Anaphylaxis and Draw-Up Epinephrine

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Objectives

- Identify the possible triggers on a allergic reaction.
- Review the pathophysiology of an allergic reaction and how the body triggers a systemic response.
- List the signs and symptoms of an allergic reaction.
- Compare and contrast general allergic reactions to life-threatening anaphylactic response.
- Review the indications for using epinephrine IM.
- Describe the effects of administering epinephrine to the anaphylactic patient.
- Review the 5 rights of medication administration.
- Review and perform the procedure for drawing up and administering epinephrine from a vial.

Why Draw Up Epi?

=

Allergic Reactions and Anaphylaxis

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

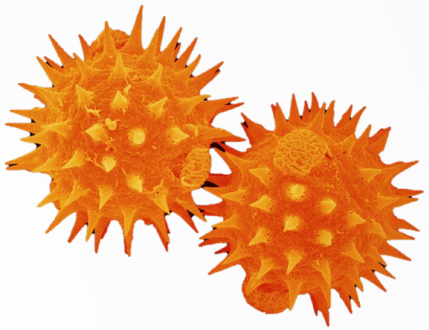
Hymenoptera are insects such as sawflies, wasps, bees, and ants

Anaphylaxis

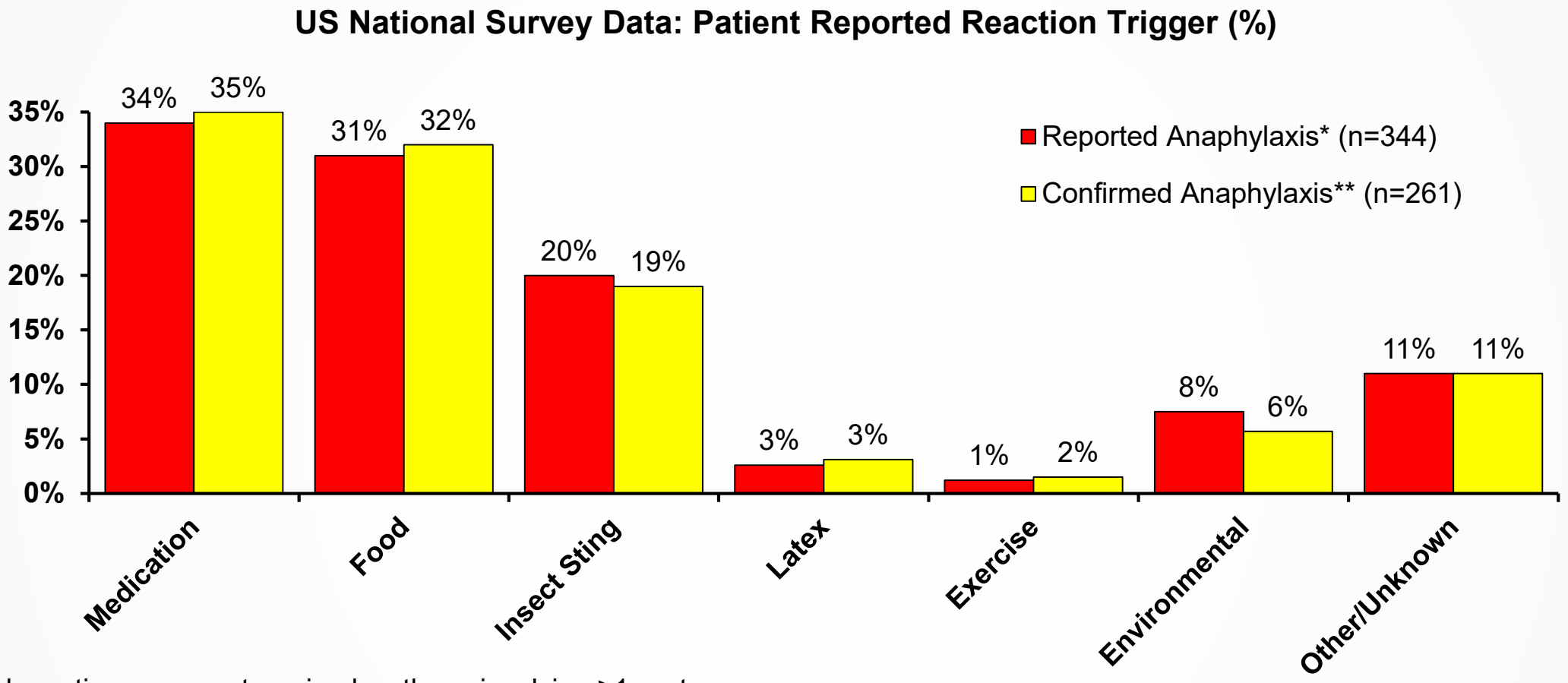
Rosen's Emergency Medicine, Ed 2, Chapter 119

- Anaphylaxis is derived from Greek
  - ***Ana*** = against
  - ***Phylax*** = guard or protect
  - Meaning "against protection"
- 100,000 attacks per year in the United States
  - 60,000 are first-time events
  - 1000-1500 are fatal [1-1.5%]

Causes of Allergic Reactions



Patient Reported Causes of Anaphylaxis



*Reported reactions were categorized as those involving ≥1 system.
**Confirmed reactions were categorized as those involving ≥2 systems with respiratory and/or cardiovascular symptoms or those leading to loss of consciousness, even if only that single system was involved.

Wood RA, et al. *JACI*. 2014;133:461-7

Food Allergies Increasing in the US

- Food allergy prevalence in children as high as 8.0%[1]
  - 39.7% had a history of severe reactions
  - 30.4% had multiple food allergies
- Prevalence was highest for peanut followed by milk and shellfish
- 8 major foods are responsible for >90% of serious allergic reactions in the US (fish, shellfish, peanut, tree nuts, milk, egg, wheat, soy)[2]

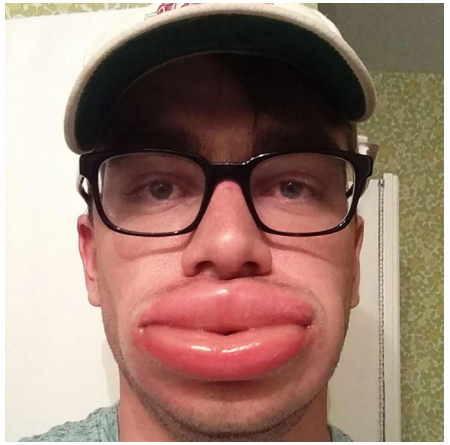
1. Gupta, et al. *Pediatrics*. 2011;128:e9-e17.
2. Boyce JA, et al. *J Allergy Clin Immunol*. 2010;126:S1-S58.

Allergic Reactions

- Involves usually one body system
  - Itchy/runny nose, sneezing
  - A few hives, mild itch
  - Mild nausea/discomfort

Anaphylaxis

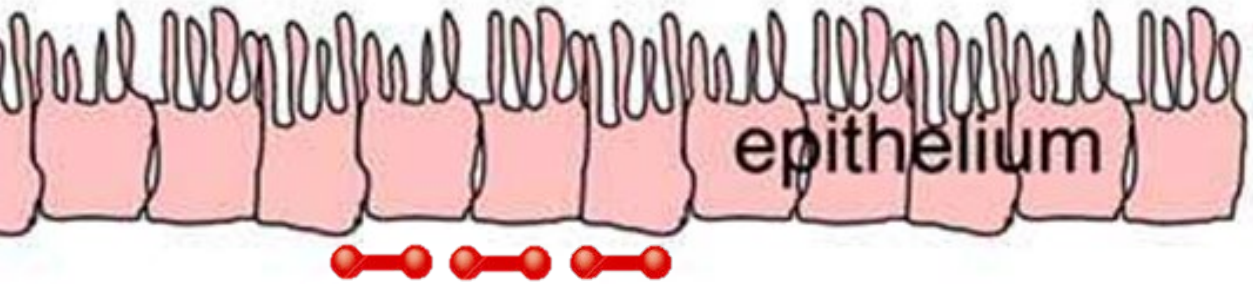
- Involving more than one body system (usually)
  - Short of breath, wheezing, repetitive cough
  - Pale, blue, faint, weak pulse, dizzy
  - Tight throat, hoarse, trouble breathing/swallowing
  - Significant swelling of the tongue/lips
  - Many hives over the body, widespread redness
  - Repetitive vomiting, severe diarrhea
  - Impending doom, anxiety, confusion



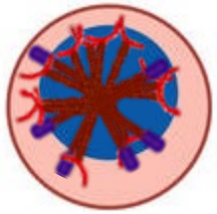
Anaphylactic Shock

- State of inadequate perfusion
  - Respiratory compromise
  - Hypotension

Sensitization – Mechanism in the body

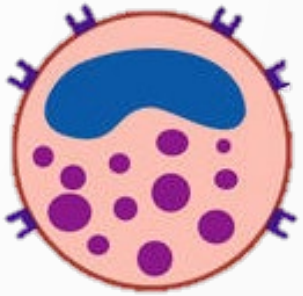


Allergen

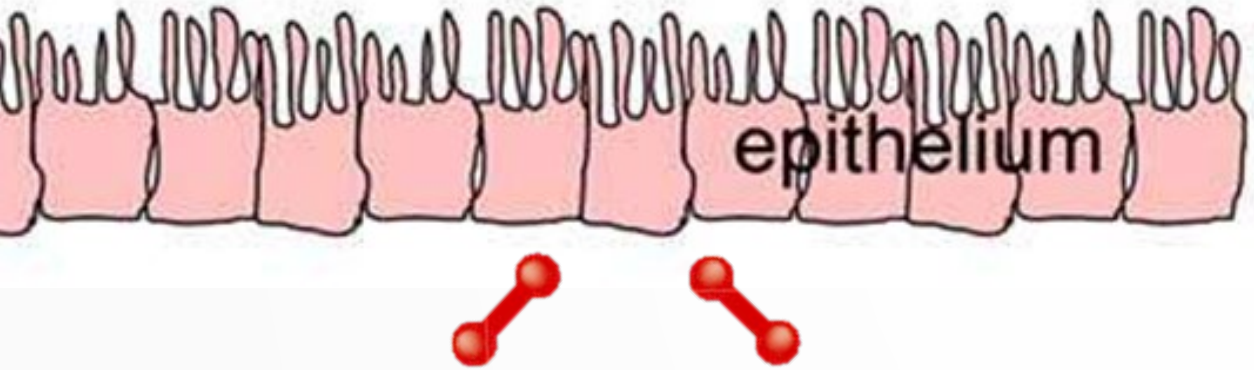


b cell transmits IgE

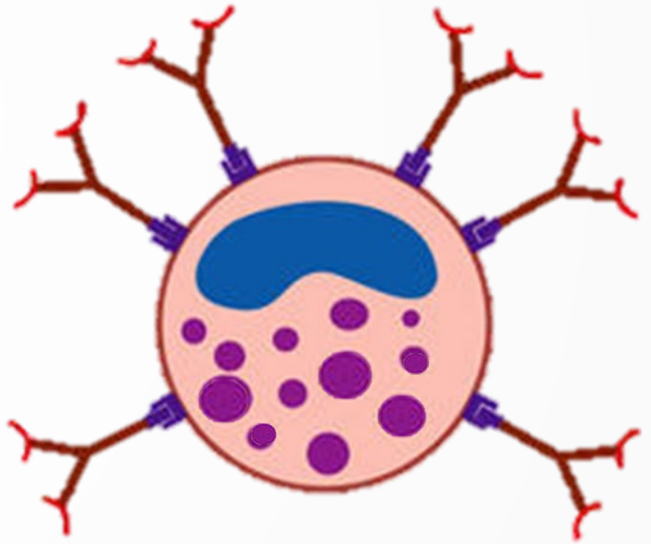
Mast cell now has IgE attached so it can recognize the allergen during the next exposure



