Anaphylaxis & IM Epinephrine Administration by the WI EMR

Advanced Skill

Requires Additional Training and Approval

Learning Objectives:

With successful completion of this training module, the EMR will be able to describe and/or correctly demonstrate:

- Expected baseline education for EMR:
  - Signs and Symptoms of Anaphylaxis
  - Epinephrine identification as a medication
  - The mechanism of action and effects of Epinephrine
- Advanced skills MUST be recorded in WARDS report

- **Steps in Aseptic Technique**
- **Preparation of Epinephrine for IM administration**
- **Intramuscular administration of Epinephrine**

Resources

- ✓ WI EMS Allergy/Anaphylaxis treatment guideline or local protocol
  - Adult and Pediatric
- ✓ Skills & Procedures Manual IM Injection Section
- ✓ IM Injection video from WCTC; CD copy (edited) or internet access
  - https://www.youtube.com/watch?v=0SIG0N65yNY
  - Provided by WCTC as open EMS education
- ✓ Epinephrine Check & Inject reference sheets as visual prompts
- ✓ Skills testing check sheet or similar check sheet from local training program
- ✓ EMR Advanced Skills form to update Op Plan

The earliest reported case of anaphylaxis can be traced to approximately 3300 BC, when the Egyptian King Menses died from a hymenoptera sting.

Hymenoptera are insects such as sawflies, wasps, bees, and ants

Anaphylaxis

Rosen's Emergency Medicine, Ed 2, Chapter 119

- A*naphylaxis* is derived from Greek
  - *Ana* = against
  - *Phylax* = guard or protect
  - meaning "against protection"

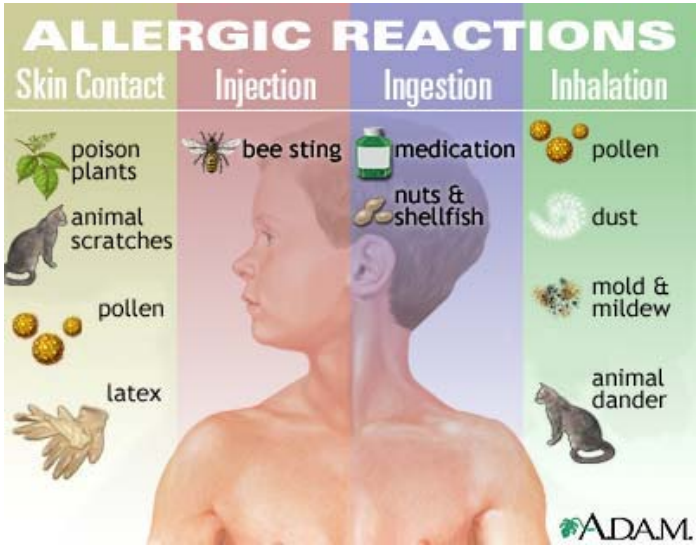
- 100,000 attacks per year in the U.S.
  - 60,000 are first-time events
  - 1000-1500 are fatal [1-1.5%]

Anaphylaxis

Rosen's Emergency Medicine, Ed 2, Chapter 119

Primary triggers:

- Foods
  - Egg, peanut, tree nut, milk, fruits, shellfish, shrimp, crustaceans
- Medications
  - Antibiotics:
    - penicillins, cephalosporins, sulfonamides, nitrofurantoin, tetracycline, streptomycin
- Insect stings
  - Hymenoptera venoms, fire ant stings
- Natural rubber latex



In 1/3 of cases a trigger cannot be established

Anaphylaxis

Rosen's Emergency Medicine, Ed 2, Chapter 119

Involvement of 2 systems after allergen exposure

- Skin/Mucosa Rash or Swelling
- Respiratory Distress
- Hypotension
- GI Upset/Cramps

Or Low SBP after exposure to allergen:

- Age 1 month to 1 yr: <70 mmHg
- Age 1-10 yrs: < (70 mmHg + [2 × age])
- Age 11-17 yrs: < 90 mmHg
- Adults: < 90 mmHg **or** more than 30% decr from baseline

ANAPHYLAXIS IS TREATED WITH EPINEPHRINE

Emphasis on Epi

- Epinephrine for Anaphylaxis: Underutilized and Unavailable
  - *Western J Emerg Med. 2015;16(3):385387*
- Anaphylaxis Requires Prompt Epinephrine Shot
  - *Annals of Allergy, Asthma and Immunology Dec 2014*
- THE USE OF EPINEPHRINE FOR OUT-OF-HOSPITAL TREATMENT OF ANAPHYLAXIS: RESOURCE DOCUMENT FOR THE NATIONAL ASSOCIATION OF EMS PHYSICIANS POSITION STATEMENT
  - NAEMSP
- Children with Food Allergies Should Carry Two Epinephrine Doses
  - *Pediatrics 2009*
- Epinephrine: The Drug of Choice for Anaphylaxis
  - A Statement of the World Allergy Organization 2008

Key Terms

Anaphylaxis: life-threatening, hypersensitivity reaction of the immune system

Aseptic technique: procedure performed under sterile conditions

Asphyxia: suffocation as a result of blockage of the airway

Dyspnea: labored or difficult breathing

Epinephrine: hormone released from the adrenal glands that activates several tissues in the “fight-or-flight” response

Histamine: one of several chemical messages released from immune cells that promote inflammation as a defense mechanism

Intramuscular: medication route by injection into the belly of a muscle which encourages rapid transport in the bloodstream

Shock: severe reduction in blood pressure (by any cause) that results in inadequate blood flow (oxygen & glucose) to tissues

6 “Rights” of Medication Administration

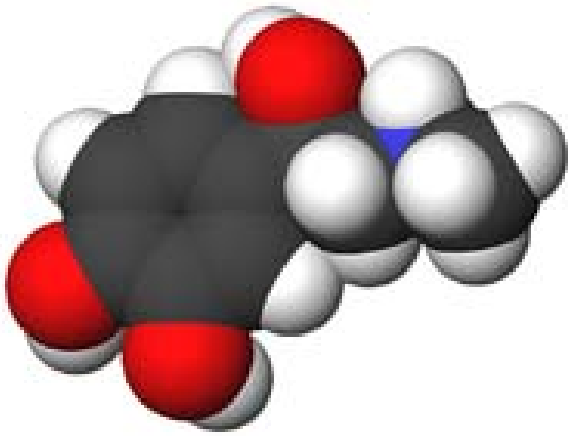
1. Right patient
2. Right medication
3. Right dose
4. Right route
5. Right time
6. Right documentation

HALF OF THE PEOPLE WITH EPIPENS DO NOT KNOW WHY OR HOW TO USE THEM.

