Epinephrine Administration by the EMT

Pilot Project for the Administration of Epinephrine by Washington EMTs
Tamara Coulter BS, FF/PM and Captain/MSO Steven Engle
North Kitsap Fire & Rescue
Objectives

- Recall the drug name and classification
- Correctly identify the drug and its concentration
- Define and describe the indications and contraindications for the administration of epinephrine
- Explain the routes of administration, dosing regimen, pharmacology, pharmacokinetics, and precautions for this drug
- Accurately locate and describe acceptable sites of administration
- Understand and explain the mechanism of action and effects of epinephrine
- Anticipate possible side effects and adverse reactions
- Precisely and accurately draw the medication and prepare it for administration
Topics

• Aseptic Technique
• Medication Administration Routes
• Medication Package
• Anatomy & Physiology Related to Medication Administration
Six Rights of Drug Administration

• Right Person
• Right Drug
• Right Dose
• Right Time
• Right Route
• Right Documentation
What is epinephrine?

- A synthetic reproduction of the endogenous hormone/neurotransmitter epinephrine
- Functions in “fight or flight” response of the sympathetic branch of the autonomic nervous system
What is epinephrine?
SCFD4 Epi-Kits
Indications for the use of epinephrine by the EMT-B

1:1,000

- Anaphylaxis (Discussion: S/S)
- Anaphylactic shock (Discussion: S/S)
Contraindications to the use of epinephrine by the EMT

**Absolute Contraindications**

- There are no absolute contraindications in the emergency setting

**Relative Contraindications**

- Hypersensitivity to epinephrine preparations
- Glaucoma (narrow-angle)
- Cardiovascular disease
- Use during labor/childbirth
- Cases where vasopressors are contraindicated (e.g., thyrotoxicosis, diabetes, hypertension, toxemia of pregnancy)
- Patients taking monoamine oxidase inhibitors (MAOIs)
Route of administration for the EMT

- Intramuscular sites allow a drug to be injected into the belly of a muscle so that the blood vessels supplying that muscle distribute the medication to its site of action via the bloodstream.
Dosing Regimen for Epinephrine Administration by the EMT

Anaphylaxis and anaphylactic shock

- **Adults** - 0.3mg of 1:1,000 via Intramuscular injection
- **Pediatrics** - 0.01mg/kg of 1:1,000 via Intramuscular injection
Epinephrine Pharmacology

- Exerts both alpha and beta adrenergic activity (alpha constrictor and beta dilation)
- Relaxes smooth muscle in the bronchial tree.
- Antagonizes histamine
- Increases glycogenolysis and raises blood glucose levels
- Raises heart rate, blood pressure (systolic in particular), and myocardial oxygen demand
- Increases myocardial chronotropy, inotropy, dromotropy, irritability, and automaticity.
Pediatric Dosing Regimen for Epinephrine Administration

**Pediatrics - 0.01mg/kg of 1:1,000 via Intramuscular injection**

Using a 1cc syringe, insert the needle into the vial or ampule, draw the plunger back on the syringe until you reach the correct dosage for the weight of the patient.

<table>
<thead>
<tr>
<th>Weight</th>
<th>4 KG</th>
<th>6 KG</th>
<th>8 KG</th>
<th>10 KG</th>
<th>12 KG</th>
<th>15 KG</th>
<th>19 KG</th>
<th>24 KG</th>
<th>30 KG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epinephrine</td>
<td>.04 mg</td>
<td>.06 mg</td>
<td>.08 mg</td>
<td>.1 mg</td>
<td>.12 mg</td>
<td>.15 mg</td>
<td>.19 mg</td>
<td>.24 mg</td>
<td>.3 mg</td>
</tr>
</tbody>
</table>
Epinephrine Pharmacokinetics
Continued

• Approximate onset/duration times –

**IM:** 3-5 min/1-4hrs
**SQ:** 5-10 min/2-6hrs
**Inhaled:** within 5 minutes/1-3hrs

• Crosses the placenta and into breast milk; does not cross the blood-brain barrier
Precautions to consider during epinephrine administration

- **BE CERTAIN** you are administering the correct concentration! It will be 1:1,000, or 1mg/1mL.

