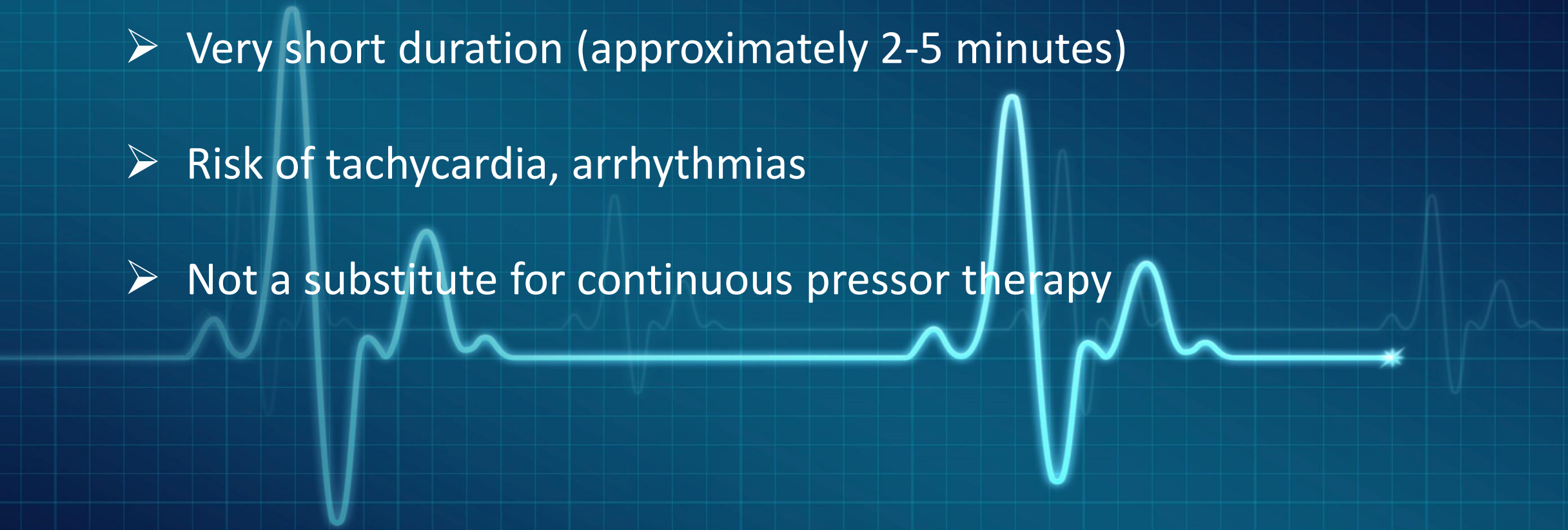
Epinephrine Drip

- Rapid, short-term blood pressure support during critical hypotension or peri-arrest
- Epinephrine is classified as an endogenous catecholamine, sympathomimetic
- Epinephrine contains both alpha and beta-adrenergic properties. Because of these properties, epinephrine will increase↑ heart rate, increase↑ peripheral vascular resistance (PVR), increase↑ myocardial oxygen consumption, increase↑ blood pressure, and increase↑ automaticity of the heart. It is a positive+ chronotropic and inotropic drug, as well as a potent bronchodilator.

Epinephrine Precautions



- Very short duration (approximately 2-5 minutes)
- Risk of tachycardia, arrhythmias
- Not a substitute for continuous pressor therapy



Differences to be aware of with common vasopressors:

- At lower dosing Epinephrine and Dopamine can increase MAP/BO by increasing cardiac output via beta effects (contractility-inotropy/ heart rate- chronotropy)
- At higher dosing, alpha effects begin and leads to vasoconstriction
- Norepinephrine primarily increases mean arterial pressure (MAP) and blood pressure (BP) through potent vasoconstriction via alpha-1 adrenergic receptor activation. Its beta-1 effects, such as increased heart rate and contractility, are minimal at standard doses but become more pronounced at higher concentrations.

