- بسم الله الرحمن الرحيم

ACUTE TREATMENT OF ANAPHYLAXISE

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Grade	Symptoms			
	Skin	GI	Respiratory	Cardiovascular
I	Local pruritis Flushing Urticaria Angioedema			
II	Same as above	Nausea Cramping	Rhinorrhea Hoarseness	Tachycardia (>20 bpm) Blood pressure Δ (>20 mmHg systolic) Arrhythmia
III	Same as above	Vomiting Defecation Diarrhea	Laryngeal edema Bronchospasm Cyanosis	Shock
IV	Same as above	Same as above	Respiratory arrest	Cardiac arrest

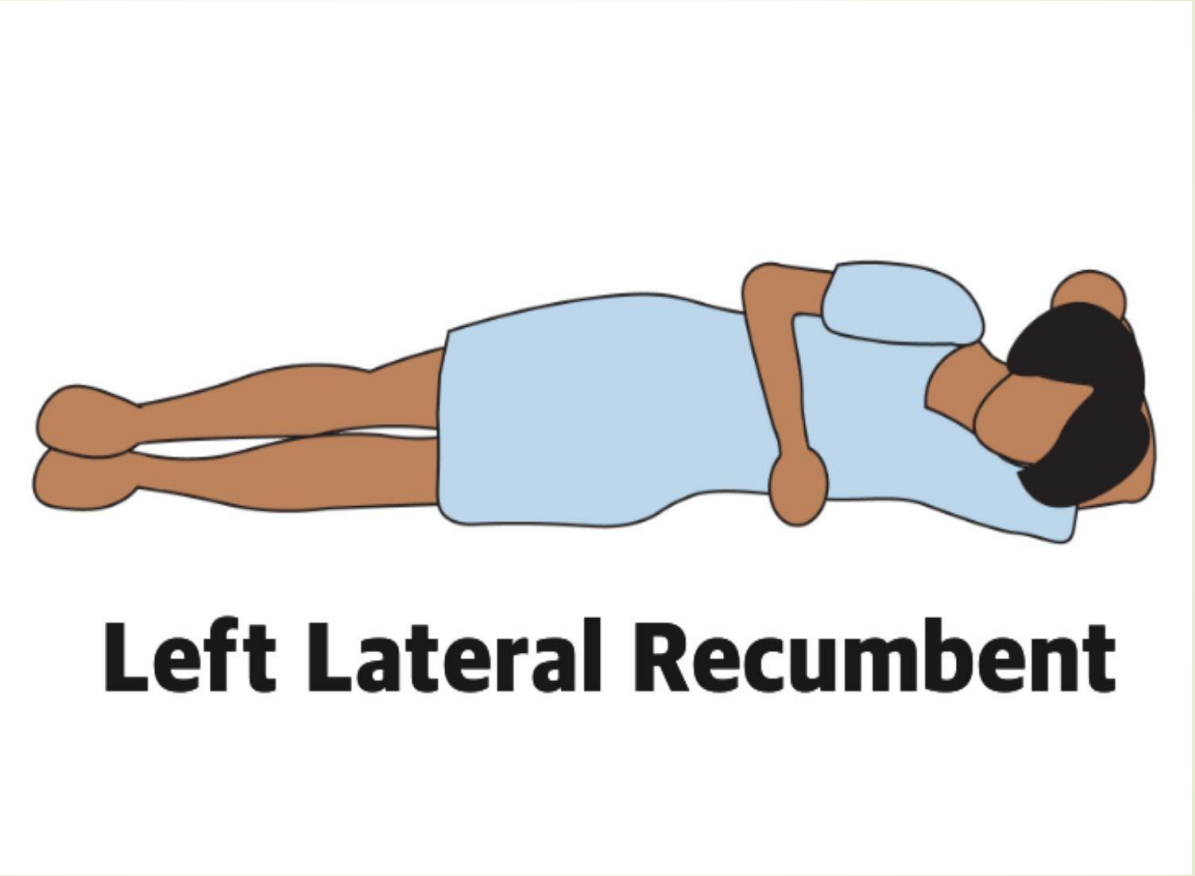
The management of anaphylaxis

- when a patient has anaphylaxis it is important to follow this steps:
- Remove exposure to the trigger if possible (discontinue administration of drugs/therapeutic agents)
- Assess airways, breathing, circulation ,mental status, and skin
- Simultaneously call emergency services, injecting epinephrine(adrenaline) intramuscularly into the vastus lateralis of the quadriceps (antero-lateral thigh), and positioning the patient according to his/her presenting features.