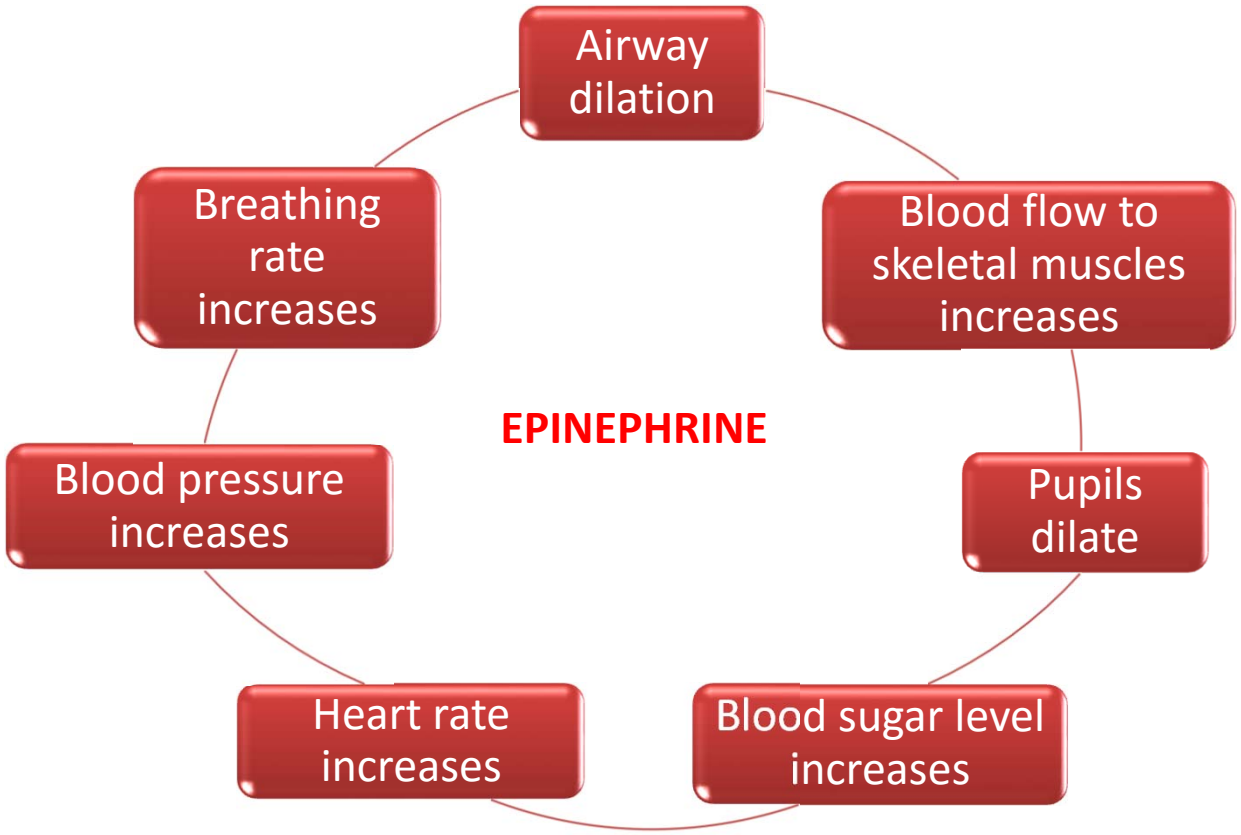
What is Epinephrine?

- A synthetic form of the naturally occurring hormone **Epinephrine**
- Released during "fight or flight" responses
  - Reflex stimulation of the adrenal gland
  - Sympathetic division of the autonomic nervous system

During "fight or flight" reactions, the airways _____ .
(dilate or constrict)



The body's stress response causes the normal release of epinephrine to maintain homeostasis during vigorous activity: "fight or flight". These same actions of epinephrine counteract the bronchoconstriction and low blood pressure of anaphylaxis when administered by medical personnel.



Epinephrine Underused in EMS

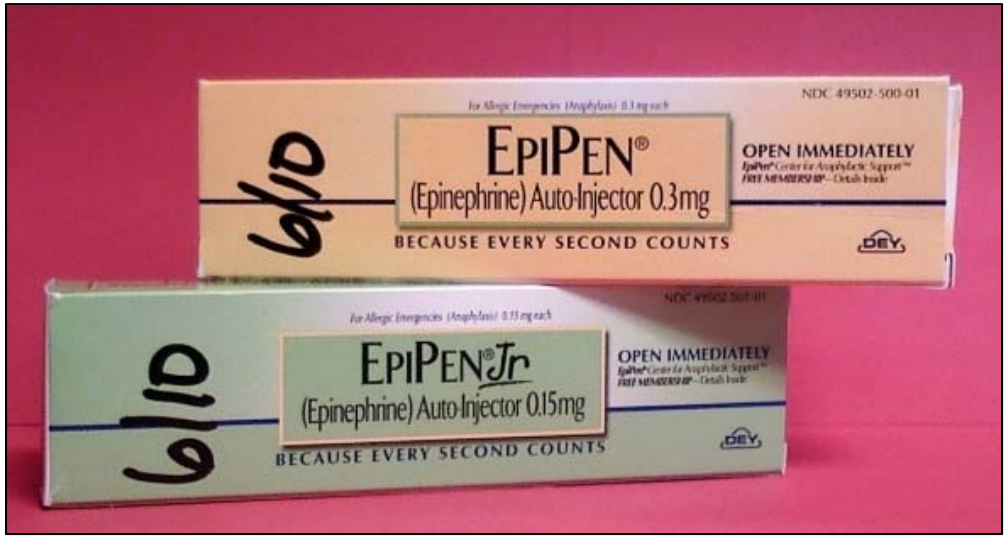
- *The Use of Epinephrine for Out-of-Hospital Treatment of Anaphylaxis*
  - National Association of EMS Physicians Position Statement
- *Epinephrine for Anaphylaxis: Underutilized and Unavailable*
  - Western J Emerg Med. 2015;16(3):385387.
- *Epinephrine Use Among EMS Providers Varies Widely By State*
  - American College of Allergy, Asthma & Immunology 2009
- *Life-Saving Epinephrine Under Utilized by Paramedics*
  - American College of Allergy, Asthma and Immunology 2008