Allergic Reaction After Sensitization

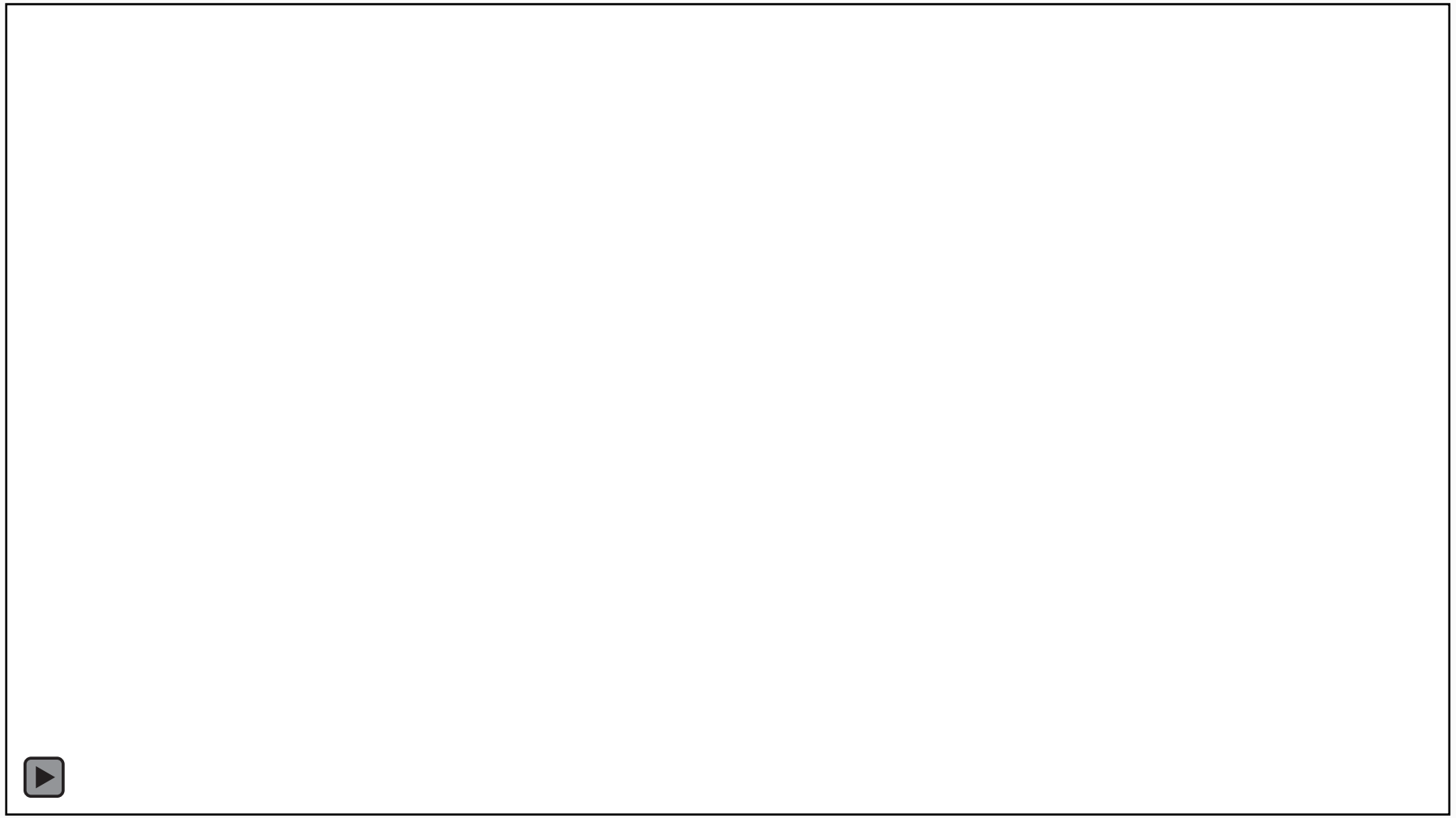


- Allergens bind directly to the IgE protein on the mast cell which degranulates and releases histamine

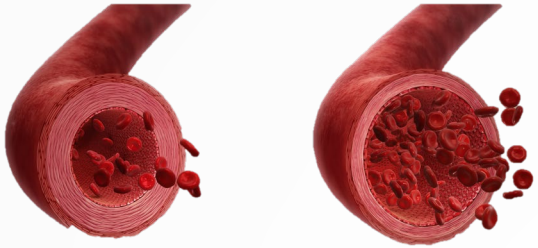


Cytokines & Histamine →

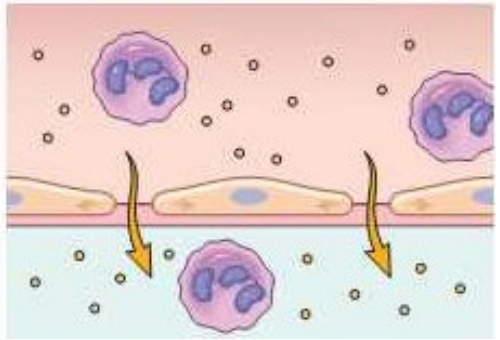
Mast Cell Degranualization – Histamine Release



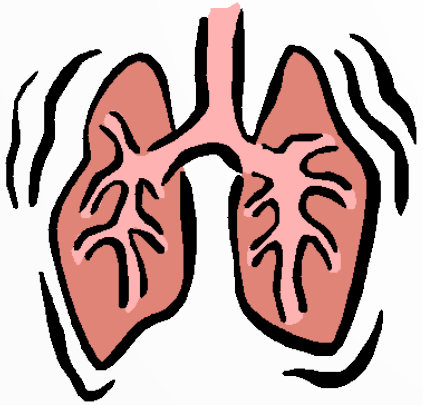
Histamine is Bad



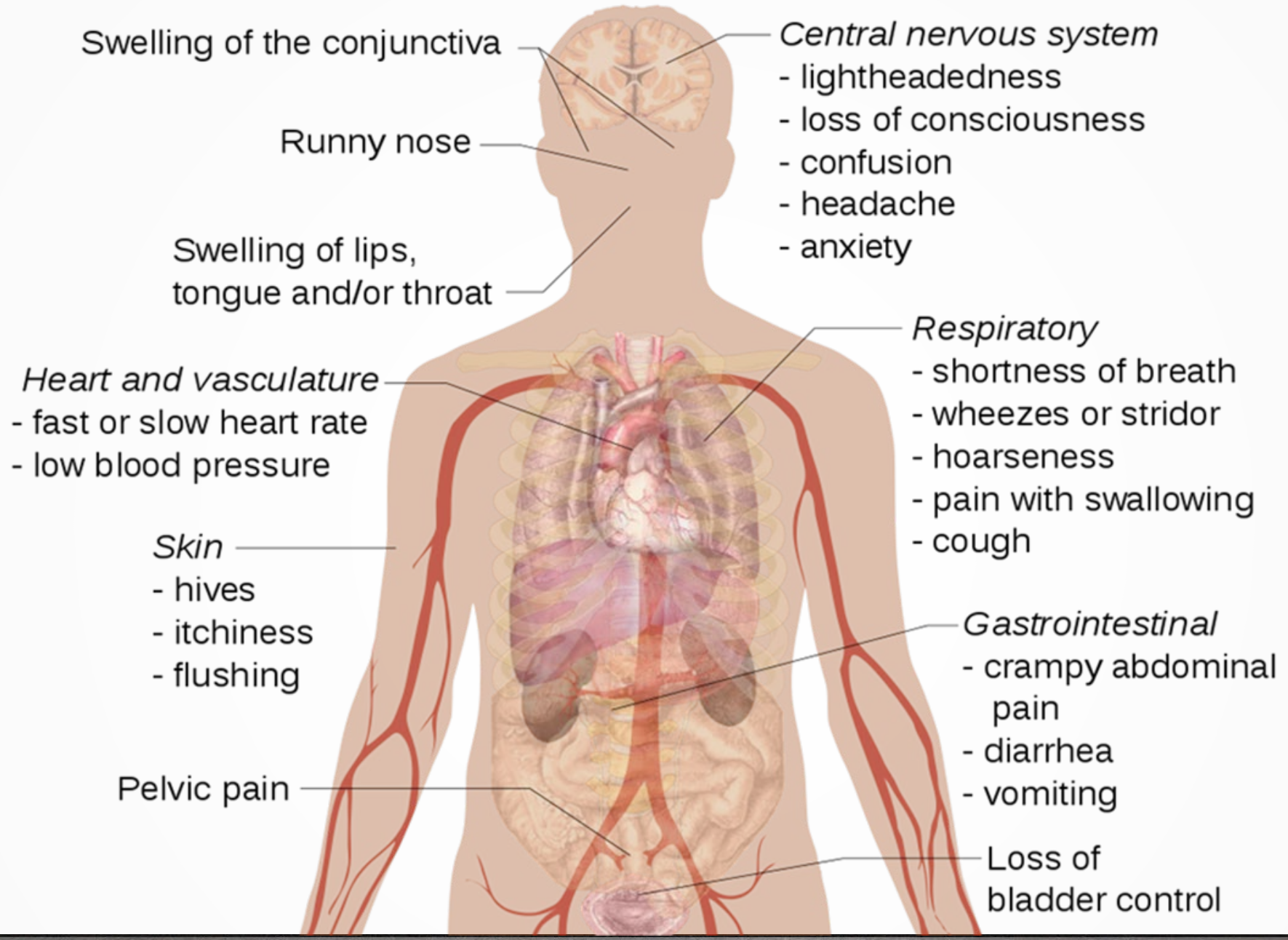
- ↑ **Vasodilation**
  - Tachycardia
  - Hypotension



- ↑ **Vascular Permeability**
  - Swelling
  - Respiratory Mucous



- **Smooth Muscle Constriction**
  - Bronchoconstriction
  - Intestinal spasm
    - Vomiting, cramps, diarrhea


Swelling of the conjunctiva
Runny nose
Swelling of lips, tongue and/or throat
Heart and vasculature
- fast or slow heart rate
- low blood pressure
Skin
- hives
- itchiness
- flushing
Pelvic pain
Central nervous system
- lightheadedness
- loss of consciousness
- confusion
- headache
- anxiety
Respiratory
- shortness of breath
- wheezes or stridor
- hoarseness
- pain with swallowing
- cough
Gastrointestinal
- crampy abdominal pain
- diarrhea
- vomiting
Loss of bladder control

Epinephrine In Treating Anaphylaxis

Epinephrine is Underused in Anaphylaxis!