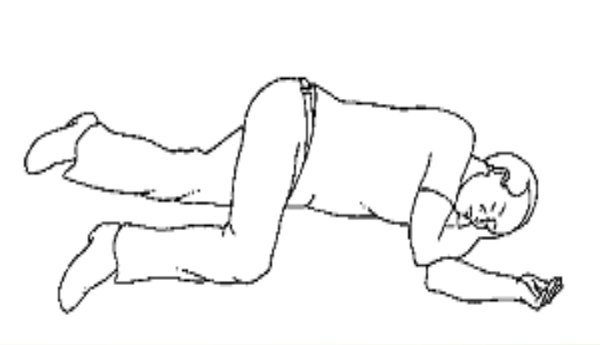
The management of anaphylaxis(position)

- Most patients should be placed in a supine position during anaphylaxis unless there is respiratory distress in which case a sitting position may optimize respiratory effort
- If pregnant, position the patient in a semi-recumbent position on the left side
- If unconscious, place in the recovery position.
- The benefit of elevation of the lower extremities (Trendelenburg position) is controversial.

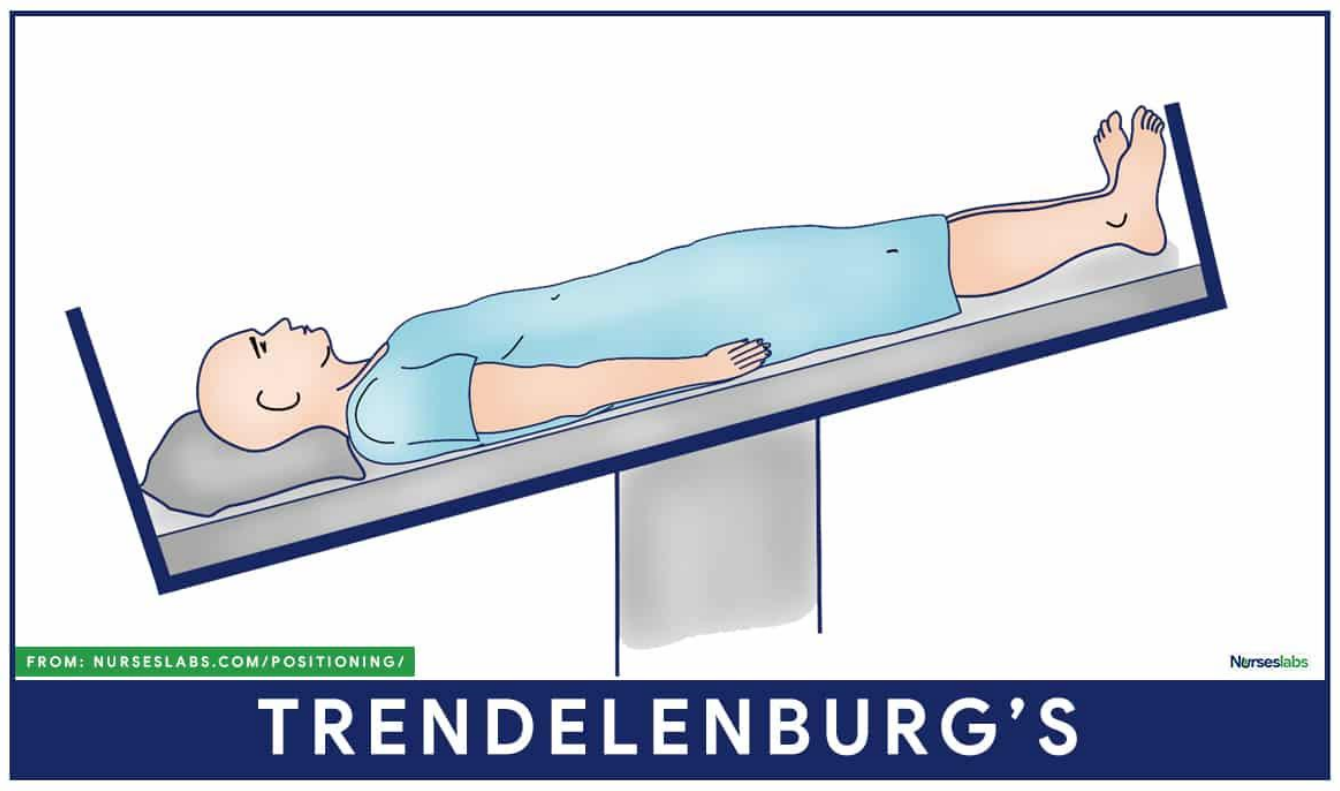
Sitting position


Left Lateral Recumbent

Recovery position



Trendelenburgs position



The management of anaphylaxis