Epinephrine Underused in EMS

There is <u>NO</u> contraindication for Epinephrine for anaphylaxis or anaphylactic shock

This is the primary medication for allergic reaction & anaphylaxis in children

Examples of the Medication



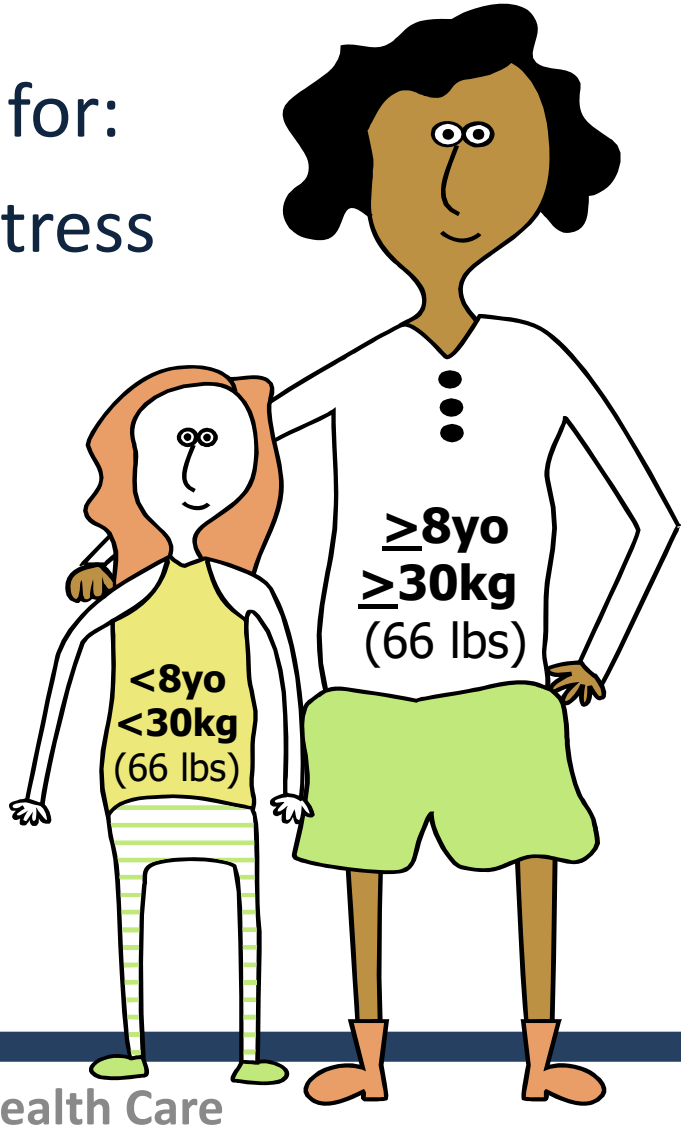
- Name of medication
- Concentration (1:1,000 or 1mg/1ml)
- Expiration date

Indications for Use

EMRs may administer Epinephrine for:

- Anaphylaxis with Respiratory Distress
- Anaphylactic shock

Is this a different dose than when using the EpiPen?



Dosage:

- **Adults - 0.30 mg of 1:1,000**
- **Pediatrics - 0.15 mg of 1:2,000**

EpiPen Dosages

Pediatrics - **0.15 mg of 1:2,000**

Adults - **0.30 mg of 1:1,000**

The same dosage schedule is used in anaphylaxis, no matter the method of IM administration.

Anaphylaxis is an over-reaction of the Immune System

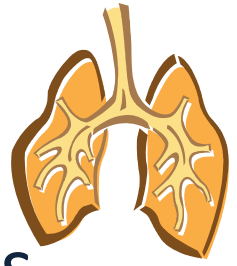
- Sudden, severe allergic reaction involving the whole body *(more than a local reaction, sting or rash)*
- Most common allergens:
  - **Insect stings, Food, Medications, Latex**
- Skin responses with itching, hives & swelling
- Vascular responses with tachycardia, hypotension, and hypoperfusion/shock
- Tracheal and bronchial swelling may result in asphyxia

What respiratory signs would be typical of anaphylaxis?

Respiratory Signs & Symptoms

- Shortness of breath
- Swelling and/or spasm
- Rapid and/or labored breathing, use of accessory muscles, prolonged expirations, hypoventilation, decreased lung sounds
- Changes in the ability to speak
- Hoarseness, stridor (upper airway), wheezing (lower airway), or other abnormal sounds of breathing

Action of Epinephrine



- Relaxes smooth muscle in the airways
- Counteracts histamine and other cytokines
- Raises blood sugar level
- Raises heart rate, blood pressure, and myocardial oxygen demand

For Intramuscular injection of Epinephrine

Onset of effect: 3-5 min

Duration of effect: 1-4 hours

Some Side Effects of Epinephrine will occur:

- Palpitations
- Tachycardia & dysrhythmias
- Hypertension
- Headache
- Tremor, weakness
- Skin signs: pallor, sweating
- Nausea & vomiting
- Nervousness & anxiety
- Pain, redness at the injection site

Which vital signs are important to document before and after administering Epinephrine?

