16. EPINEPHRINE 1:10,000/1:1,000 (NEW '20)

a) Pharmacology

(1) The administration of epinephrine causes increases in:
  (a) Systemic vascular resistance
  (b) Systemic arterial pressure
  (c) Heart rate (positive chronotropic effect)
  (d) Contractile state (positive inotropic effect)
  (e) Myocardial oxygen requirement
  (f) Cardiac automaticity
  (g) AV conduction (positive dromotropic effect)

(2) Causes bronchial dilation by smooth muscle relaxation

b) Pharmacokinetics

(1) IV administered epinephrine has an extremely rapid onset of action.
(2) Is rapidly inactivated by the liver
(3) Subcutaneous administration of epinephrine results in slower absorption due to local vasoconstriction.
(4) Local massage will hasten absorption.
(5) Topically applied nebulizer within the respiratory tract, epinephrine has vasoconstrictor properties that result in reduction of mucosal and submucosal edema. It also has bronchodilator properties that reduce airway smooth muscle spasms.

c) Indications

(1) Medical cardiac arrest and pediatric traumatic arrest
(2) Moderate to severe allergic reaction/anaphylaxis
(3) IV push epinephrine should be reserved for cardiac arrest patients
(4) Epinephrine infusion (IV/IO) should be reserved for patients in shock refractory to fluid bolus or for patients in anaphylactic shock
(5) Severe asthma
(6) Respiratory stridor (suspected croup)

d) Contraindications

(1) Hypertension
(2) Preexisting tachydysrhythmias with a pulse (ventricular and supraventricular)
(3) Use with pregnant women should be avoided whenever possible
(4) IVP epinephrine (1:1,000) should not be administered to any patient with a pulse

e) Adverse Effects

(1) Tachydysrhythmias (supraventricular and ventricular)
(2) Hypertension
(3) May induce early labor in pregnant women

(4) Headache
(5) Nervousness
(6) Decreased level of consciousness
(7) Rebound edema may occur 20–30 minutes after administration to croup patients.

f) Precautions

(1) Do not mix with sodium bicarbonate as this deactivates epinephrine.
(2) Epinephrine causes a dramatic increase in myocardial oxygen consumption.
(3) Its use in the setting of an acute MI should be restricted to cardiac arrest.

g) Dosage

(1) Cardiac Arrest **(NEW '20)**
  (a) Adult:
    (i) Administer 1 mg (1:10,000) IVP/IO every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
  (b) Pediatric:
    (i) Administer 0.01 mg/kg (0.1 mL/kg) of 1:10,000 IVP/IO every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
    (ii) ET: Administer 0.1 mg/kg of 1:1,000, diluted with 5 mL of LR; repeat every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
  (c) Neonate:
    (i) Administer 0.01 mg/kg (0.1 mL/kg) of 1:10,000 IVP/IO every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses.
    (ii) ET: Administer 0.1 mg/kg of 1:1,000, diluted with 5 mL of LR; repeat every 4 minutes to a maximum of 4 doses for the initial arrest. If arrest recurs following any period of ROSC, administer a maximum of 2 additional doses
(2) Bradycardia
  (a) Adult: Using epinephrine infusion (1 mg epinephrine in 100 mL LR), administer 1 mL/min (60 drops/min) using a 60 drop-set. If systolic blood pressure remains less than 90 mmHg, obtain medical consultation for further dosing. Infusion pump: 2-10 mcg/min.
  (b) Pediatric:
    (i) Administer 0.01 mg/kg (0.1 mL/kg) of the 1:10,000 IVP/IO; repeat every 3–5 minutes
    (ii) ET: 0.1 mg/kg of 1:1,000, diluted with 5 mL of LR; repeat every 3–5 minutes

(c) Neonate:
(i) Administer 0.01 mg/kg (0.1 mL/kg) of 1:10,000 IVP/IO; repeat every 3–5 minutes
(ii) ET: 0.03 mg/kg of 1:10,000, diluted with 1 mL of LR

(3) Allergic Reaction/Anaphylaxis/Asthma
(a) ADULT
For patients who are in extremis with severe hypotension or impending respiratory failure:
(i) Administer epinephrine 0.5 mg every 5 minutes up to a total of 3 doses.
(ii) If patient remains hypotensive or with impending respiratory failure, administer epinephrine infusion per management of shock with epinephrine infusion (below)