- The management of anaphylaxis continues upon transfer to a healthcare setting (including in the ambulance) with:
- High flow oxygen (preferably100% using a non-rebreather facemask) to all patients with respiratory distress
- Those receiving further doses of epinephrine
- Establish intravenous access using needles or catheters with a wide bore cannula (14 or 16 gauge for adults);

The management of anaphylaxis

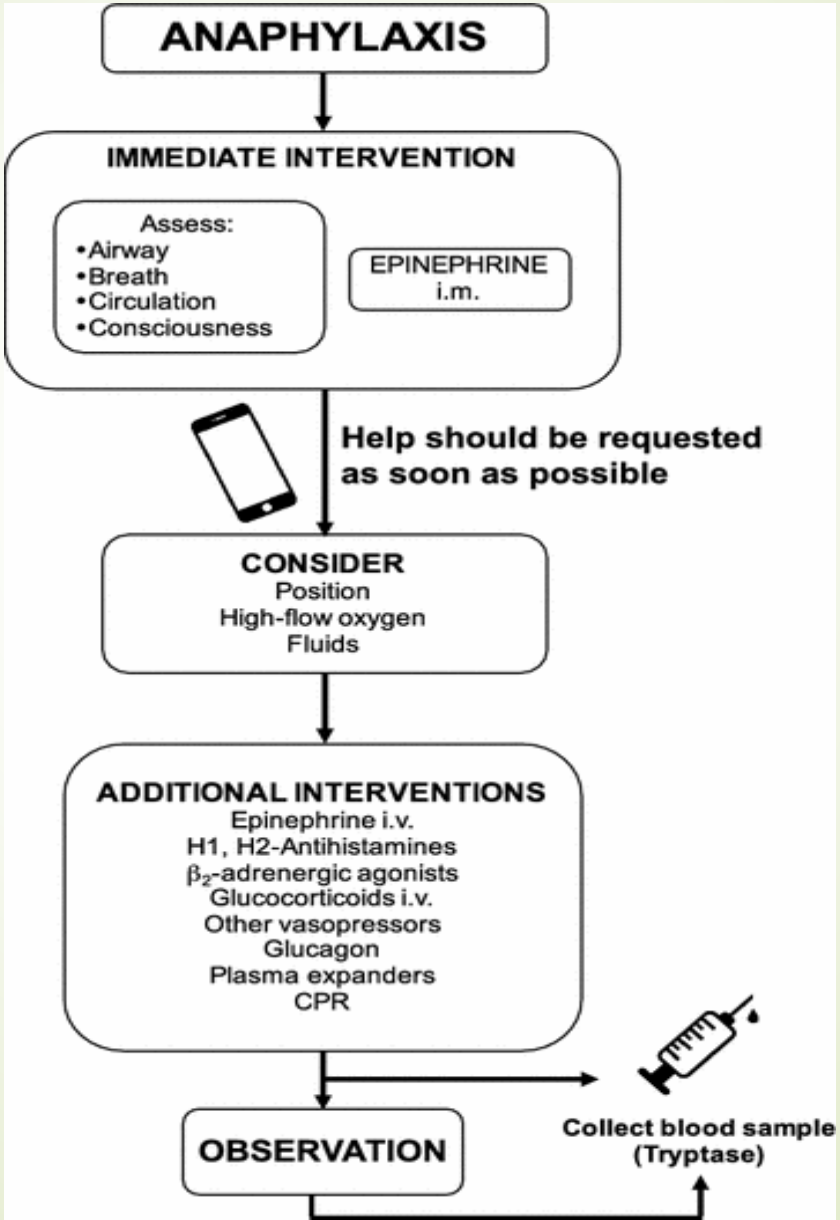
- *Intravenous fluids to patients with cardiovascular instability(20 mL/kg bolus using crystalloids).*
- *Where indicated, perform cardiopulmonary resuscitation with continuous cardiac compressions.*