Document Vital Signs before and after treatment with Epinephrine

Because Epinephrine is expected to cause widespread changes in function, it is important to frequently monitor and document vital signs:

- HR, RR, BP
- Include general appearance, work of breathing, lung sounds, skin signs, and ability to speak

Techniques of Medication Administration

- Equipment used for injections
  - Medication vial or ampoule
  - Transfer device
    - Filter needle/straw or blunt medication transfer device
  - 1ml syringe
  - 23 gauge 1.25 inch safety injection needle
  - Alcohol/Iodine wipe x2
    - 1 for pt, 1 for vial/ampoule
  - Small gauze square
  - Adhesive bandage
  - Sharps disposal container

Techniques of Medication Administration

- Equipment used for injections
  - Transfer device
    - Filter needle/straw for ampoule
    - Blunt transfer device for vial
  - 1ml syringe; not larger
  - 23 gauge 1.25 inch safety injection needle
    - Adequate for adults and peds

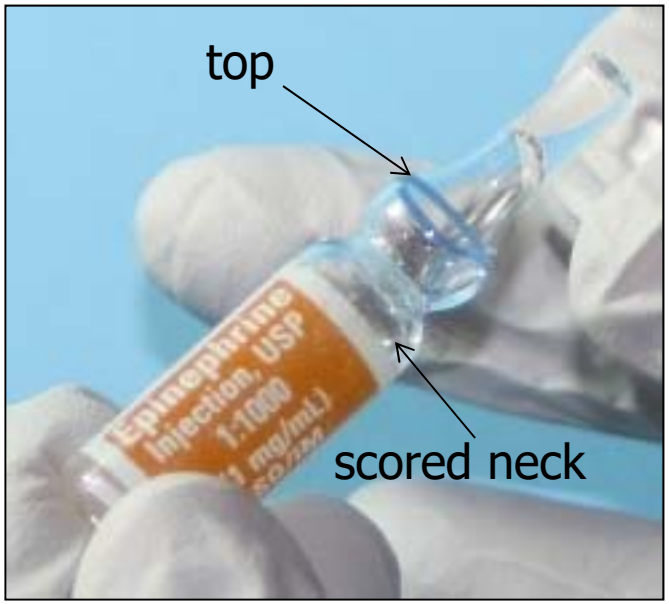
For safety, the devices are used on the medication container and the needle is only used on the patient

PREPARING AMPOULES & VIALS

Ampoules and Vials

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

Ampoule



Vial

Self-sealing rubber top

Epinephrine After Being Exposed To Sunlight for Various Times

Skills Section:

Obtaining Medication from a Glass Ampoule

Confirm the Medication

- Medication name
- Dosage (1:1,000 or 1mg/1ml)
- Expiration date
- Not cloudy; no color or precipitate

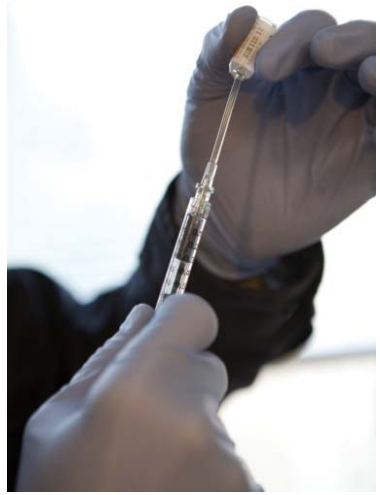
Hold the ampoule upright and tap its top to dislodge any trapped solution.

Use thumb to break along scored edge of neck. Place gauze or alcohol pad wrap around the neck to protect thumb.

Use Caution When Breaking Glass Ampoule

Techniques of Medication Administration

- Drawing medication from ampoules
  - Hold upright between thumb and fingers
  - May invert to ensure all medication is in the lower section of the ampoule
  - Requires a filter needle/straw to retain glass fragments
  - Do not need to draw air into syringe or inject air into ampoule before drawing up medication, it is an open system.



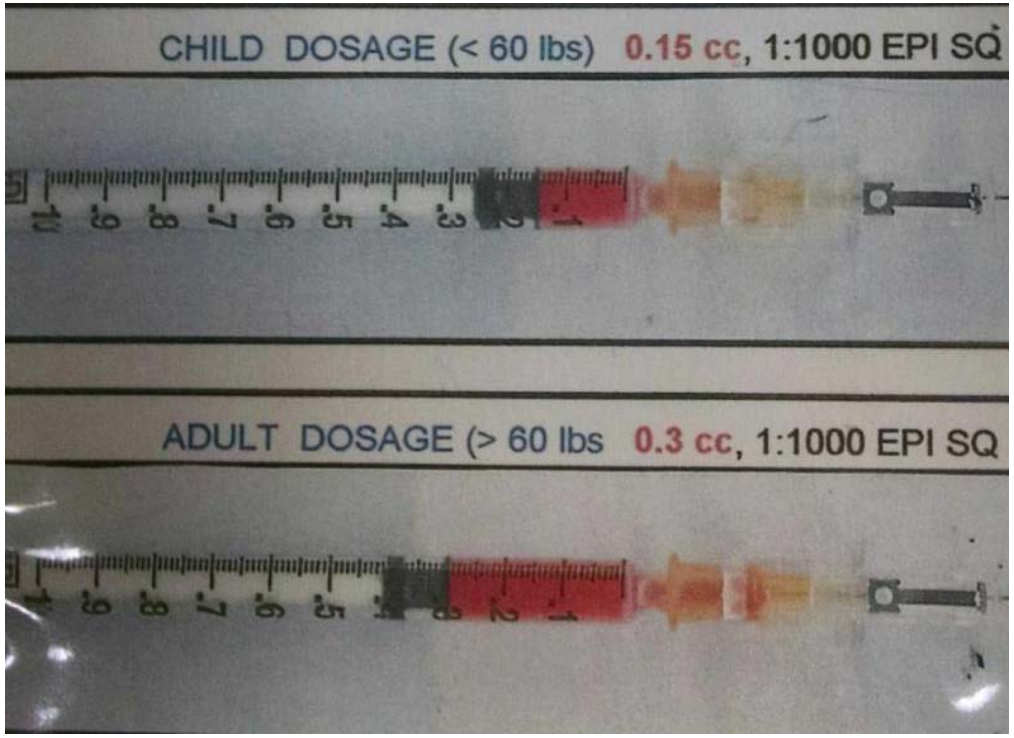
Tap-Wrap-Snap-Draw

1.

2.

3.