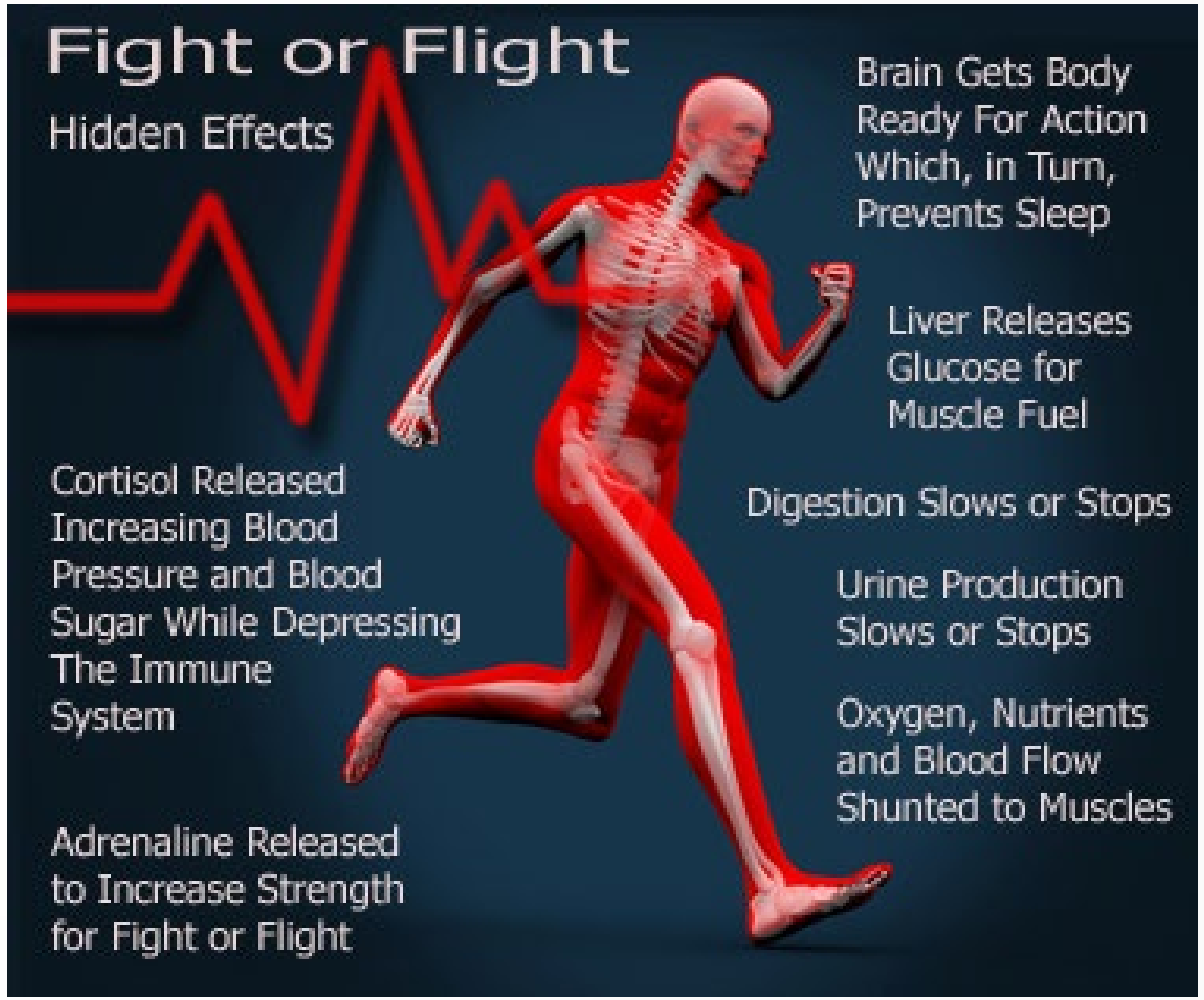
There is NO contraindication for Epinephrine for anaphylaxis or anaphylactic shock

Failure to administer epinephrine promptly is the most important factor contributing to death in patients with anaphylaxis

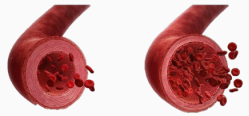
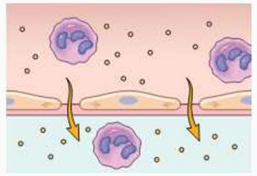
The vasopressive effects of epinephrine, along with its effects in preventing and relieving laryngeal edema and bronchoconstriction, may be life saving

What is Epinephrine?

- A synthetic form of a naturally occurring hormone.
- 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)

	Anaphylaxis	Epinephrine
	Vasodilation/Hypotension	Vasoconstriction ↑ Blood Pressure ↑ Heart Rate ↑ Cardiac Contraction Force
	Respiratory Mucosal Edema	↓ Mucosal Edema
	Smooth Muscle Contraction Bronchoconstriction	Relaxes Smooth Muscle Bronchodilation

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

5 Rights of Medication Administration

5 Rights of Medication Administration

1. Right Patient
2. Right Medication
3. Right Dosage/Concentration
4. Right Route
5. Right Documentation

1. **Right Patient**
2. Right Medication
3. Right Dosage/Concentration
4. Right Route
5. Right Documentation

- Does the patient have the signs and symptoms of an anaphylactic reaction?
  - Respiratory distress? (wheezing, tachypnea, stridor, etc.)
  - Oral/facial swelling? (angioedema)
  - Circulatory compromise? (tachycardia, hypotension)

1. Right Patient
2. **Right Medication**
3. Right Dosage/Concentration
4. Right Route
5. Right Documentation

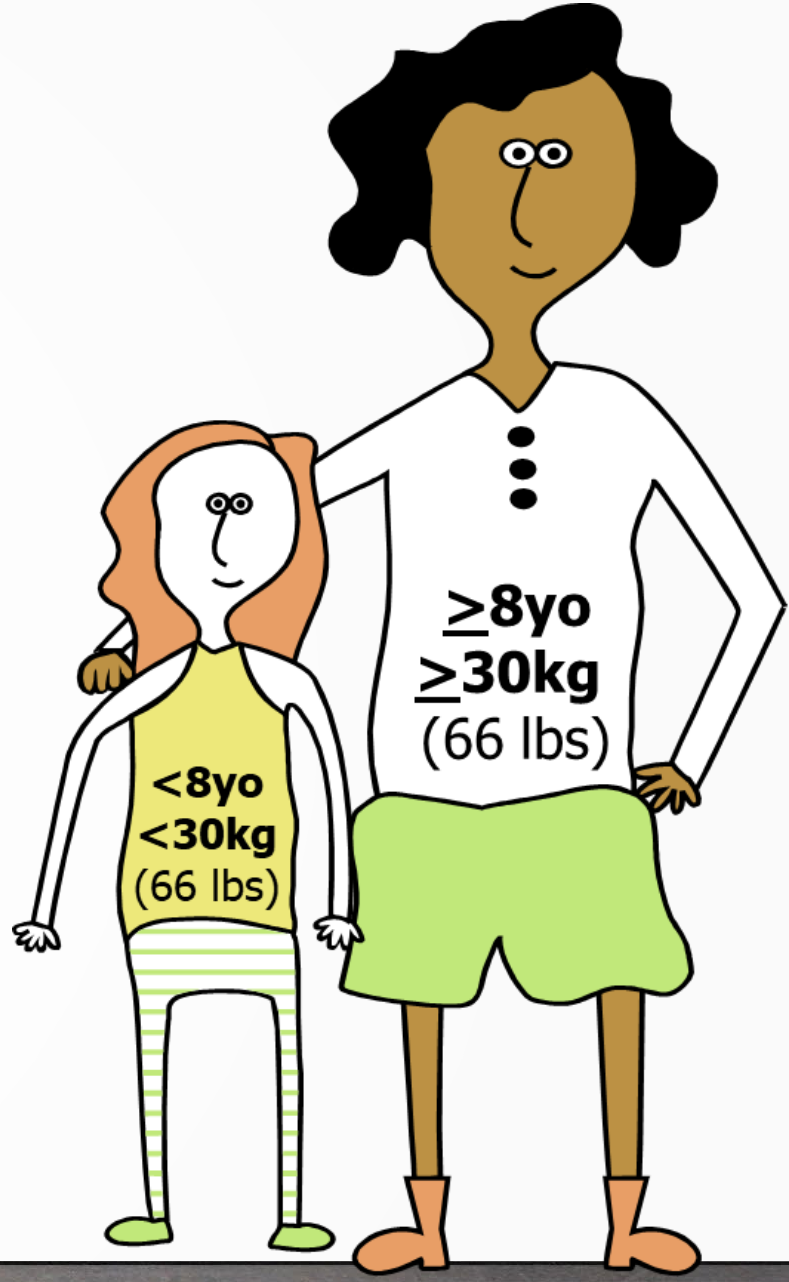
- Epinephine (Adrenalin) 1mg/1mL
- Check expirations date
- Ensure it is clear and not cloudy

Epinephrine exposed to sunlight

1. Right Patient
2. Right Medication
3. **Right Dosage/Concentration**
4. Right Route
5. Right Documentation

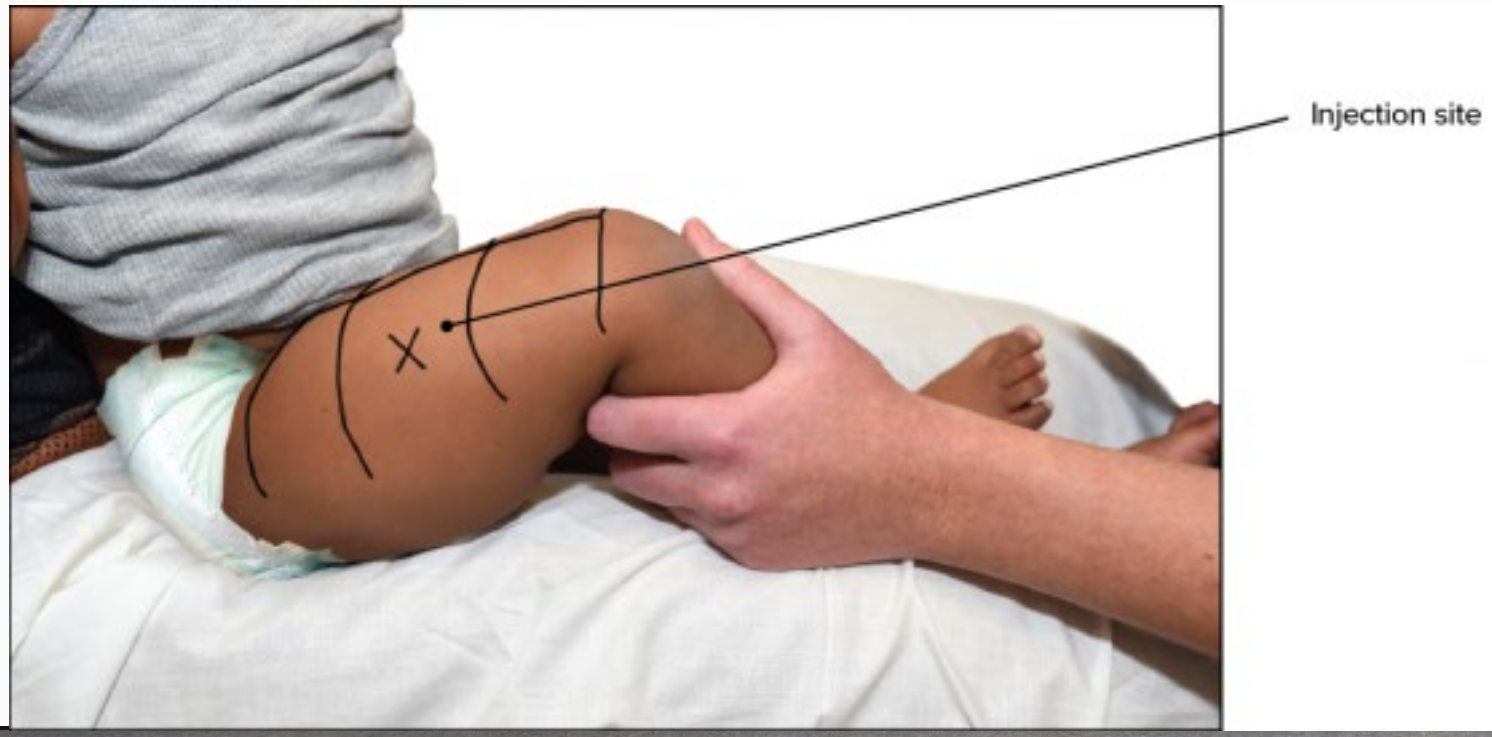
- Dosage
  - Adult >30kg = 0.3mg (0.3mL)
  - Pediatric 10-30kg = 0.15mg (0.15mL)
- Concentration – 1mg/1mL

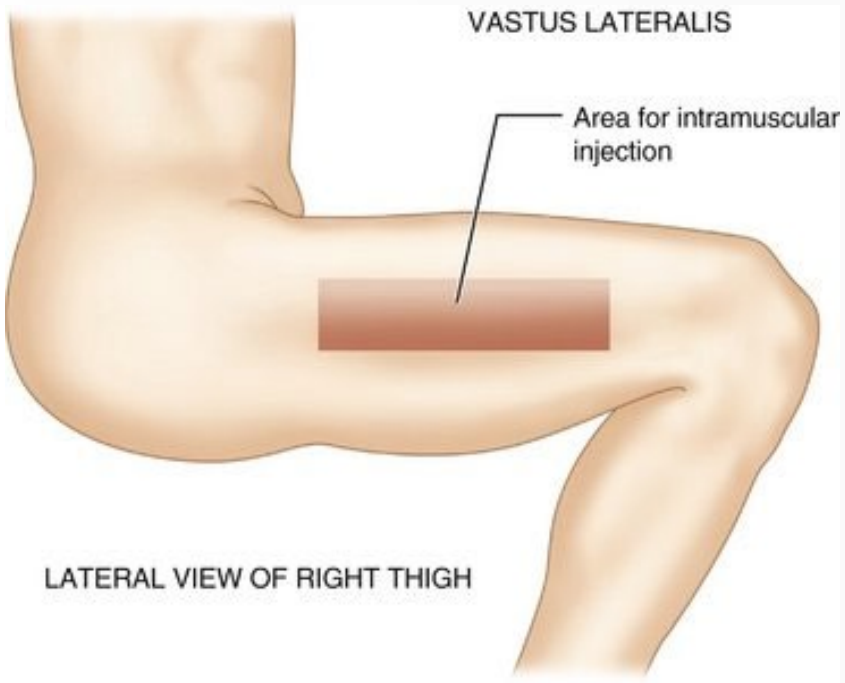
Is this a different dose than when using the EpiPen?