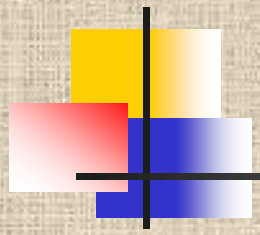
The management of anaphylaxis

- In patients with anaphylaxis and symptoms of bronchoconstriction, inhaled short-acting beta-2agonists can be given (salbutamol/albuterol).
- Bronchodilators given by inhalation or nebulization are not an alternative to the repeated administration of intramuscular epinephrine (adrenaline) in the presence of ongoing symptoms.

The management of anaphylaxis

- In case of upper airway obstruction, consider nebulized epinephrine.
- At frequent and regular intervals, evaluate the patient's blood pressure, heart rate and perfusion, and respiratory and mental status.


ANAPHYLAXIS
IMMEDIATE INTERVENTION
Assess:
•Airway
•Breath
•Circulation
•Consciousness
EPINEPHRINE
i.m.
Help should be requested
as soon as possible
CONSIDER
Position
High-flow oxygen
Fluids
ADDITIONAL INTERVENTIONS
Epinephrine i.v.
H1, H2-Antihistamines
β2-adrenergic agonists
Glucocorticoids i.v.
Other vasopressors
Glucagon
Plasma expanders
CPR
OBSERVATION
Collect blood sample
(Tryptase)



- *Removal of venom sac*. Insect envenomation by bees (but not wasps) may leave a venom sac attached to the victim's skin. At some point during initial assessment, look at the sting site, and if you see a stinger, immediately scrape it or any insect parts at the site of the sting, using the dull edge of a knife.
- Avoid compressing or squeezing any insect parts near the skin because squeezing may increase envenomation

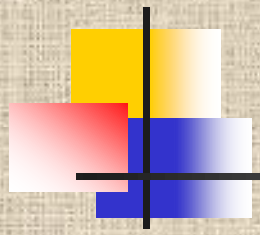
Airway Obstruction

Early elective intubation is recommended for patients observed to develop hoarseness, lingual edema, stridor, or oropharyngeal swelling.

Patients with angioedema pose a particularly worrisome problem because they are at high risk for rapid deterioration

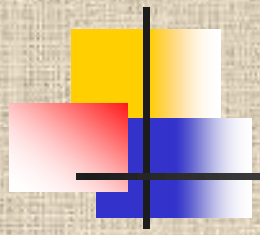
Aggressive volume expansion

- profound vasodilation
- Increases intravascular capacity
- Massive volume replacement is needed. At least 2 large-bore IVs with pressure bags to administer large volume (typically between 4 and 8 L) of isotonic crystalloid as quickly as possible

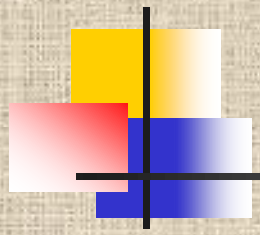


- *Asystole/Pulseless Electrical Activity (PEA) Algorithms*. The arrest rhythm in anaphylaxis is often PEA or asystole.