- Epinephrine **IS NOT** a substitute for fluid resuscitation in hypovolemic patients!

- May precipitate ACS in those with underlying cardiovascular disease, so be very cautious in older patients.

- Use drug with caution in elderly patients, patients with CV disease, pulmonary edema, hypertension, hyperthyroidism, diabetes, psychoneurotic illness, asthma, prefibrillatory rhythm, or anesthetic cardiac accidents.

- Store epinephrine AWAY from light; leave it in its carton until ready to use. Also keep away from extreme heat and danger of freezing.
Site Selection and Preparation

- Choose the site appropriate for the route and patient ("Intramuscular" is the preferred by Washington State MPD's)
- Prep the site with approved antiseptic by scrubbing vigorously and allowing to dry. DO NOT TOUCH, BLOW ON OR FAN THE INJECTION SITE!
- For intramuscular injection, select the injection site, deltoid, dorsogluteal, vastus lateralis, and rectus femoris muscle
- Align the syringe and needle above the injection site at a 90 degree angle, with the bevel of the needle facing up.

From Mosby's Paramedic Textbook
Drug Administration
Intramuscular Injection

- Insert the hypodermic needle bevel-up under the skin at a 90-degree angle.
- Retract the plunger of the syringe to assure you haven’t inadvertently placed the needle into a blood vessel.
- If there is no ‘flash’, slowly and smoothly depress the syringe’s plunger to inject the medication.
- Remove the needle/syringe and place in a sharps container.
- Place an adhesive bandage over the injection site.
- Complete required documentation: Medication, site, time, bandage application, vitals before/after, and patient response to therapy.
Drug Administration
Intramuscular Injection (Cont.)
Assessment of Patient Response

Document your findings upon assessment of patient condition after treatment:

- This includes appearance, work of breathing, lung sounds, skin signs, vital signs, and changes in ability to speak
- Also document any adverse or idiosyncratic effects
Ongoing Assessment

• Continue to monitor and document the patient’s vital signs and condition for the remainder of your transport

• Record the patient’s vital signs every fifteen minutes if stable and every five minutes if unstable
Review

Epinephrine

• Functions in “fight or flight” response of the sympathetic branch of the autonomic nervous system
Review Continued

Classifications

• Sympathomimetic monamine
• Catecholamine
• Arylalkylamine
• Vasopressor used in shock
Epinephrine Pharmacology

- Exerts both alpha and beta adrenergic activity
- Relaxes smooth muscle in the bronchial tree
- Raises heart rate, blood pressure and myocardial oxygen demand
- Increases myocardial chronotropy, inotropy, dromotropy, irritability and automaticity
Review Continued

Side Effects/Adverse Reactions

- Anxiety, tremors, nausea, vomiting, hypertension, cardiac dysrhythmias, headache, and heart palpitations
- Necrosis at injection site may occur with repeated injections at the same site
- Anginal pain (chest pain) may result from administration in those patients with underlying cardiovascular disease
Review Continued

Absolute Contraindications

There are no absolute contraindications in the emergency setting.
Review Continued

Intramuscular sites allow a drug to be injected into the belly of a muscle so that the blood vessels supplying that muscle distribute the medication to its site of action via the bloodstream.

“Intramuscular” is the preferred by Washington State MPD’s
Dosage

Anaphylaxis and anaphylactic shock

- **Adults** - 0.3mg of 1:1,000 via Intramuscular injection
- **Pediatrics** - 0.01mg/kg of 1:1,000 via Intramuscular injection
ALLERGIC REACTIONS AND ANAPHYLAXIS

MILD: Red and itchy skin; hives; if sting present, localized swelling at sting site; and vital signs within normal limits.