1. Right Patient
2. Right Medication
3. Right Dosage/Concentration
4. **Right Route**
5. Right Documentation

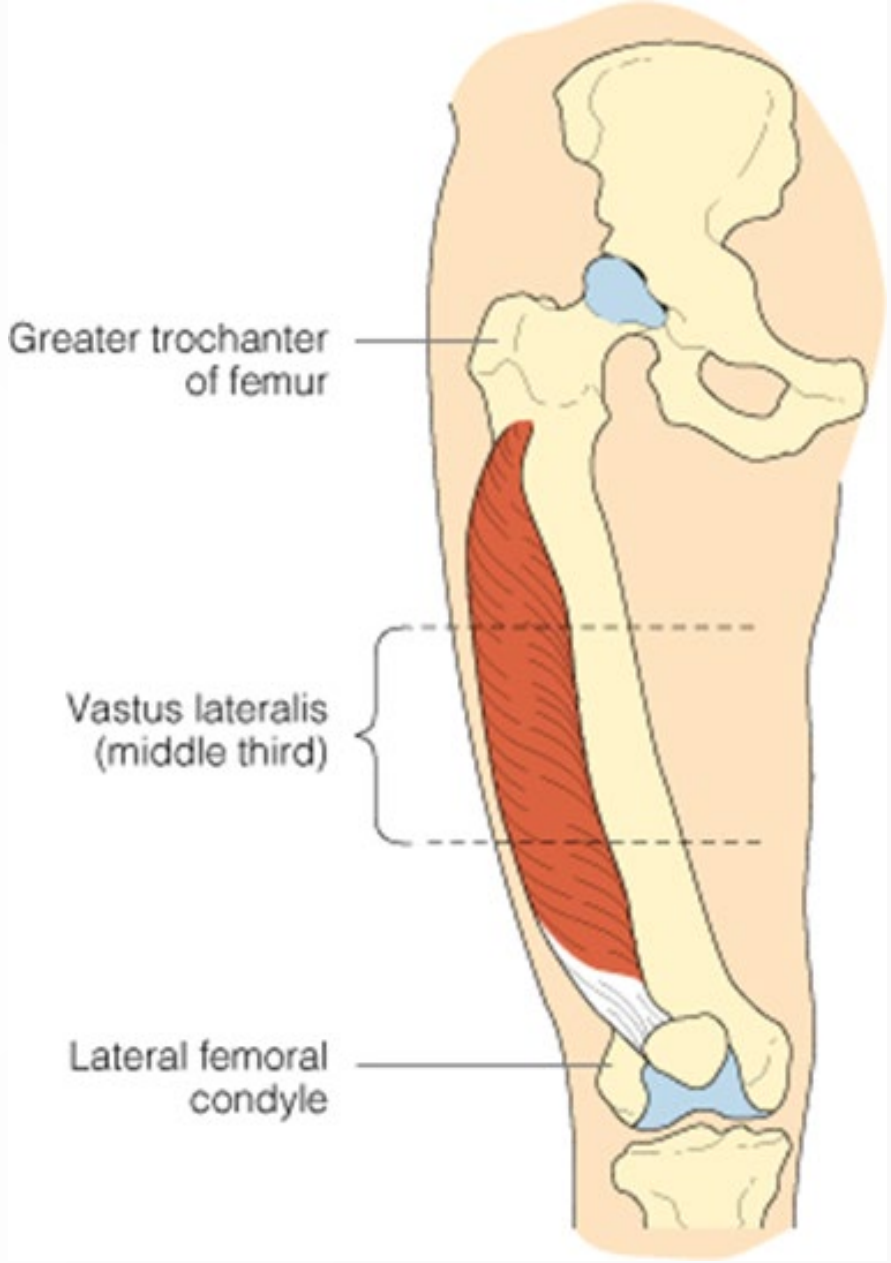
- Intramuscular (IM)
  - Vastus lateralis
  - Onset of action is 3-5 minutes



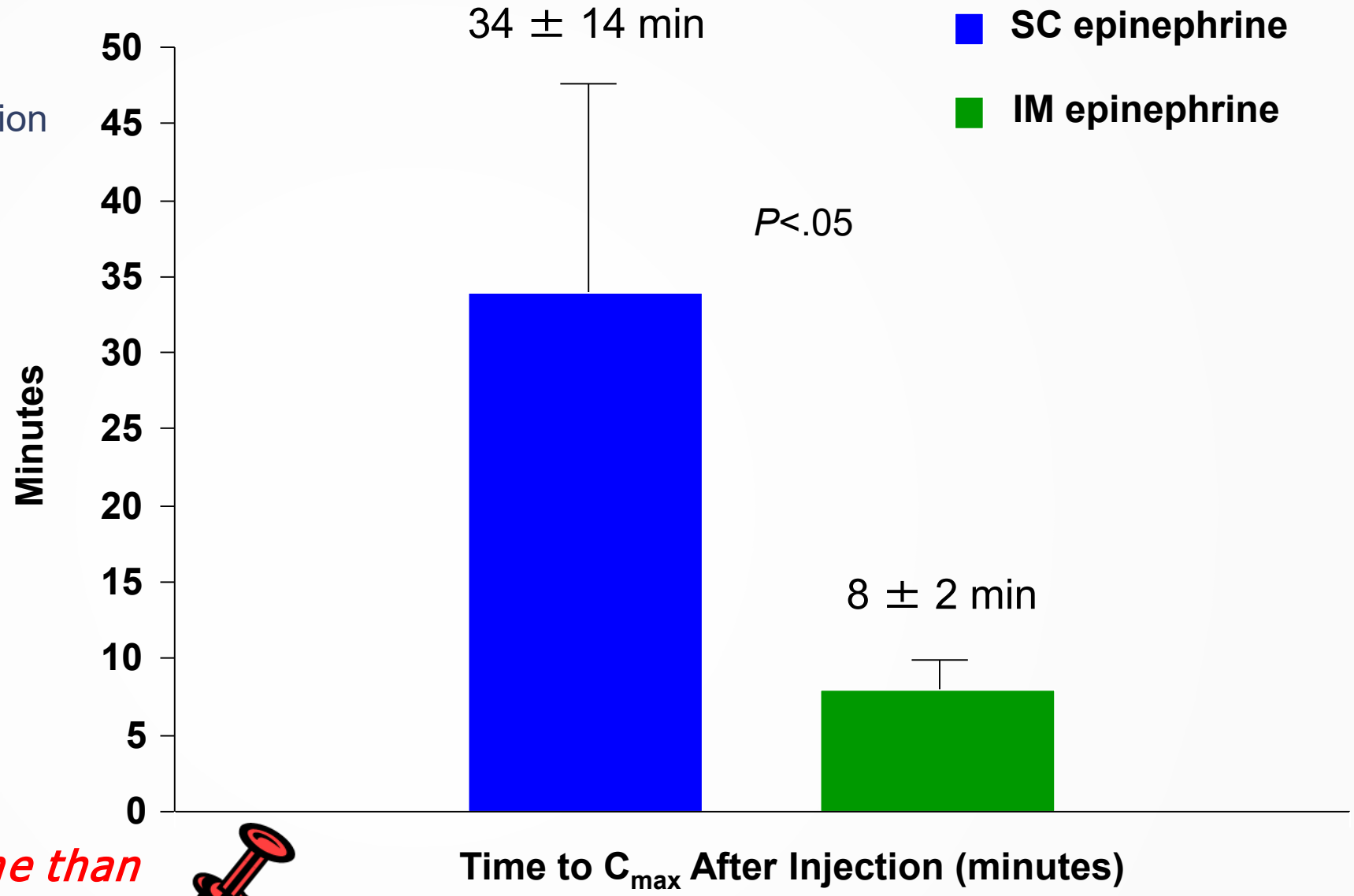


1. Right Patient
2. Right Medication
3. Right Dosage/Concentration
4. **Right Route**
5. Right Documentation

- **Locate the injection site**
  - Place little finger of one hand on the greater trochanter.
  - Place little finger of the other hand on the lateral femoral condyle.
  - The center of the space between thumbs is the injection site.