- *Prolonged CPR*. Effective CPR may maintain sufficient oxygen delivery until the catastrophic effects of the anaphylactic reaction resolve.



- *Oxygen*. Administer oxygen at high flow rates.
- *Epinephrine*
  - Administer epinephrine by IM injection early to all patients with signs of a systemic reaction, especially hypotension, airway swelling, or definite difficulty breathing.
  - Use an IM dose of 0.3 to 0.5 mg (1:1000) repeated every 15 to 20 minutes if there is no clinical improvement



- Administer IV epinephrine if anaphylaxis appears to be severe with immediate life-threatening manifestations
- Use epinephrine (1:10 000) 0.1 mg IV slowly over 5 minutes. Epinephrine may be diluted to a 1:10 000 solution before infusion.
- An IV infusion at rates of 1 to 4 µg/min may prevent the need to repeat epinephrine injections frequently

High-dose epinephrine IV

- Use a rapid progression to high dose without hesitation in patients in full cardiac arrest.
- A commonly used sequence is 1 to 3 mg IV (3 minutes), 3 to 5 mg IV (3 minutes), then 4 to 10 µg/min infusion

IM Epinephrine

- First line therapy!
- Has alpha-1, beta-1, and beta-2 agonist actions
  - Increased vascular resistance and decreased mucosal edema (alpha-1)
  - Increased inotrophy and chronotrophy (beta-1)
  - Increased bronchodilation and decreases release of mast cell and basophil mediators (beta-2)
- Only 18% reported use in pediatric anaphylaxis cases

Intramuscular Epinephrine

- Despite intramuscular epinephrine (adrenaline)being the first-line drug recommended to treat anaphylaxis, its use remains suboptimal.
- The dose recommended for use by healthcare professionals is 0.01 mg/kg of body weight, to a maximum total dose of 0.5 mg, given by the intramuscular route .
- Dosing should be repeated every 5–15 min if symptoms are refractory to treatment. Epinephrine administered by the intramuscular route is generally well-tolerated.

Epinephrine

- Epinephrine can reverse bronchoconstriction and treat lower respiratory symptoms through its effect on b-2 adrenergic receptors .
- Epinephrine has been shown to activate b-2 adrenergic receptors on mast cells and basophils and prevent additional release of histamine and other mediators.
- Thus, epinephrine not only treats all symptoms associated with anaphylaxis but also can prevent the escalation of symptoms

Epinephrine

- A small study145 conducted in children 4 to 12 years of age demonstrated a higher mean peak plasma concentration and faster onset of action for intramuscular compared with subcutaneous administration of epinephrine.
- A similar study in adult males also demonstrated higher mean peak plasma concentration for intramuscular epinephrine in the thigh (compared with both intramuscular administration in the deltoid and subcutaneous administration in the deltoid region).

Epinephrine

- For pediatric patients, administration of epinephrine into the anterolateral thigh is preferred to the deltoid region as this likely decreases the risk for inadvertent intraosseous administration due to needle length.

Epinephrine

- Although potential epinephrine-related adverse events must be balanced in high-risk patients (elderly patients with multiple comorbidities and patients with complex congenital heart disease, pulmonary hypertension, prior epinephrine-associated cardiomyopathy), there is no absolute contraindication to epinephrine use in the treatment of anaphylaxis.

IM Epinephrine

- Dose: 0.01mg/kg of 1:1000
- Max dose is 0.3mg
- May repeat every 5-15 minutes
- 20% require subsequent dosing

EpiPen:

- 2 fixed doses: 0.15mg and 0.3mg
- < 22kg give EpiPen Jr (0.15mg)
- >22kg give EpiPen (0.3mg)

Lane et al, *Pediatric Emergency Care*, 2007

EpiPen

www.allergywindow.com
Russell et al., *Pediatric Emergency Care*, 2010

Patient Education

Hold for 10 seconds!