Draw Up The Medication



Using a syringe, insert the filter needle into the ampoule and draw the plunger back until you reach the correct dosage

(PEDS = 0.15 ml or ADULT = 0.3ml)

Skills Section:

Obtaining Medication from a Vial

Confirm the Medication

- Medication name
- Dosage (1:1,000 or 1mg/1ml)
- Expiration date
- Not cloudy; no color or precipitate

Clean the Vial's Rubber Top

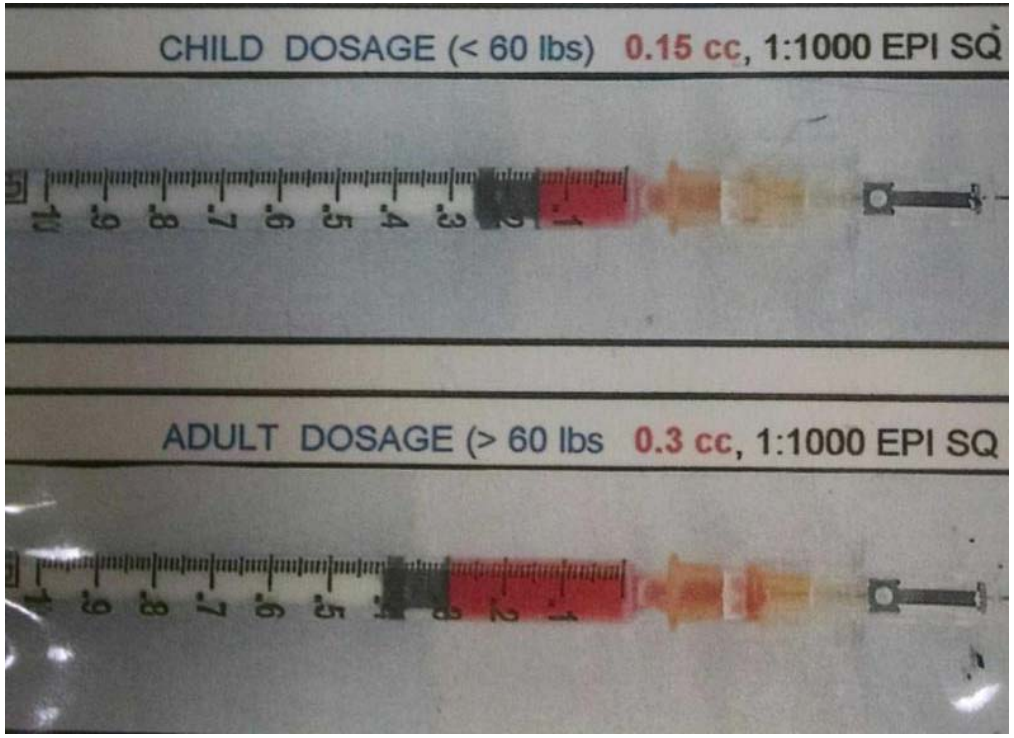
Prepare the syringe

With the needle cap on, pull back the plunger to the appropriate dosage.
You will inject the same volume of air into a vial as you withdraw the medicine.

Inject Air and Withdraw Med

- Insert transfer device through rubber stopper
- Inject a volume of air slightly greater than the volume of medication to be withdrawn
- Draw the medication from the vial

Draw Up The Medication



Using a syringe, insert the transfer device into the vial and draw the plunger back until you reach the correct dosage

(PEDS = 0.15 ml or ADULT = 0.3ml)

Site Selection & Preparation

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.

What PPE should be worn when preparing the medication and injection site?

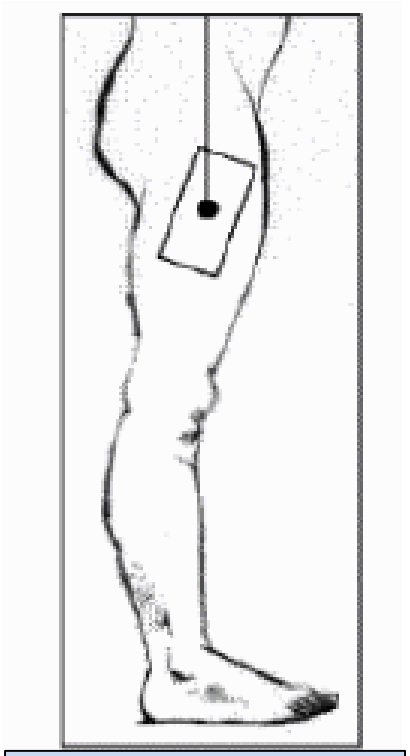
First steps:

1. Prep the site with approved antiseptic by scrubbing vigorously and allowing to dry.
   - ❖ DO NOT TOUCH, BLOW ON OR FAN THE INJECTION SITE!
2. Align the needle above the injection site at a 90 degree angle to help insure IM administration of drug.

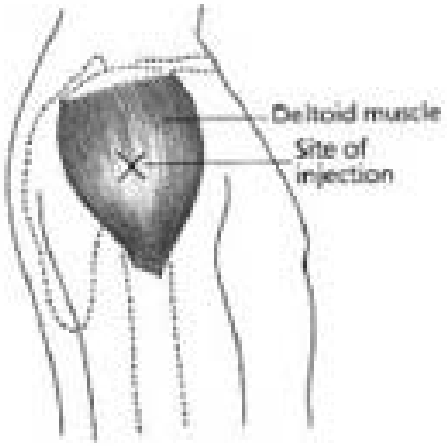
Techniques of Medication Administration

- EMS provider safety
  - Always use Standard Precautions
    - Gloves for standard precautions
  - Alcohol or povidone iodine swabs
  - Syringe of proper size with proper graduations
    - Needles or filter straws
  - **Never recap** contaminated needles
  - Dispose in biohazard container