1. Administer O₂.
2. If present, scrape stinger out. Stabilize involved extremity and apply ice.
3. Apply venous tourniquet on involved extremity above injection or sting site, if present.
4. Apply cardiac monitor and establish IV/IO.
5. Administer 25-50 mg of diphenhydramine (Benadryl™), IV/IO.*

MODERATE: Red and itchy skin; hives; swelling of face, lips, tongue, or pharynx; mild to moderate SOB; stridor/wheezing; BP > 70

1. Follow steps 1-4 for mild anaphylaxis.
2. Administer epinephrine at 1:1 000, 0.01 mg/kg IM,† up to a maximum dose of 0.3 mg. Repeat q 5 minutes, as needed.
3. Administer 25-50 mg of Benadryl, IV/IO.*

SEVERE (ANAPHYLAXIS): Red and itchy skin, hives; severe swelling of face, lips, tongue, or pharynx; possible sever SOB; stridor/wheezing; BP < 70

2. Scrape stinger out, if present. Stabilize involved extremity and apply ice.
3. Apply venous tourniquet above injection or sting site, if on an extremity.
4. Apply cardiac monitor.
5. Administer IV of NS, and infuse rapidly if BP < 90.
6. Slowly administer epinephrine at 1:10 000, 0.01 mg/kg IV/IO,† up to a maximum dose of 0.3 mg. Repeat q 5 minutes, as needed.

SECTION 4: MEDICAL PROTOCOLS
7. Administer 50 mg of Benadryl, IV/IO.+

8. If unable to establish IV, administer epinephrine at 1:1 000, 0.01 mg/kg
IM/IO up to 0.3 mg. Repeat q 5 minutes, as needed.

9. If severe SOB and wheezing, consider administering **albuterol**
(Ventolin®) treatment with small volume nebulizer.

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*May administer Benadryl IM, if unable to establish an IV.*

*Usual adult dose is 50 mg.*

*This drug may be administered via the endotracheal tube if IV access cannot be established. ETT dose is double the IV dose.*

**SECTION 4: MEDICAL PROTOCOLS**
PEDIATRIC ALLERGIC REACTIONS AND ANAPHYLAXIS

MILD ALLERGY: Red and itchy skin; hives; if sting present, localized swelling at sting site; and vital signs within normal limits.

1. Administer O₂ at 8-15 LPM by mask or blow-by.
2. If present, scrape stinger out. Stabilize involved extremity and apply ice.
3. Apply venous tourniquet above injection or sting site, if on an extremity.
4. Apply cardiac monitor.
5. Establish IV/IO access.
6. Administer diphenhydramine (Benadryl) at 1 mg/kg IV/IO/IM, up to a maximum dose of 50 mg.

MILD ALLERGY: Red and itchy skin; hives; swelling of face, lips, tongue, or pharynx; mild to moderate SOB; wheezing; BP > 80.

1. Follow steps 1-4 for mild allergy.
2. Administer epinephrine at 1:1000, 0.01 mg/kg IM, up to a maximum dose of 0.3 mg. Repeat q 5 minutes, as needed.
3. Administer Benadryl at 1 mg/kg IV/IO/IM, up to a maximum dose of 50 mg.

ANAPHYLAXIS: Red and itchy skin; hives; severe swelling of face, lips, tongue, or pharynx; possible severe SOB; BP < 70.

1. Follow steps 1-4 for mild allergy.
2. Establish IV/IO access.
3. Administer NS fluid challenge at 20 ml/kg as rapidly as possible.
   Repeat once to achieve minimum BP for age and clinical improvement (capillary refill < 2 seconds; stronger pulses; warmer extremities; improving LOC). Contact receiving physician to consider additional fluid administration.
4. Slowly administer epinephrine at 1:10 000, 0.01 mg/kg IV/IO, up to a maximum dose of 0.3 mg. Repeat q 5 minutes, as needed.

5. Administer Benadryl® at 1 mg/kg IV/IO up to a maximum dose of 50 mg.

6. If unable to establish IV/IO, administer epinephrine at 1:1 000, .01 mg/kg IM up to 0.3 mg. Repeat q 5 minutes, as needed.

7. If severe SOB and wheezing, administer albuterol (Ventolin®) at 2.5 mg in 3 ml NS (3 ml premix) via small volume nebulizer.

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*This drug may be administered via the endotracheal tube, if an IV cannot be established. The ET dose is Epinephrine 1:1 000, 0.1 mg/kg diluted to a total of 3 ml in NS q 3-5 minutes.*
# Epinephrine (Adrenalin) - Adult

**Therapeutic Effects:** A potent alpha and beta stimulant which is diluted 1 mg in 1 ml (1:1000) or 1 mg in 10 ml (1:10000) of saline. It increases vasoconstriction through its alpha properties and electrical activity of the heart through its beta properties.