Look at expiration date!

www.drug3k.com

GLOBAL AVAILABILITY OF EPINEPHRINE(ADRENALINE) AUTOINJECTORS

- (EAI)Epinephrine (adrenaline) is recommended as an essential medication for the treatment of anaphylaxis by the World Health Organization (WHO).
- Despite its pivotal role, the auto-injectable form is not readily available in the majority of countries. It is limited to only 32% of all 195-world countries , mostly high-income countries.

Epinephrine

- Intra-venous administration of epinephrine is also not recommended as first-line treatment of acute anaphylaxis, even in a medical setting, due to risk for cardiac adverse events such as arrhythmias and myocardial infarction.
- However, for patients within adequate response to intramuscular epinephrine and intravenous saline, intravenous epinephrine can be given by continuous infusion by micro drip, preferably using an infusion pump in a monitored hospital setting.
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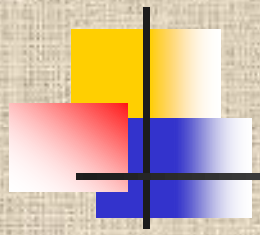


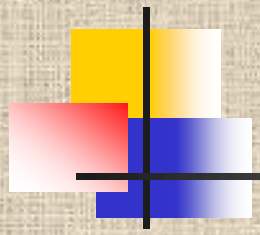
- *Aggressive fluid resuscitation.* Give isotonic crystalloid (normal saline) if hypotension is present and does not respond rapidly to epinephrine. A rapid infusion of 1 to 2 L or even 4 L may be needed initially

- *Antihistamines.* Administer antihistamines slowly IV or IM (eg, 25 to 50 mg of diphenhydramine)

- *H2 blockers.* Administer H2 blockers such as cimetidine (300 mg orally, IM, or IV)

Inhaled ß-adrenergic agents

- Provide inhaled albuterol if bronchospasm is a major feature.
- Inhaled ipratropium may be especially useful for treatment of bronchospasm in patients receiving ß-blockers.
- Note that some patients treated for near-fatal asthma actually had anaphylaxis, so they received repeated doses of conventional bronchodilators rather than epinephrine



- Patients who are taking ß-blockers have increased incidence and severity of anaphylaxis and can develop a paradoxical response to epinephrine.
- Consider glucagon as well as ipratropium for these patients

Potential Therapies

- *Vasopressin*. There are case reports that vasopressin may benefit severely hypotensive patients.
- *Atropine*. Case reports suggest that when relative or severe bradycardia is present, there may be a role for administration of atropine.
- *Glucagon*. For patients who are unresponsive to epinephrine, especially those receiving ß-blockers, glucagon may be effective. This agent is short-acting; give 1 to 2 mg every 5 minutes IM or IV. Nausea, vomiting, and hyperglycemia are common side effects

Antihistamines

- Second generation antihistamines may overcome unwanted side effects such as sedation which may be counter productive in anaphylaxis, but first generation H1-antihistamines are currently the only available for parenteral use chlorpheniramine diphenhydramine, clemastine
- Rapid intravenous administration of first-line antihistamines such as chlorphenamine can also cause hypotension.

Antihistamines

- Antihistamines lack the vasoconstrictive , bronchodilatory , ionotropic, and mast cell stabilization properties of epinephrine. While intravenous administration of H1 antihistamines may be used in a medical setting or by EMS, it should never be utilized in place of timely intramuscular epinephrine administration, but it may have an adjunct role in treatment after epinephrine has been administered.

Role of Corticosteroids?

- Corticosteroids
  - NO clinical evidence-based support for steroids in acute management of anaphylaxis
  - NO support for steroids against biphasic reactions
- Reported use of corticosteroids is more prevalent than IM epinephrine in anaphylaxis

Lane et al, *Pediatric Emergency Care*, 2007
Russell et al.,*Pediatric Emergency Care*, 2010

Steroids

- Glucocorticosteroids are commonly used in anaphylaxis, with the objective of preventing protracted symptoms, in particular in patients with asthmatic symptoms, and also to prevent biphasic reactions (intravenous hydrocortisone, or methylprednisolone).