Intramuscular Injection Sites



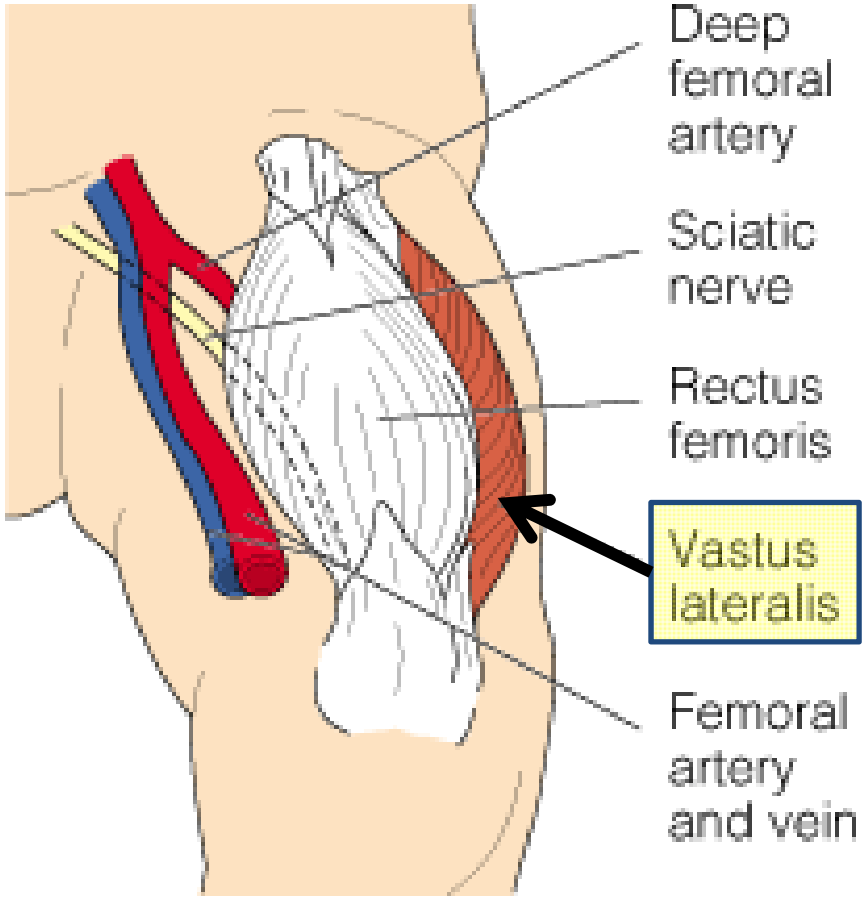
Primary
Lateral thigh



Secondary
Deltoid

Where is the best IM injection site for infants and toddlers?

The Anterolateral Thigh is the Best Site for Infants & Toddlers

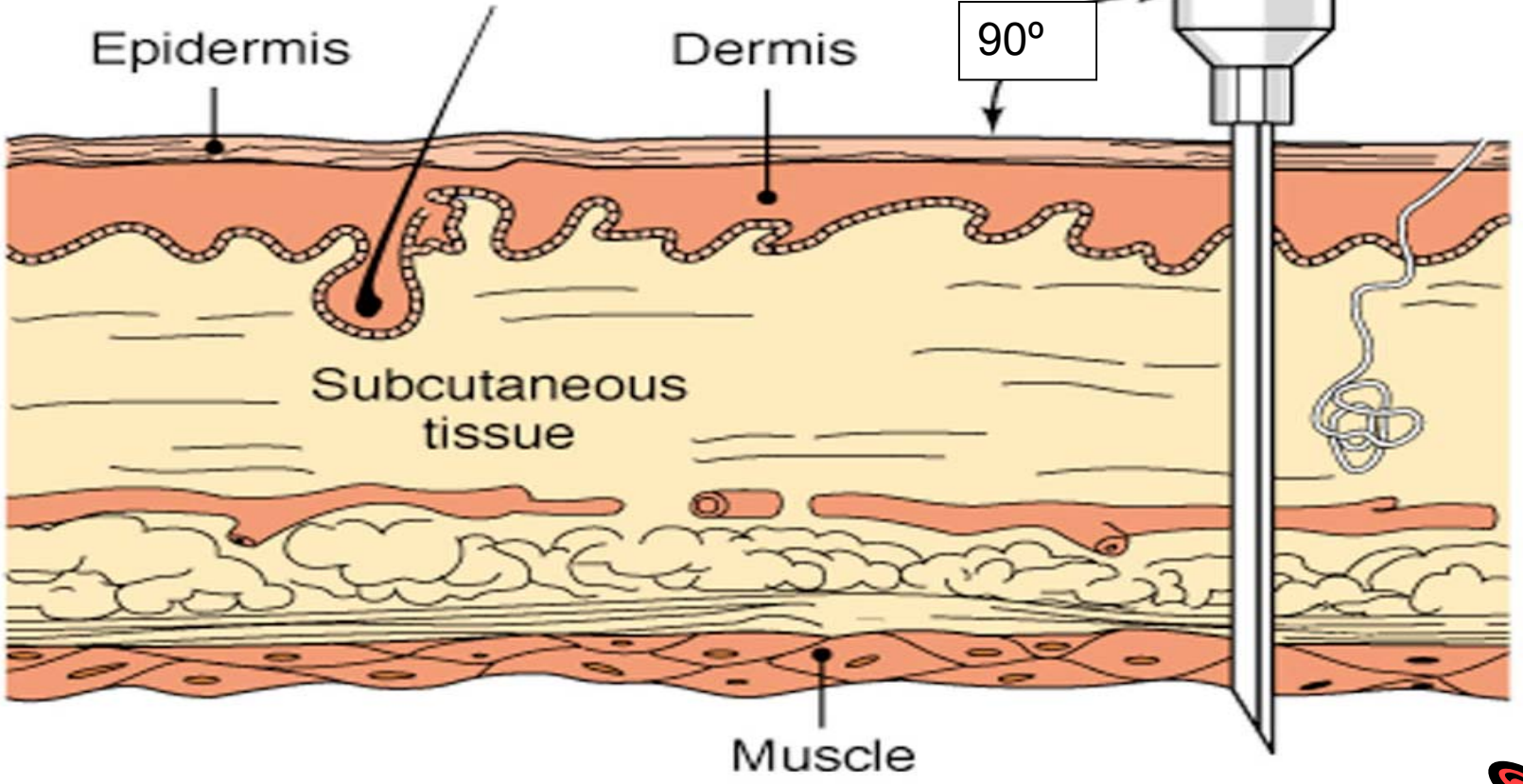


- Good site for all ages, but especially under 3 years old
- Far from major blood vessels & nerves
- Insert needle at 90° angle ↓

Prepare The Site

- Scrub the skin vigorously with an alcohol/iodine wipe
- Allow to air dry
- Do not touch, blow on, or fan the injection site