**Indications:**
1. Ventricular Fibrillation/Pulseless Ventricular Tachycardia
2. Asystole/PEA
3. Asthma
4. Anaphylaxis
   - Moderate
   - Severe
5. Bradycardia or non-traumatic hypotension

**Contraindications:** None in the patient who needs aggressive resuscitation.

**Precautions/Side Effects:** Should be protected from light and should not be infused with alkaline solutions such as sodium bicarbonate since they will deactivate epinephrine. The drug’s actions are of short duration.

**Adult Dosage/Route**

<table>
<thead>
<tr>
<th>Indications</th>
<th>Dosage/Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>1 mg 1:10000 IV/IO* q 3-5 minutes, as needed.</td>
</tr>
<tr>
<td>3, 4a</td>
<td>0.01 mg/kg 1:10000 IM up to 0.3 mg q 5 minutes, as needed.</td>
</tr>
<tr>
<td>4b</td>
<td>0.01 mg/kg 1:10000 IV/IO*, slowly up to 0.3 mg q 5 min. as needed.</td>
</tr>
<tr>
<td></td>
<td>0.01 mg/kg 1:10000 IM up to 0.3 mg q 5 minutes as needed.</td>
</tr>
<tr>
<td>5</td>
<td>A continuous infusion of 2-10 mcg/min.</td>
</tr>
</tbody>
</table>

*May be given ET at double the IV dose.

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**Section 11: Drug Protocols**
**EPINEPHRINE (ADRENALIN)-PEDIATRIC**

**THERAPEUTIC EFFECTS**
A potent alpha and beta stimulant which is diluted 1 mg in 1 ml (1:1,000) or 1 mg in 10 ml (1:10,000) of saline. It increases vasoconstriction through its alpha properties and electrical activity of the heart through its beta properties.

**INDICATIONS**
1. Bradycardia or non-traumatic hypotension
2. Ventricular Fibrillation/Pulseless Ventricular Tachycardia
3. Asystole/PEA
4. Anaphylaxis
   ✓ Moderate
   ✓ Severe

**CONTRAINDICATIONS**
None in the patient who needs aggressive resuscitation.

**PRECAUTIONS/SIDE EFFECTS**
Should be protected from light and should not be infused with alkaline solutions such as sodium bicarbonate since they will deactivate epinephrine. The drug's actions are of short duration.

**PEDIATRIC DOSAGE/ROUTE**

<table>
<thead>
<tr>
<th>Indication</th>
<th>1</th>
<th>2,3</th>
<th>4a</th>
<th>4b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indication 1</strong></td>
<td>A continuous infusion of 0.1 to 1 mcg/kg/min</td>
<td>0.01 mg/kg 1:10,000 IV/IO</td>
<td>0.01 mg/kg 1:1000 IM</td>
<td>0.01 mg/kg 1:10,000 IV/IO</td>
</tr>
<tr>
<td><strong>Indication 2,3</strong></td>
<td></td>
<td>Max dose 1 mg q 3-5 min. If no access, 0.1 mg/kg 1:1000 diluted in 3 ml NS ET q 3-5 min</td>
<td>Up to 0.3 mg q 5 minutes, as required.</td>
<td>Up to 0.3 mg q 5 minutes, as required.</td>
</tr>
</tbody>
</table>
Test Question
EMT Administration of Epi for Anaphylaxis
Complete test and turn in to your Battalion EMS Lt

1. Epinephrine functions in “fight or flight” response of the sympathetic branch of the autonomic nervous system?
   True or False

2. Epinephrine raises heart rate, blood pressure and lowers myocardial oxygen demand?
   True or False

3. Anxiety, tremors, nausea, vomiting, hypertension, cardiac dysrhythmias, headache, and heart palpitations are all side effect of epinephrine?
   True or False

4. The preferred method of administering Epinephrine by EMT’s for anaphylaxis is?
   A. IV
   B. IO
   C. SQ
   D. IM

5. Dosage for Epinephrine administration by the EMT for an adult having an anaphylactic reaction is _______________ and for a pediatric patient is _______________?
Any questions?

Contact your Battalion EMS Lt