Steroids

- Studies investigating the use of glucocorticoids for treatment of anaphylaxis have shown that their use is associated with reduced length of hospital stay but have not shown any benefit of preventing return visits to the ED following discharge.

Biphasic Reactions

- Delayed anaphylactic reaction developing after initial reaction has resolved
- About 1-20% of all anaphylactic reactions
  - 6% in pediatric anaphylaxis
- Asymptomatic intervals range from 1-28 hours
- Can occur up to 72 hours from initial reaction
- Length of observation?
  - Suggested 8-24 hours in literature
- "The only intervention that has been shown to reduce the prevalence and severity of biphasic allergic reactions is **early treatment with IM epinephrine**"

Lane et al, *Pediatric Emergency Care*, 2007

Summary

- Anaphylaxis- acute onset, involvement of 2 or more organ systems or presence of hypotension
- Severity of a previous reaction does not predict the severity of a subsequent reaction
- Patients with previous anaphylactic reactions are at a higher risk for reoccurrence
- First line treatment is IM epinephrine
  - < 22kg give EpiPen Jr (0.15mg)
  - >22kg give EpiPen (0.3mg)
- Early IM epinephrine can reduce the risk of a biphasic reaction
- Discharge home with EpiPen, education, allergist referral, and school forms

Question 1

A 5 year old M who has experienced a severe allergic reaction to shrimp in the past needs a CT scan with IV and oral contrast. What precautions should you take?

A. NS bolus and diphenhydramine

B. NS bolus, diphenhydramine, and prednisone

C. This patient can not receive contrast

D. Reassurance, there is no associated risk for a reaction between shellfish and contrast

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Question 2

You have been asked by a local school to provide recommendations about the use of self injectable epinephrine for anaphylaxis. What is the BEST response to give regarding anaphylaxis?

A. A patient should not receive a second dose of epinephrine unless a physician is present

B. Epinephrine reaches higher peak plasma concentrations in injected into the thigh rather than the arm

C. Families should keep one epinephrine auto injector in the car in case a reaction occurs after school

D. Subcutaneous injection of epinephrine is preferable to intramuscular injection

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Question 3

A 14 y/o M who has seasonal allergies and moderate persistent asthma is currently receiving allergen immunotherapy. Today in clinic he received his usual allergen injection, but after 10 minutes, he started coughing and complaining of dyspnea and throat swelling. On physical exam he exhibits moderate respiratory distress and has diffuse expiratory wheezing on auscultation. No oropharyngeal edema noted. Vitals signs include a pulse ox of 97%, BP of 130/70, and HR of 90. Of the following, the MOST appropriate next action is to administer:

A. A short acting beta-2 agonist nebulization

B. An oral antihistamine

C. An oral corticosteroid

D. Intramuscular epinephrine

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Question 4

A 10 y/o M with a history of peanut allergy presents with diffuse itching and trouble breathing after eating a friend's candy bar that contained nuts during school lunch. At the nurse's office the patient received IM epinephrine with his EpiPen with symptom resolution. EMS was called and the patient was brought to the local pediatric ED (about a 12 minute ride). On arrival to the ED, the patient is again complaining of itching with an urticarial rash on his chest and per EMS the patient began vomiting as they were pulling up to the ambulance bay. Arrival vitals include a pulse ox of 96%, BP of 88/67, and HR of 95. Of the following, the MOST appropriate treatment plan is:

A. Intramuscular epinephrine, oral antihistamine, oral corticosteroid, and a short acting beta-2 agonist neb treatment

B. Intramuscular epinephrine, IV antihistamine, IV corticosteroid, NS bolus

C. Intramuscular epinephrine, IV antihistamine, IV Zantac, NS bolus

D. Intramuscular epinephrine, oral antihistamine, and oral corticosteroid

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B. Intramuscular epinephrine, IV antihistamine, IV corticosteroid, NS bolus

C. **Intramuscular epinephrine, IV antihistamine, IV Zantac, NS bolus**

D. Intramuscular epinephrine, oral antihistamine, oral corticosteroid