Monitoring and Documentation



- Frequent BP checks (every 5 minutes during titration)
- After titrations are complete, check BP every 5 minutes
- Continuous ECG monitoring
- Document dose and any titrations, time, effect, and patient response
- Watch for signs of extravasation, tachyarrhythmias, and worsening perfusion

Dosing Summary Table

Drug	Concentration	Starting Dose	Indication	Route
Norepinephrine	16mcg/mL	3-10 mcg/min	Septic, Neurogenic, Cardiogenic Shock, ROSC	IV Infusion
Epi Drip	4mcg/mL	2-10 mcg/min	Anaphylaxis, Bradycardia, Shock	IV Infusion
Push-Dose Epi	10mcg/mL (diluted)	5-10 mcg every 2-5 minutes	Post ROSC, Peri- Arrest	IV Bolus

Case Application

Slide 1

55 YO , female septic patient

PMHx: None

Dx: Undifferentiated Sepsis

VS: BP 72/42 (MAP 52) HR 120-sinus tach, RR 20, SPO2 97% RA,
Temp 100.5 Oral

En route from Critical Access Hospital (CAH) to tertiary care center
approximately 2 hours away

Complications: Weather, Snowy day in November

Case Application

Slide 2

- Treatment at CAH
 - 2 Liters of Lactated Ringers, 1 gram of Tylenol administered
 - 8mcg/minute **Norepinephrine** via peripheral IV started 10 minutes PTA of EMS @ CAH
 - BP 92/46 (MAP 61), HR 120 upon EMS arrival @ CAH
 - Meropenem 2 grams established and will finish during transport
 - Lab Values:
 - WBC 12,3000/mm
 - Lactate 4.5mmol/L
 - Creatinine 1.8mg/dl
 - BUN 28mg/dL
 - Potassium 4.6mmol/L
 - Chloride 100mmol/L
 - Glucose 180mg/dL
 - CRP 150mg/L
 - Procalcitonin 12ng/mL
 - Room Air ABF- PH 7.28; pCO2 32; HCO3 16, PaO2 75 (taken 1 hour PTA of EMS)

Case Application

Slide 3

- **MD Orders for IFT=** Complete the Meropenum.
Continue to titrate Norepinephrine as needed to keep MAP ≥ 65 , Oxygen to keep SpO2 above 94%, Zofran 4mg PRN for nausea, Lactated Ringers at 100ml/hour

Things to be thinking about

- What would you like to do with this patient? What questions would you ask the patient?
- Could you ask CAH to titrate Norepinephrine dose up while still at their facility to obtain the desired MAP prior to transport?

	1709	Norepinephrine infusion
Nor-Cal EMS Policy & Procedure Manual		Treatment Guidelines
Effective Date: 12/1/2025 (NOT before)		Next Revision: 12/01/2028
Approval: Jeffrey Kepple MD – MEDICAL DIRECTOR		SIGNATURE ON FILE

Purpose

To provide a mechanism for Paramedics to provide Norepinephrine infusions during interfacility transports.

Paramedics will not initiate Norepinephrine infusion on 911 transports.

Policy

Paramedics are authorized to monitor and adjust Norepinephrine infusions during interfacility transports and may initiate an infusion during interfacility transports following consultation with the sending/receiving physician and having an infusion pump available).

Signed transfer order from the transferring physician must provide for maintaining and adjusting infusions during transport.

Prior to transport confirm:

Regulation of the infusion rate will occur utilizing a IV infusion pump, within the parameters as defined by the transferring physician.

Administer Norepinephrine as per physician orders. If no specific written orders, may use guidelines below.