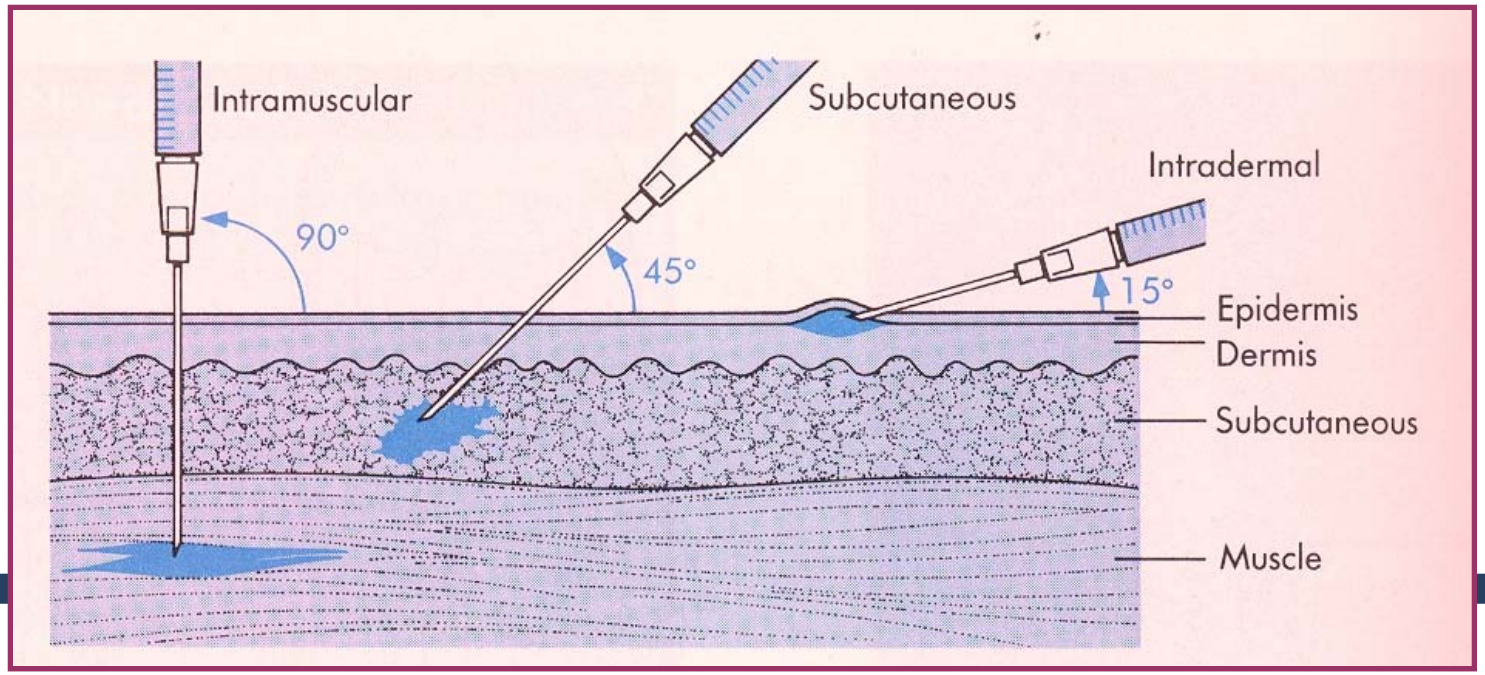
Intramuscular Injection



How much longer will it take to treat anaphylaxis if Epinephrine is administered too shallowly (subcutaneous layer), rather than in muscle?

Be sure to inject Epinephrine into the muscle

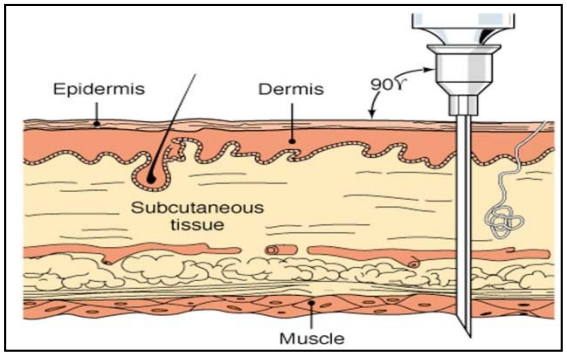
It may take twice as long (up to 10 min) for Epinephrine to have the life-saving effect if not injected into the muscle.



IM Injection Technique

IM Injection Depth [adult]

- Lateral Thigh: 12mm = 0.5 inches
- Deltoid: 13mm = 0.5 inches



- *Reinventing IM and Procedural Injections;*
- *Practical Pain Management*

- Do NOT need to bury/hub the needle

- Over 200lbs/100kg need deeper penetration

IM Injection Technique

WI EMS Skills & Procedures Manual

- Hold the syringe in dominant hand and remove the needle cover
- Stabilize the injection site with your non-dominant hand using:
  - Pinch technique
  - Stretch technique (better for obese pts)
- Holding the syringe like a dart, quickly but not forcefully, insert the needle into the injection site at a 90 degree angle until the proper depth is reached
- Release the skin while continuing to hold the syringe in place with the dominant hand

IM Injection Technique

WI EMS Skills & Procedures Manual

- Grasp the plunger with one hand and the barrel of the device with the other. Pull back (aspirate) slightly on the plunger and wait 5 seconds.
- If no blood aspirates into the syringe, proceed with the injection. Slowly depress the plunger to administer the injection. A slow, steady injection rate allows the muscle to distend gradually and accept the medication under minimal pressure.
- Once the medication has been administered, wait 10 seconds, then withdraw the needle using appropriate safety features and/or activating the needle safety engineering device.

IM Injection Technique

WI EMS Skills & Procedures Manual

- If blood is present when aspirating, withdraw the needle and discard the medication.
- Start over with new medication and a new site.

IM Injection Technique

WI EMS Skills & Procedures Manual

- Cover the injection site with an alcohol or gauze pad and apply gentle pressure to the area to help reduce pain and improve absorption.
- Properly dispose of the syringe and needle assembly in an appropriate sharps container.
- Place a bandage over the injection site.