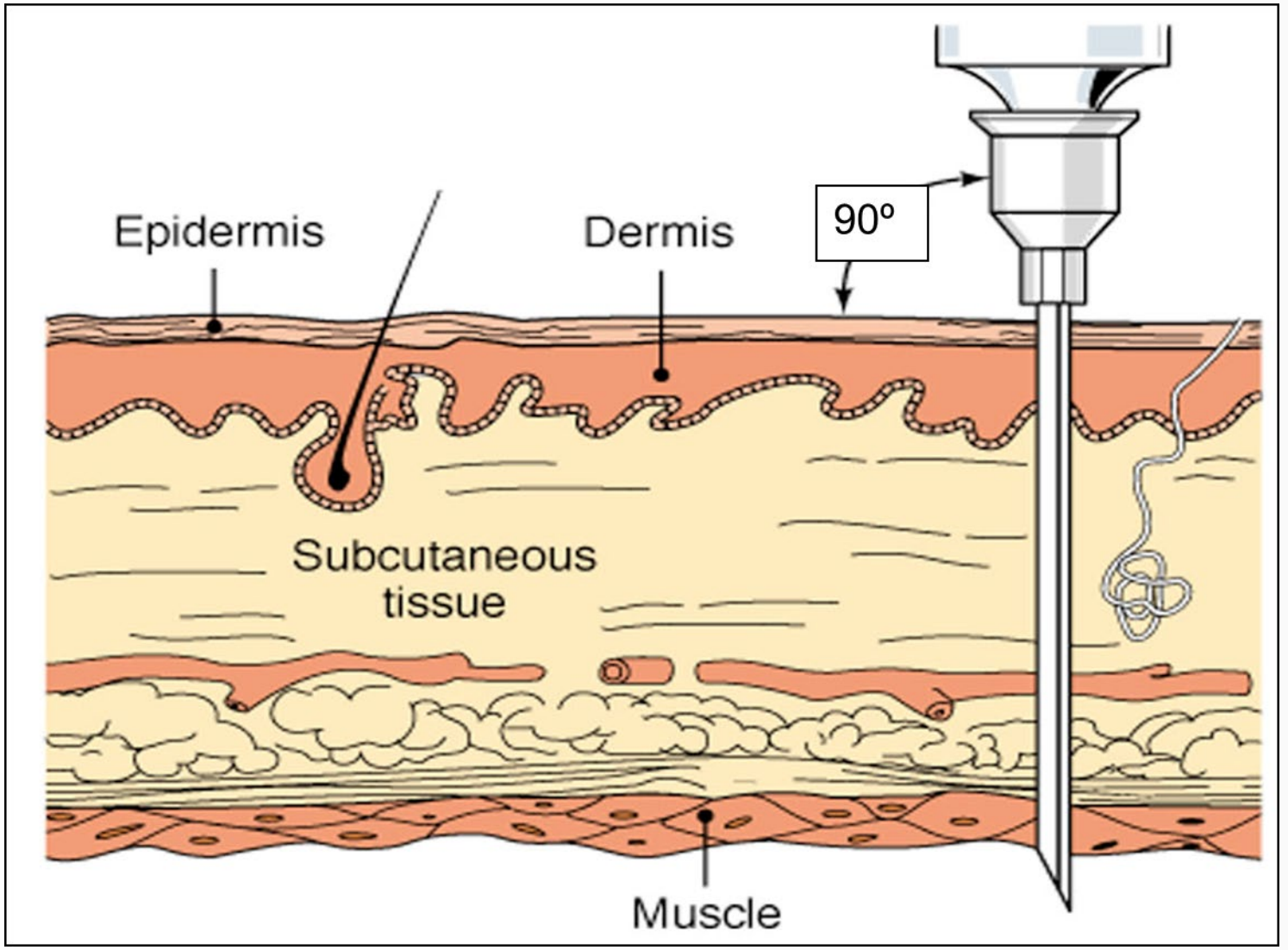


1. Right Patient
2. Right Medication
3. Right Dosage/Concentration
4. **Right Route**
5. Right Documentation



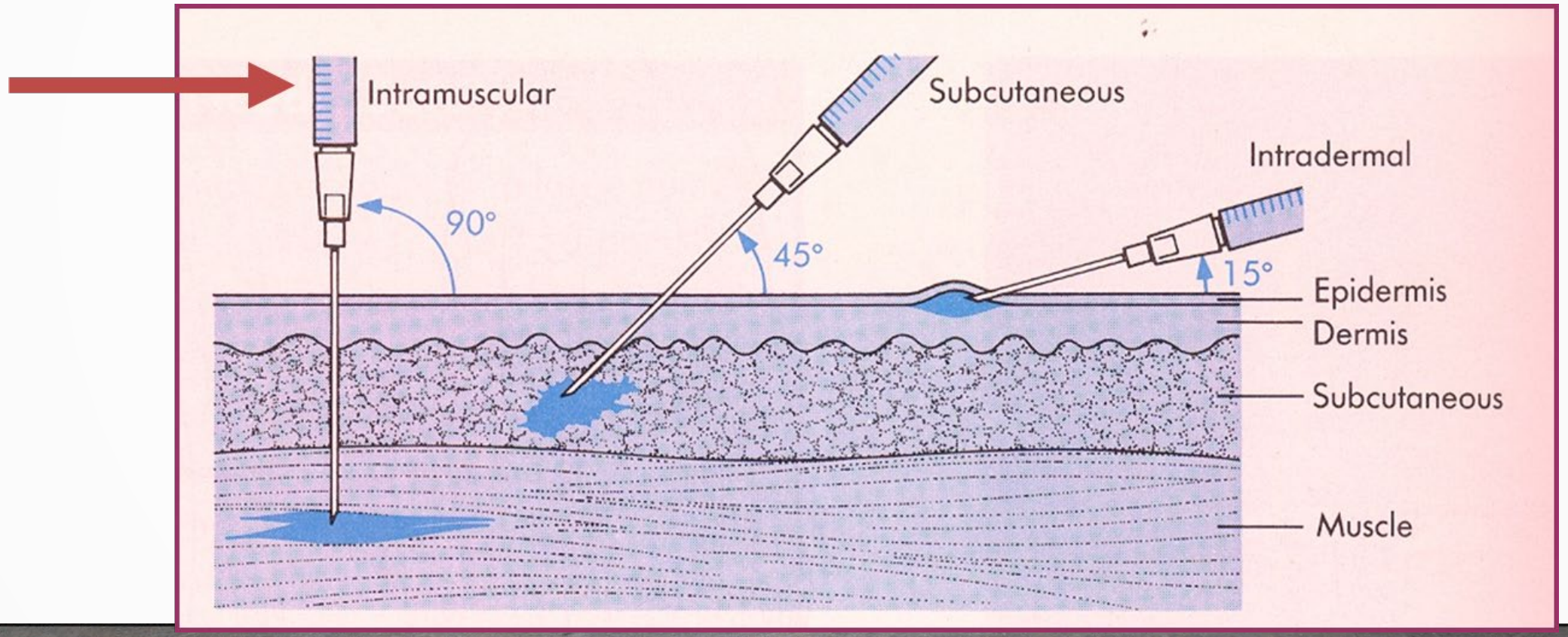
Why does SC take more time than IM in anaphylaxis?

1. Right Patient
2. Right Medication
3. Right Dosage/Concentration
4. **Right Route**
5. Right Documentation



1. Right Patient
2. Right Medication
3. Right Dosage/Concentration
4. **Right Route**
5. Right Documentation

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



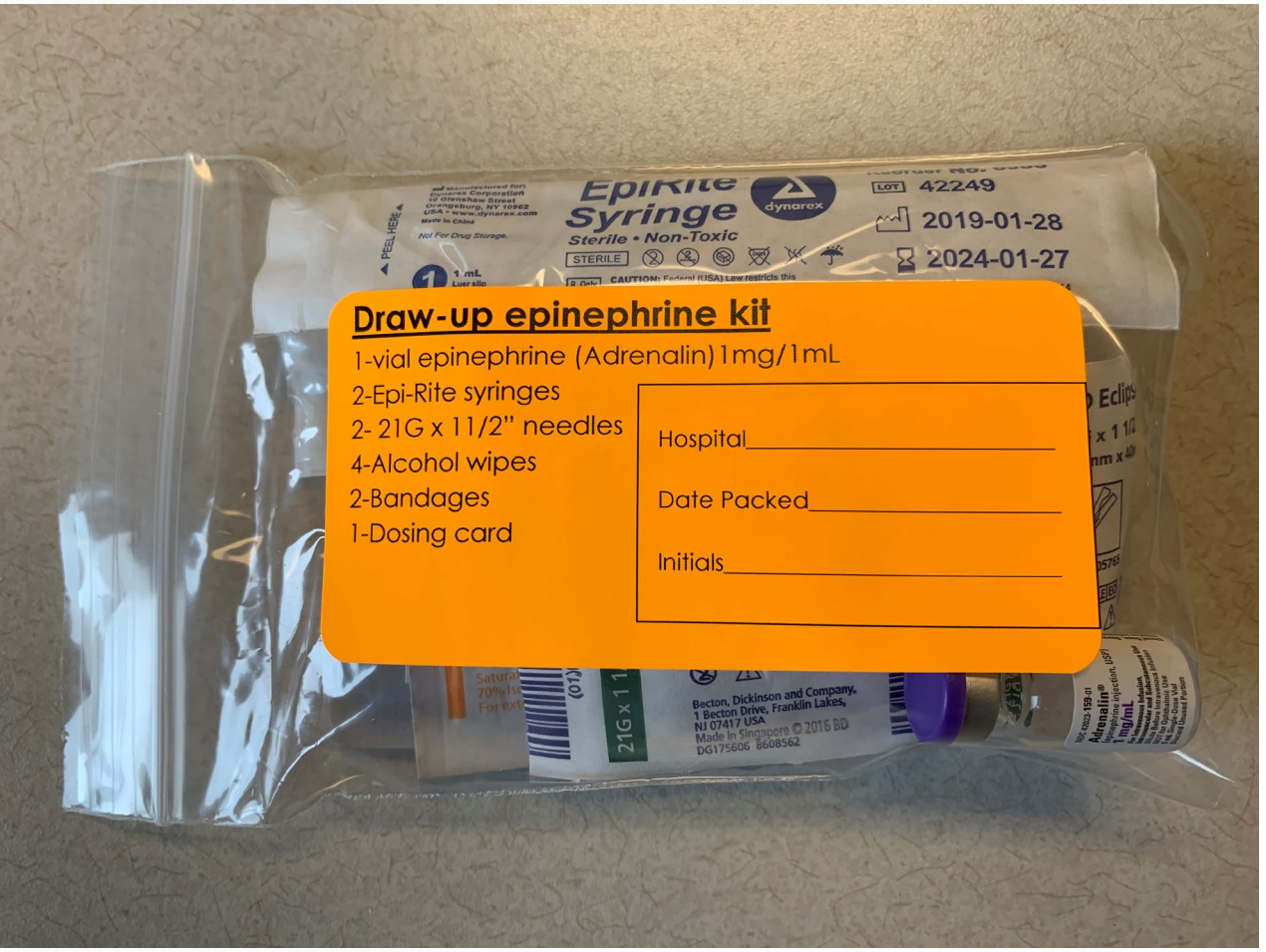
1. Right Patient
2. Right Medication
3. Right Dosage/Concentration
4. Right Route
5. **Right Documentation**

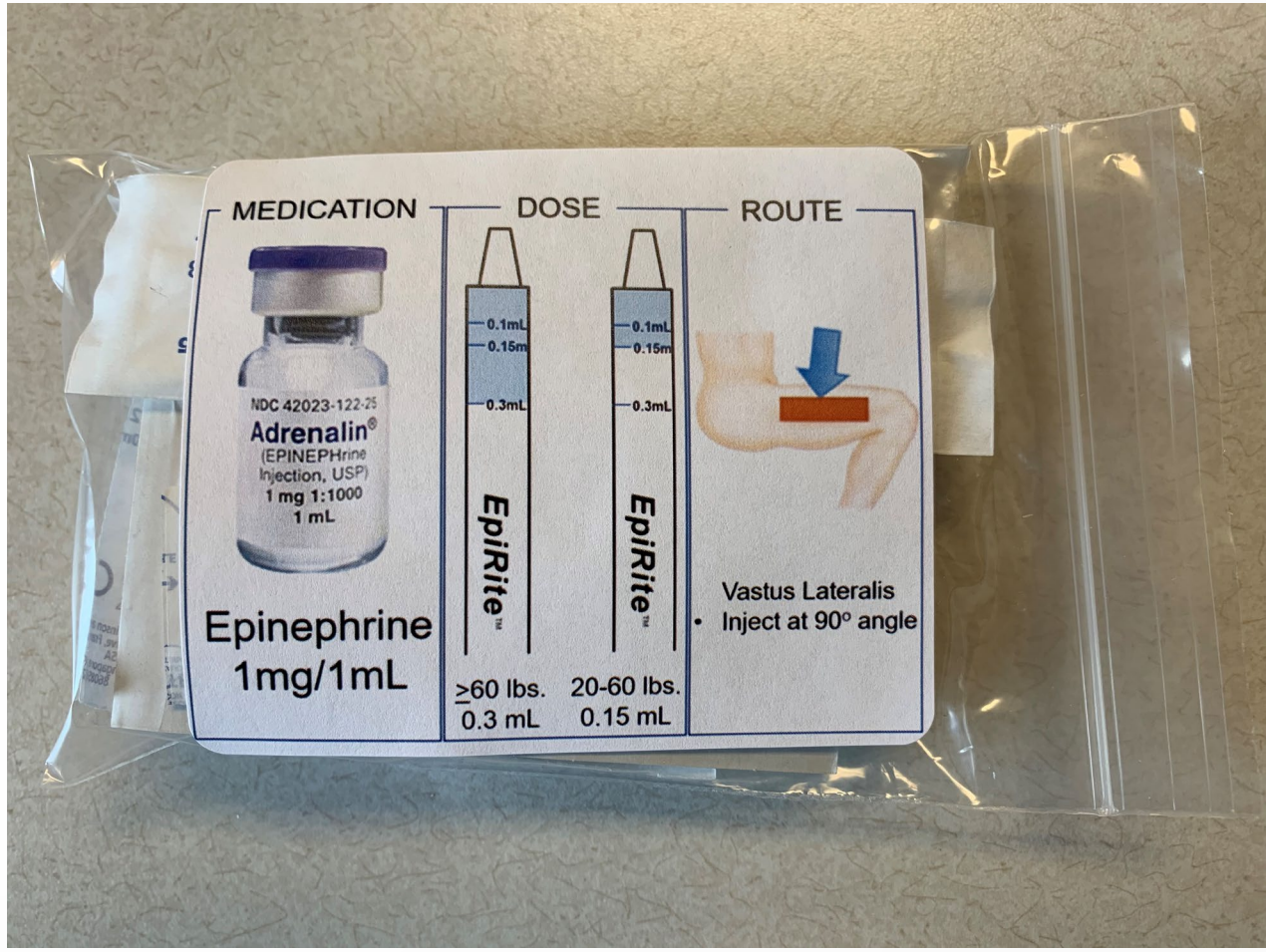
- Signs and symptoms of the patient
- Vital signs
- Indications for the treatment of anaphylaxis using epinephrine
- Dose, route, and time of the medication
- Response to medication
  - Vital signs, work of breathing, lung sounds, skin signs, changes in ability to speak
  - Document both positive and negative changes