(b) PEDIATRIC
(i) Administer epinephrine: 1:1,000 IM
Less than 5 years of age: administer 0.15 mg in 0.15 mL IM
5 years and greater: administer 0.5 mg in 0.5mL IM
(ii) May repeat IM dose every 5 minutes for a total of 3 doses for severe reactions
(iii) Epinephrine infusion (see management of non-traumatic shock with epinephrine infusion below)

(4) Croup
(a) Adult: not indicated
(b) Pediatric
(i) Administer 2.5 mL of epinephrine 1:1,000 via nebulizer.
If patient does not improve, administer a second dose of 2.5 mL of epinephrine 1:1,000 via nebulizer.

ALERT

ALL PATIENTS WHO RECEIVE NEBULIZED EPINEPHRINE MUST BE TRANSPORTED BY AN ALS UNIT.

(5) Cardiogenic Shock
(a) If rales are present, administer fluid bolus, titrate to a systolic blood pressure of 90 mmHg or greater. Maximum single of bolus of 250 mL of LR IV.

(b) Additional fluid requires medical consultation.

(c) Initiate epinephrine infusion
(i) Add 1 mg of epinephrine (either 1:1,000 or 1:10,000) in a 100 mL bag of LR or NS
(ii) Use a Microdrip set (60 drops/mL) for infusion administration
(iii) Adult epinephrine infusion dosage:
(1) Administer infusion through a free-flowing IV, ideally 20 gauge or larger, or by IO
(2) Start infusion at 1 mL/min (60 drops/min) IV/IO
(3) Check blood pressure every 5 minutes. If MAP is less than 65 mmHg or systolic blood pressure is less than 90 mmHg, increase to a maximum rate of 2 mL/min (120 drops/min).

(4) If above blood pressure goals are not met upon reaching maximum rate, obtain online medical consultation.

(6) Hypovolemic or Septic Shock
  (a) If lungs are clear, administer fluid bolus of 20 mL/kg of LR IV. Titrate to a systolic blood pressure of 90 mmHg (or mean arterial pressure of 65 mmHg). Maximum patient dose of 2,000 mL of LR
  (b) If hypotension persists after 2 L of LR are provided, consider additional LR up to a maximum of 30 mL/kg total.
  (c) Initiate epinephrine infusion if systolic blood pressure remains less than 90 mmHg (or mean arterial pressure less than 65 mmHg) after IV fluid bolus of 30 mL/kg LR.

(7) Anaphylactic shock: Initiate epinephrine infusion for patients who are in extremis with severe hypotension or impending respiratory failure, after having administered 3 doses of IM epinephrine. (Refer to Anaphylaxis Protocol.)

(8) Neurogenic shock (suspected spinal cord injury which typically presents with hypotension and bradycardia)
  (a) If lungs are clear, administer fluid bolus of 20 mL/kg of LR IV. Titrate to a systolic blood pressure of 110 mmHg (or mean arterial pressure of 85 mmHg). Maximum patient dose of 2,000 mL of LR.
  (b) Initiate epinephrine infusion if systolic blood pressure remains less than 110 mmHg (or mean arterial pressure less than 85 mmHg).

h) Pediatric epinephrine infusion dosage

(1) The following dosing chart should be used for pediatric patients less than 50 kg (using approved epinephrine infusion and 60 drop set):

Weight range (kg)	Initial epinephrine dose	If goal blood pressure not achieved at 5 min, increase to
LESS than 10 kg	6 drops/min (0.1 mL/min)	12 drops/min (0.2 mL/min)
10-19 kg	12 drops/min (0.2 mL/min)	24 drops/min (0.4 mL/min)
20-29 kg	18 drops/min (0.3 mL/min)	36 drops/min (0.6 mL/min)
30-39 kg	24 drops/min (0.4 mL/min)	48 drops/min (0.8 mL/min)
40-49 kg	30 drops/min (0.5 mL/min)	60 drops/min (1.0 mL/min)

(2) Blood pressure goal:
  (a) For patients 10 years and older (including adults), systolic blood pressure greater than 90 mmHg;
  (b) For patients under 10 years of age, systolic blood pressure greater than 70 + 2x age in years mmHg; OR
  (c) Systolic blood pressure ordered by the pediatric base station.

(3) If above blood pressure goal not met after 10 minutes, obtain online medical consultation.