Skills Section:
Intramuscular Injection

Insert The Needle at a 90-degree Angle

- Broadly hold the muscle
- Do not pinch the skin
- Hold syringe like a dart
- Insert the needle with a quick stab at a 90° angle to the skin surface

Deliver the Medication

1. Draw back the plunger to verify you are not in a blood vessel
   - ***If blood present, remove and prepare a new syringe.***
2. Depress the plunger with a slow, steady motion until the syringe is empty
3. Remove syringe and needle, utilizing safety needle mechanism

Needle Handling Precautions

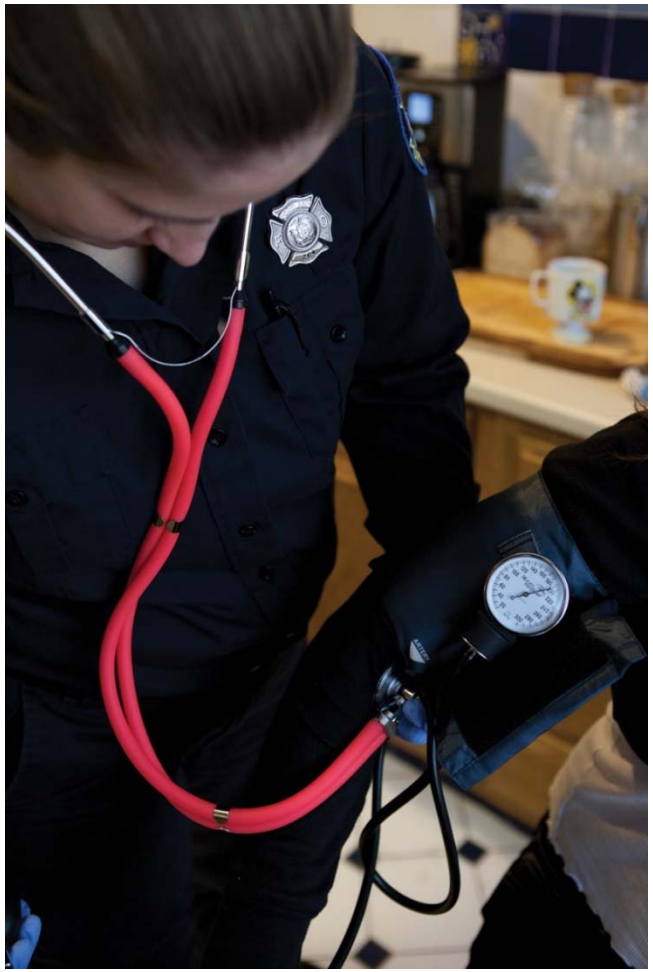
- Immediately dispose of used sharps in a sharps container.
- **NEVER** recap needles

Secure, Massage & Cover Site

- Massage with gauze or alcohol wipe to enhance absorption and comfort
- Cover the puncture site
- Reassess your patient
- Prepare for transport

Reassess Patient

- LOC
- Appearance
- Respiratory distress
- VS
- Change in symptoms



Treat & Document all information concerning the patient & medication:

1. ABC's, LOC, oxygen therapy
2. Indication for medication administration
   - Vital signs, work of breathing, lung sounds, skin signs, ability to speak (how many words)
3. Medication, dosage, and delivery site
4. Response to the medication
   - Vital signs, work of breathing, lung sounds, skin signs, changes in ability to speak
   - Both positive and negative responses

Assessment of Patient Response

Document the patient's response to treatment:

- LOC, behavior, breathing effort, lung sounds, skin signs, vital signs, and changes in ability to speak
- Document adverse effects, if any

How long does it take for the drug to take effect, and what do I do if the patient does not improve?

Ongoing Assessment

If no significant improvement within 10 minutes, consider second dose

- Second dose may require consultation with online medical control
- If unable to contact medical control or ambulance, it is recommended that an EMR may administer second dose if required
- Thorough documentation is essential

CASE EXAMPLE

Case Example

- You are called to the house of a 5 year-old male with a chief complaint of “tongue itching”.
- His father greets you and explains that approximately 30 minutes prior to arrival the patient ate an oatmeal raisin energy bar and within minutes of eating the bar he developed itching of his tongue and a sore throat. He then developed scattered hives, followed by an episode of vomiting.

Case Example

- Physical exam shows a diffuse red rash, facial swelling, rapid breathing, faint wheezing, and mild diffuse abdominal tenderness.
- Vital signs are:
  - HR 124, RR 24, Pulse ox 94%, BP 64/34, Temp 37.1° C/98.8° F
- During the examination his oxygen saturation dropped to 89% and his mental status began to decline…

Case Example

- The child was immediately placed in the supine position
- Oxygen administered via non-rebreather mask
- Epinephrine 0.15 mg administered into his left anterolateral thigh
- Transporting ambulance arrives.

Case Example

- Ambulance crew intervention:
  - An intravenous line was established
  - 20 ml/kg bolus of 0.9% normal saline
  - Albuterol nebulizer treatment

Case Example

- Within 15 minutes his rash began to improve and the wheezing was no longer heard.
- Repeat VS: HR 96, RR 18, and a pulse oximetry reading of 97%, BP 110/59 mm Hg. His mental status returned to his baseline.
  - Previous VS: HR 124, RR 24, Pulse ox 94%, BP 64/34, Temp 37.1° C/98.8° F
- He did not require any additional doses of epinephrine and was observed in the ED for approximately 5 hours.
- He was discharged in good condition with an auto-injector device and referral to an allergist.

QUESTIONS?
DISCUSSION?

Questions?

Release of training liability statement - pending

- Example from S&P Manual
- This manual is intended to provide examples of tried and proven techniques of caring for patients with the various injuries or illnesses that EMS personnel will encounter in the field. It does not provide the only method or technique that may be an acceptable approach in caring for an injury or illness. However, since the various certification examinations used within the state are based on the current edition of this document as well as the current edition of the National EMS Education Standards, the State of Wisconsin Scope of Practice, and the State of Wisconsin Curricula, this should be considered a companion to the curricula used for the education of EMS personnel. This is a consensus document, endorsed by the EMS Training Centers, the Office of Preparedness and Emergency Health Care in the Department of Health Services and the EMS Physician Advisory Committee for purposes of instruction