Draw Up and Administration of Epinephrine

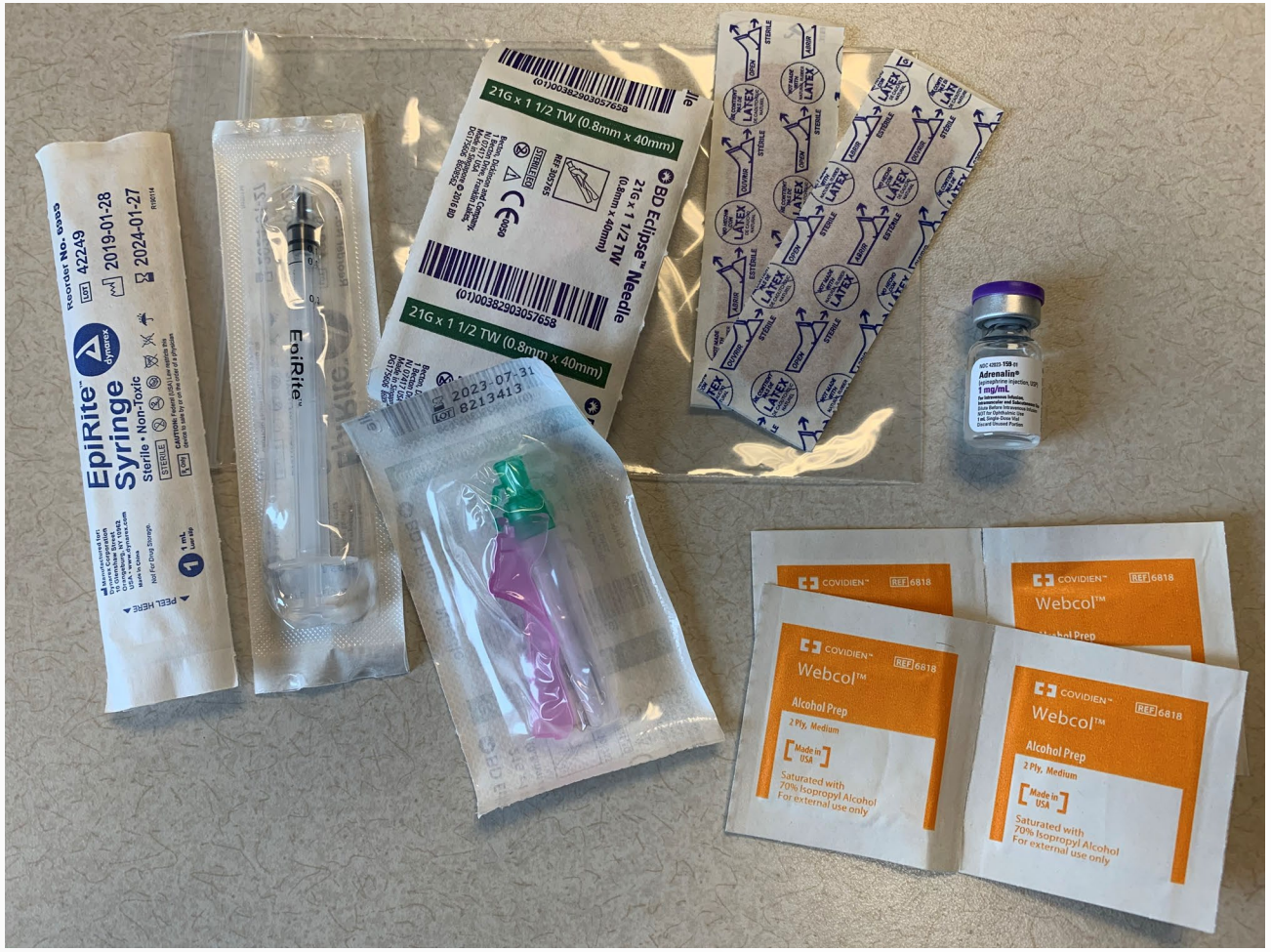
Skills Section

STMCA Epinephrine Kit





STMCA Epinephrine Kit



- Epinephrine vial 1mg in 1mL
- 2 – EpiRite Syringes
- 2 – 21 ga. 1 ½” Safety Needles
- 4 – Alcohol Preps
- 2 – Adhesive bandages

PPE

- Always use the appropriate PPE when drawing up and using any medication.

Confirm Medication

- Medication Name
- Concentration (1mg/1mL)
- Expiration Date
- No color; not cloudy, no precipitate

Remove Cap and Clean the Vial's Rubber Top

Select Site and Cleanse

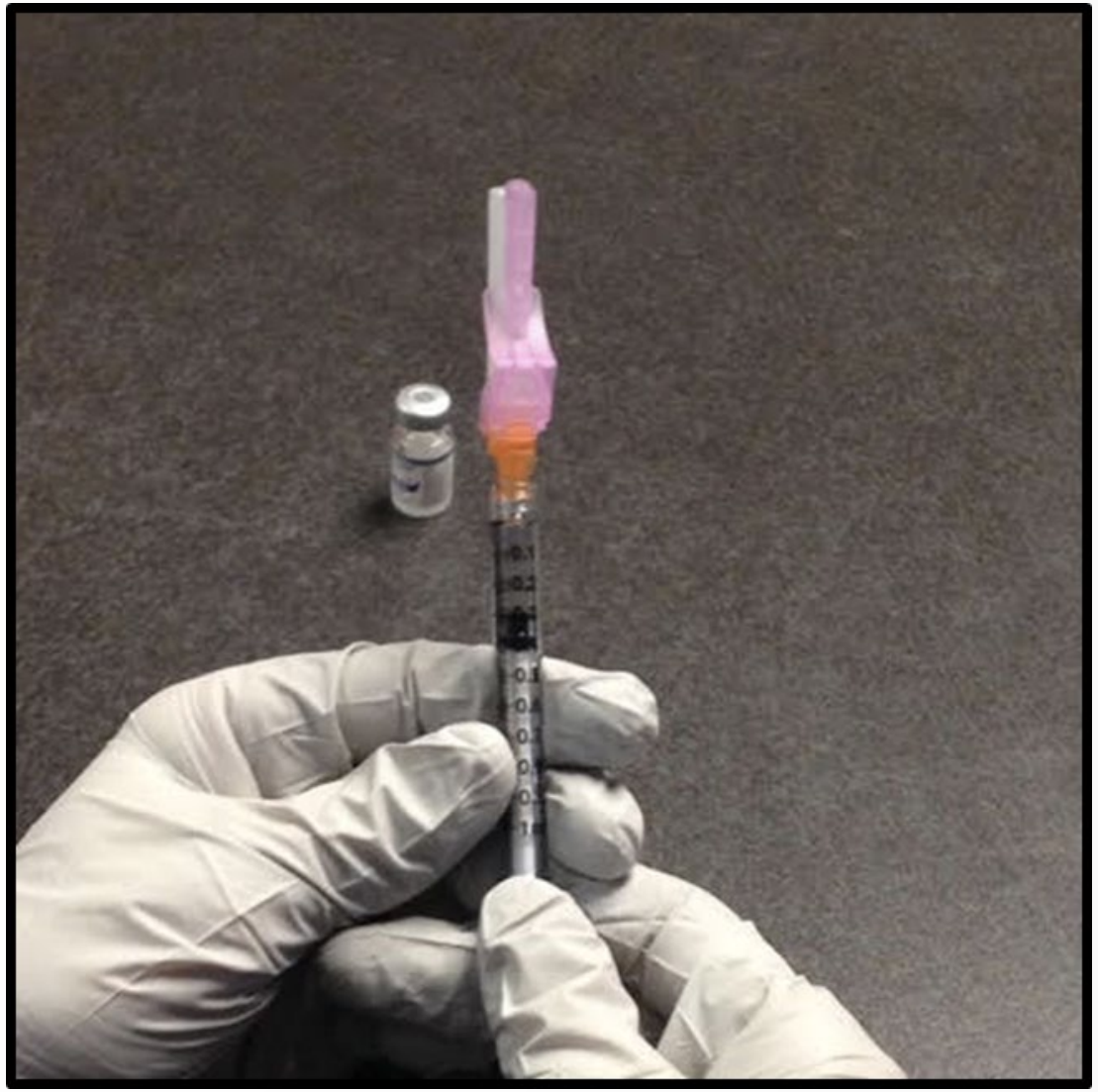
- Locate the injection site

- Cleanse the area with alcohol.
- Allow to air dry.

Attach Needle To The Syringe

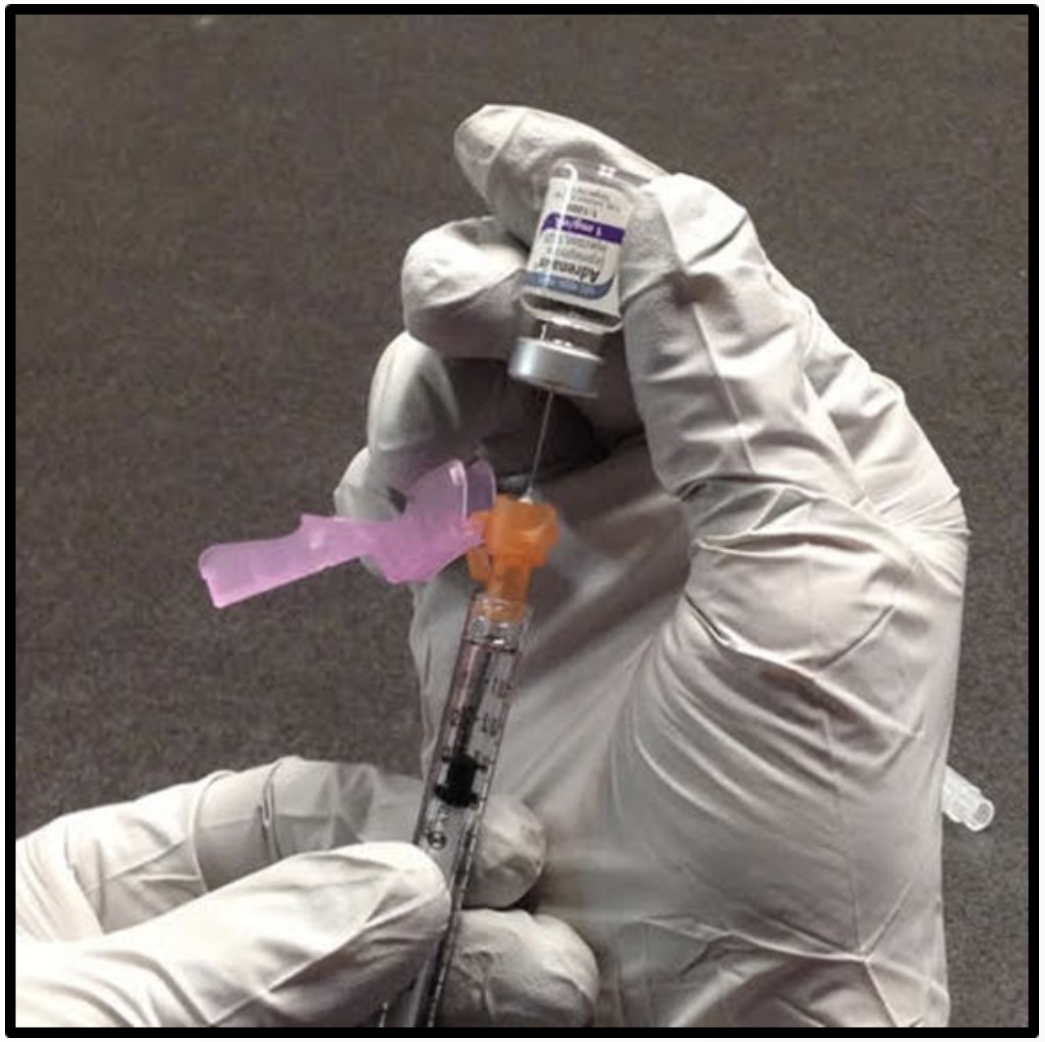
Prepare The Syringe

- With the needle cap on, pull back the plunger to appropriate dosage.
- You will inject the same amount of air into the vial before you withdraw the medication