Patient should have a second IV established prior to transport

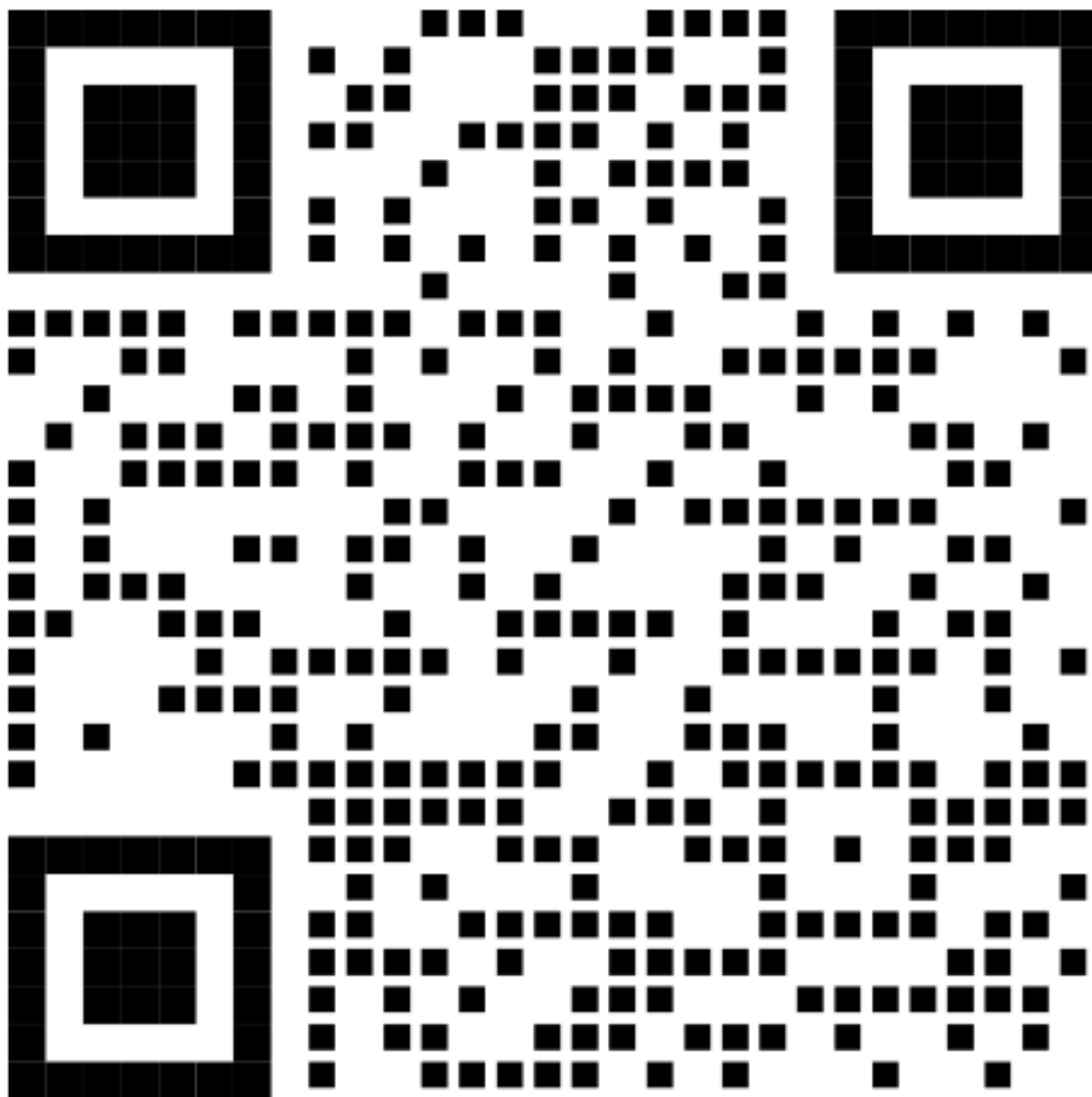
Required during transport:

Continuous ECG, SPo₂, required with vital signs being obtained at a minimum of every 5 minutes (More frequently during titration).

Norepinephrine infusion guidelines (4mg/250ml Concentration preferred)

Standard dosing is 3-20mcg/min (Maximum dose is 30 mcg/min)

May titrate per physician order or as needed (1-7 mcg/min every 5 minutes). In no case shall an adjustment greater than 7/mcg/min every 5 minutes be made.



Final Thoughts

- Vasopressors are not the first line treatment for hypotension. ALWAYS attempt fluid resuscitation first unless contraindicated.
- Push-dose epinephrine is a short-term bridge to a longer-acting infusion of Vasopressor
- Use clinical judgement: Not all hypotension requires pressors (e.g., hypovolemia, tension pneumothorax, tamponade.)
- Know your treatment guidelines; utilize paramedic Protocol Provider application, and Physician contact if any questions or treatment/dosing concerns arise.