Inject Air and Withdraw Medication

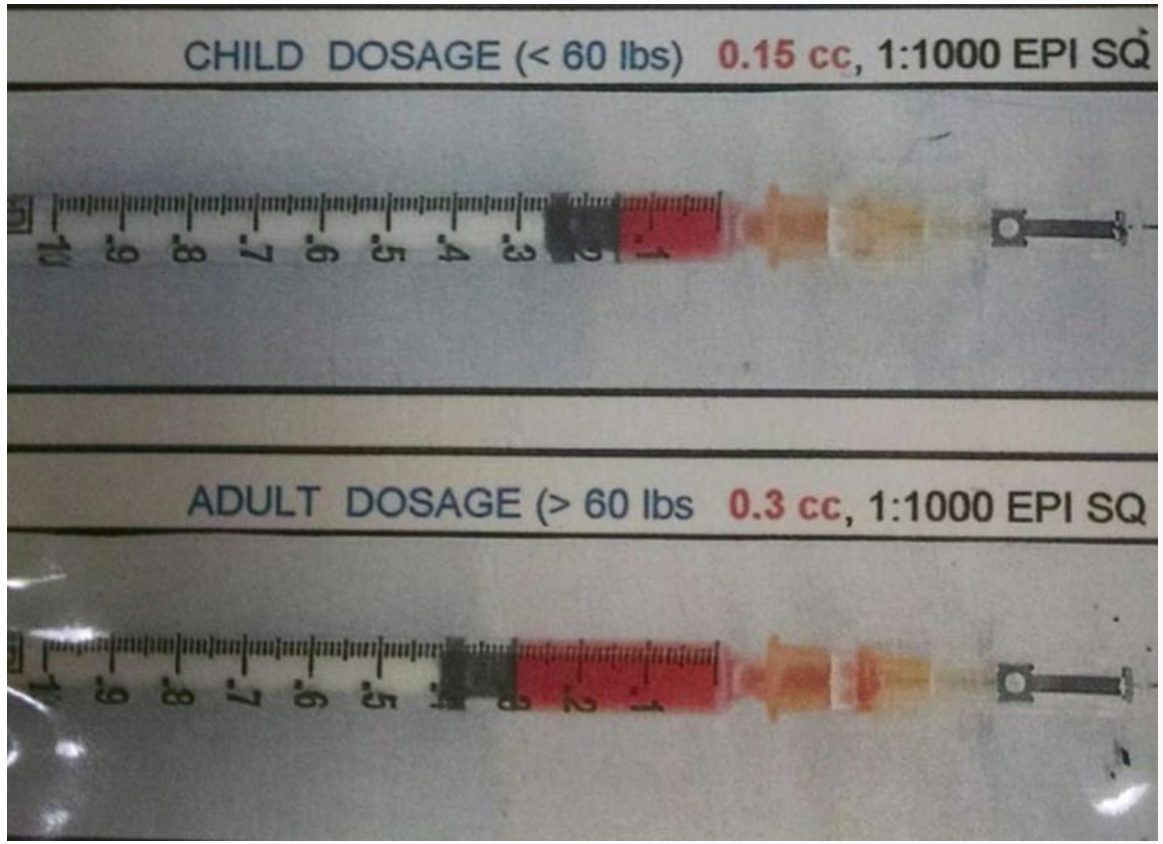
- Insert needle through rubber stopper.
- Inject air into the vial.
- Pull the plunger back and withdraw the correct amount of medication.
- Make sure the tip of the needle is near the cap of the vial so you don’t draw up air.



Withdraw the Needle and Remove Air Bubbles

Confirm The Dosage

- ADULT – 0.3mL
- PEDS – 0.15mL
- VERIFY THE DOSAGE AND CONFIRM WITH A PARTNER!



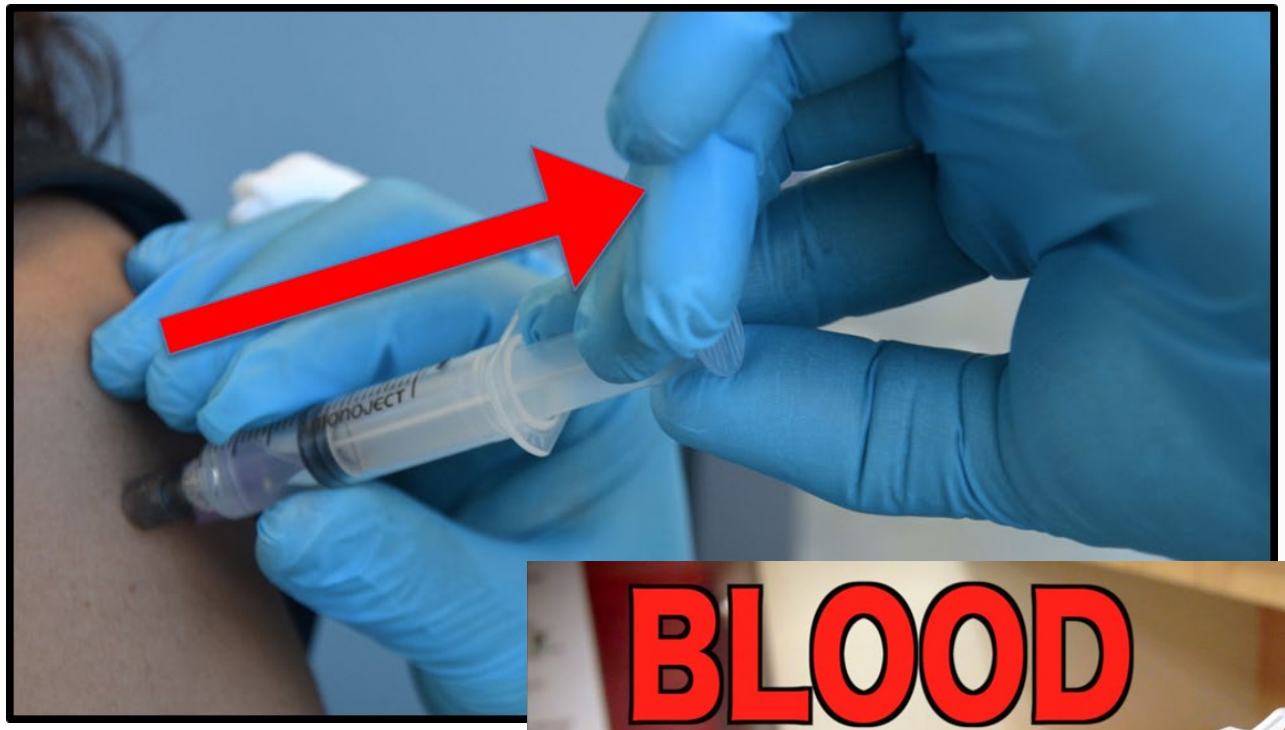
Squeeze the muscle to increase the size and depth of the injection site

Insert The Needle

- Inform the patient they will feel a poke.
- Insert the needle in a smooth motion at a 90 degree angle.

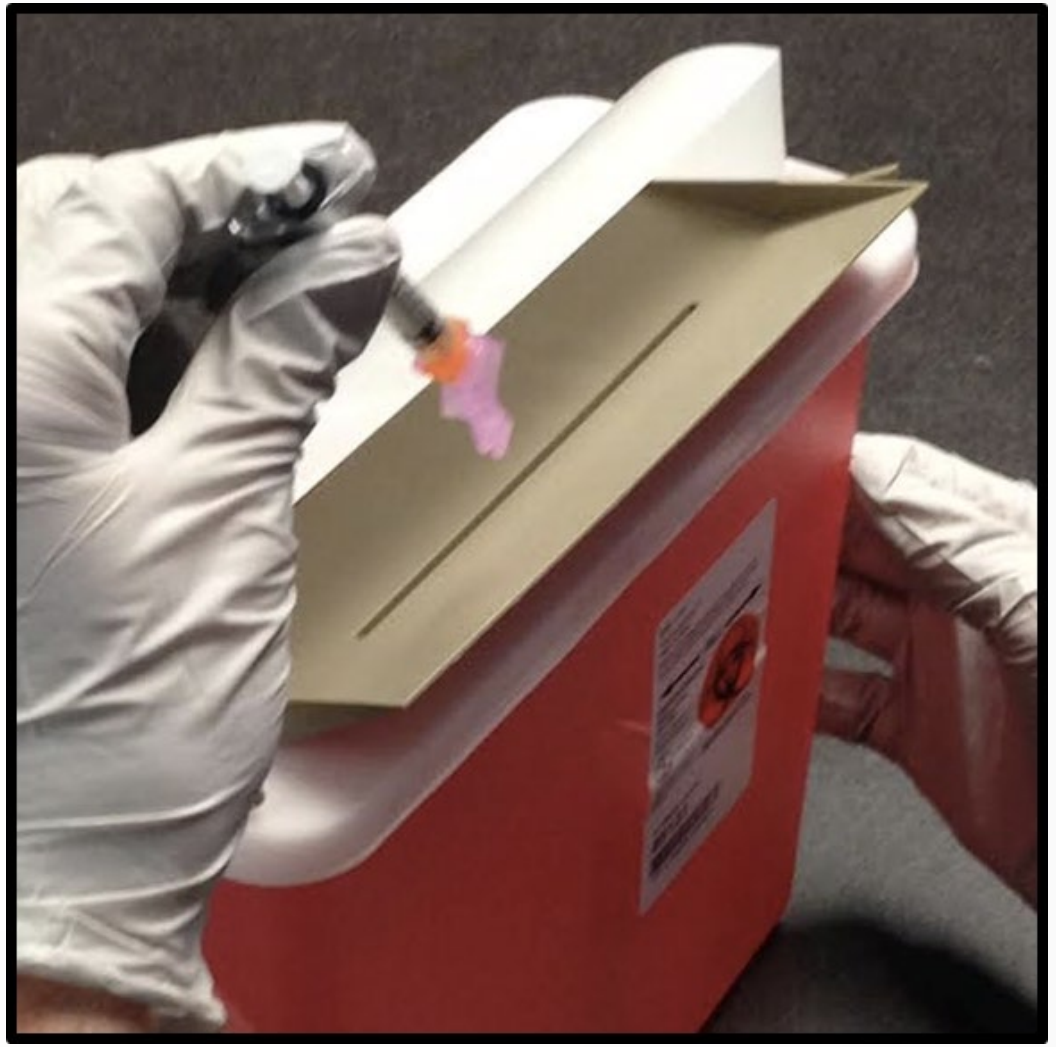
Aspirate & Inject

- Pull back on the plunger to ensure there is no blood return.
  - If blood is noted, withdraw immediately and start over
- Inject the entire amount of medication then withdraw the needle and syringe.



Dispose

- On safety needles, place the cap over the needle until is clicks.
- Remove the needle and immediately place in a sharps container.

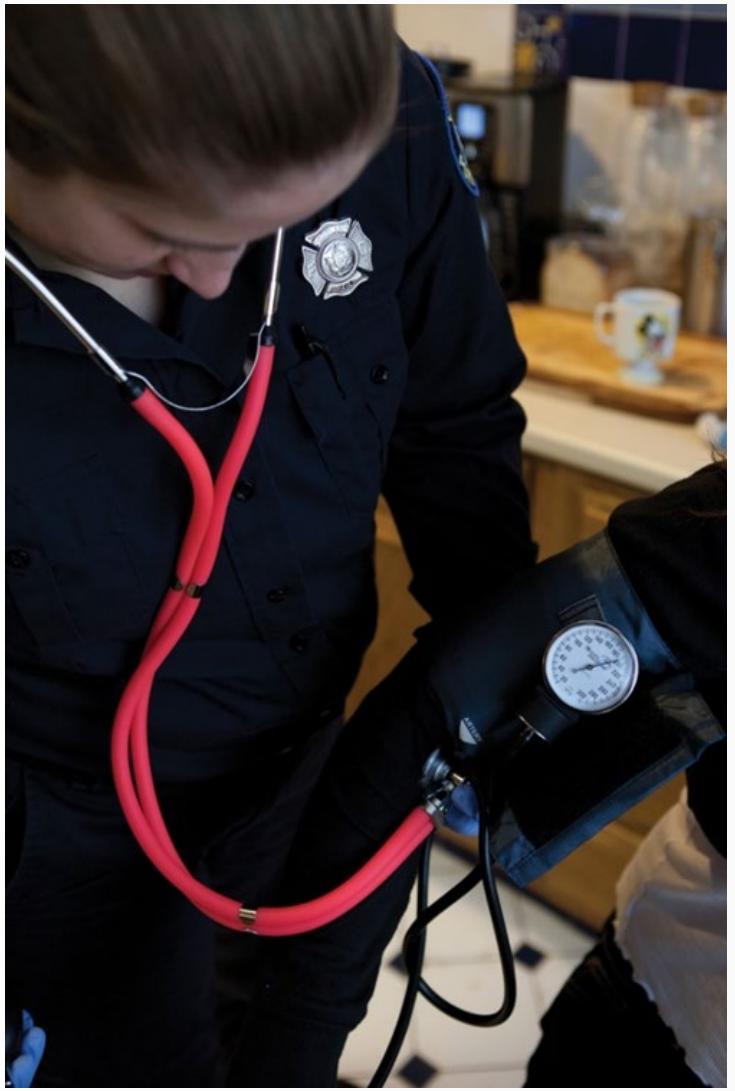


Cover The Site

- Place a bandage over the injection site.
- Massage the site to promote absorption.

Reassess The Patient

- LOC
- Appearance
- Respiratory Distress
- V/S
- Change in symptoms



Document

- Describe the patient presentation that dictated the need for epinephrine:
  - Dyspnea
  - Oral swelling
  - Dysphagia (difficulty swallowing)
  - Tachycardia
  - Hypotension
  - Cyanosis

- Document the dosage, time, and location of injection
- Document all post administration changes

Continued Treatment

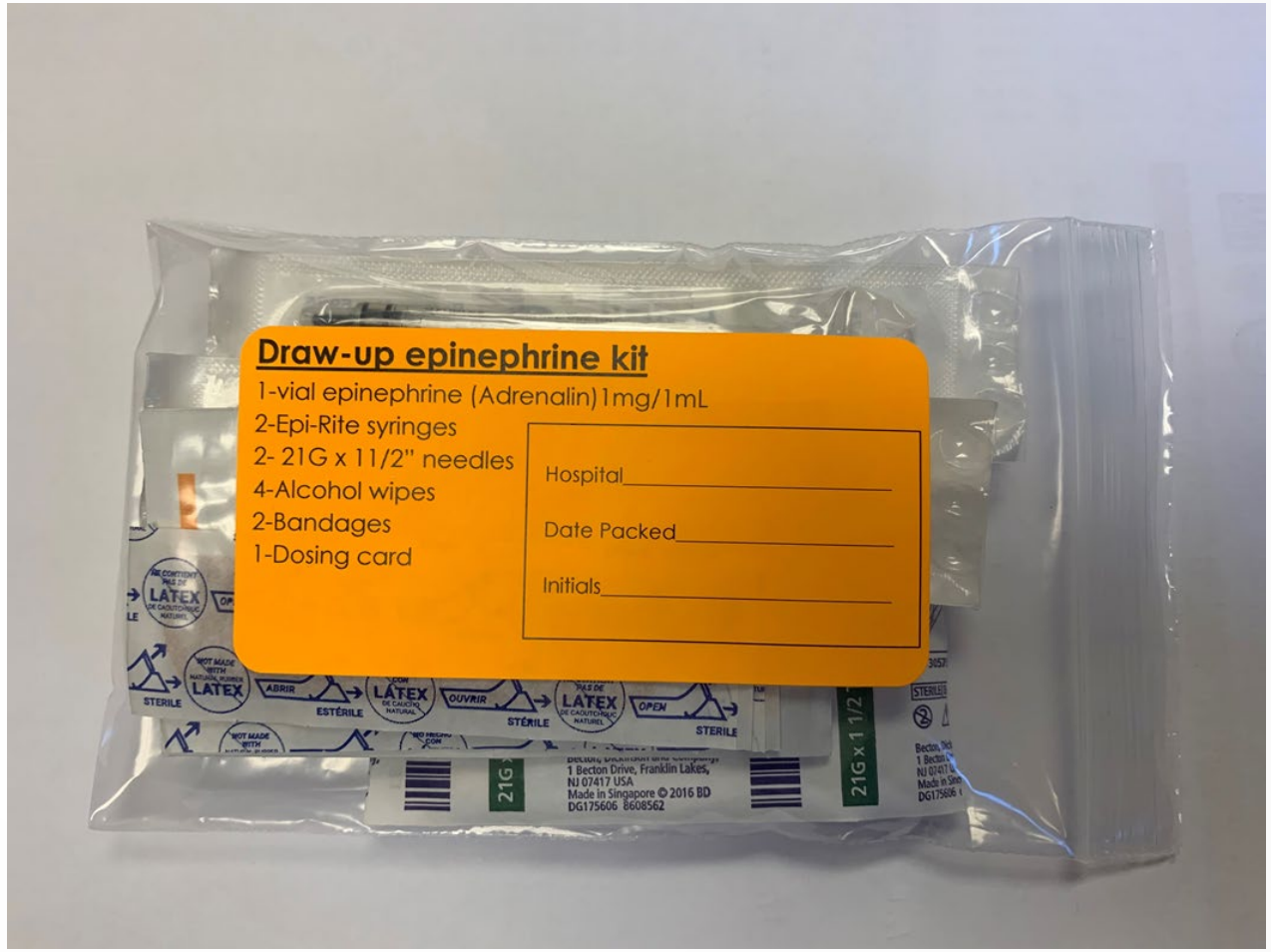
- Oxygen as needed
- BLS/EMT-B
  - Nebulized breathing treatments (albuterol)
- EMT-P
  - Aggressive fluid replacement
  - EKG monitoring
  - Anti-histamines (diphenhydramine)
  - Cortico-steroids (Solu-Medrol or prednisone)

Continued Treatment

- Epinephrine may need to be repeated every 3-5 minutes if hypotension and/or respiratory compromise persists.
- Contact Medical Control

Replacing the Epi Kit

- MFR and BLS units may exchange their kit with the responding ambulance



Medication Storage

- Keep medications from direct sunlight
- Do not freeze
- Store in a secured location

Case #1

- 7 year-old male patient complains of oral swelling, hives, and abdominal cramping after coming home from school.
  - BP 90/60, HR 110, RR 24
  - Patient's mother says he weighs 70 lbs.
- Mother says that he does not have allergies but was seen by a pediatrician 2 months ago when he had hives from eating a walnut brownie. During that episode, mother was told to give him an antihistamine and the episode subsided.
- Mother gave antihistamine again 2 hours prior to calling 9-1-1.
- *Should this patient receive epinephrine?*
- *What would the dose be?*

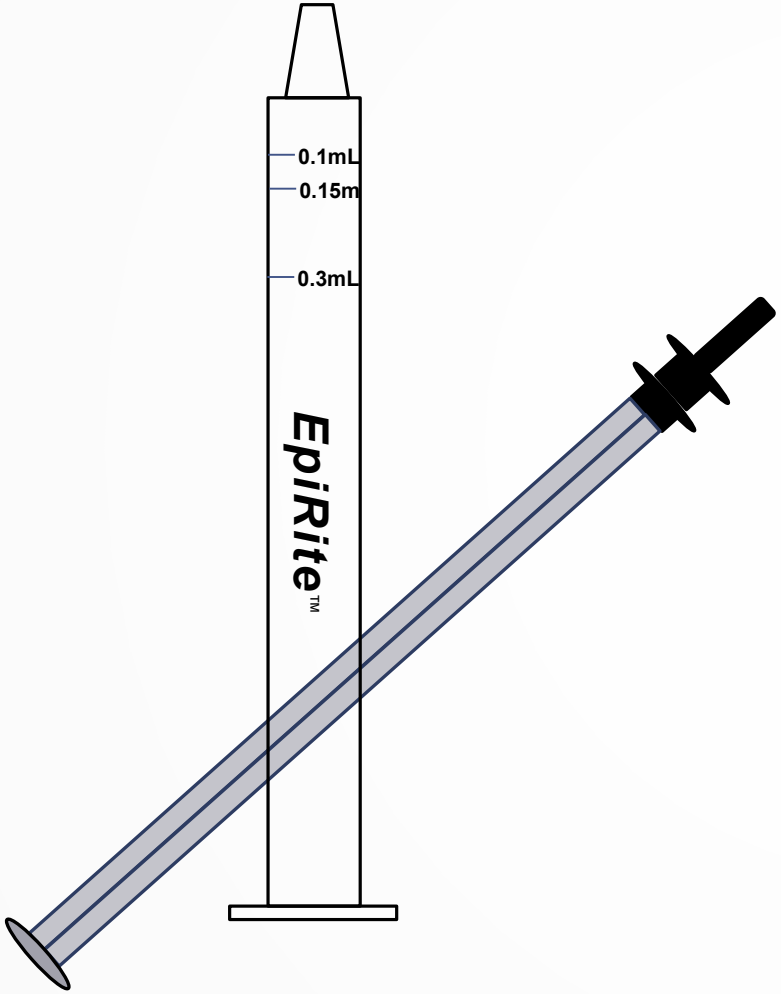
Case #2

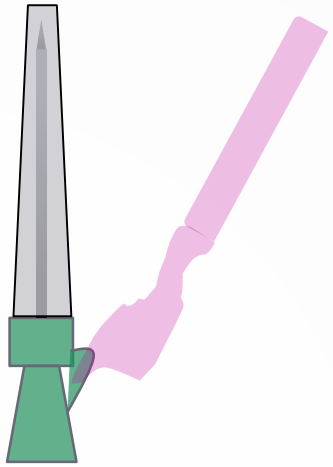
- A 66 year-old female was working in the yard when she was stung by a bee or wasp. She has an allergy to insect stings and says that she had her epinephrine pen and self-administered it 5 minutes prior to your arrival. When you look at the pen, it was not expired and appears to have discharged.
- She complains of tightness in the throat and dysphagia. She appears pale and sweating with a thready radial pulse.

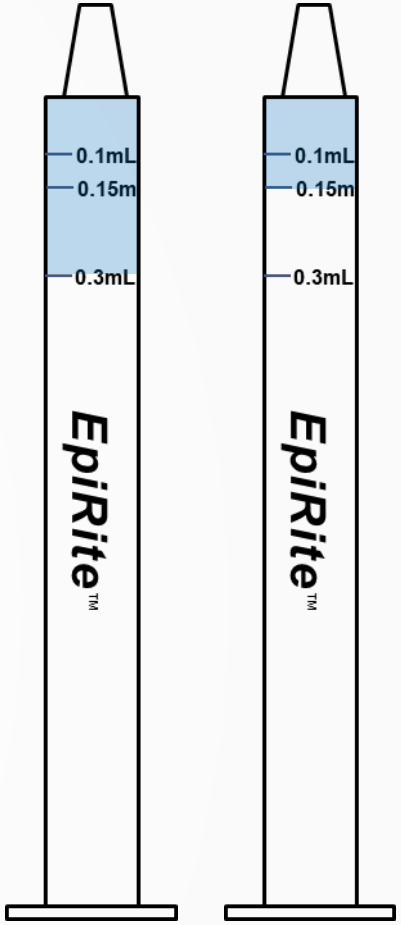
- *Should this patient receive epinephrine from EMS? If so, why?*

Review

- Mild vs. severe allergic reactions
- Dose for epinephrine?
  - Adult
  - Pediatrics
- What is the weight range for pediatric patients with respect to epinephrine administration?
- What do you do if you aspirate blood after inserting the needle for an IM injection?


0.1mL
0.15m
0.3mL
EpiRite™




0.1mL
0.15m
0.3mL
EpiRite™
0.1mL
0.15m
0.3mL
EpiRite™