

# Anaphylaxis

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# Question 1

A PGY-1 resident is about to present some information on Anaphylaxis. You have read this several times in Medical school and feel confident that you know this information already. What is your NEXT BEST step ?

- A. Snooze for 15 minutes
- B. Browse or catchup on facebook
- C. Listen to the PGY-1 resident or else...
- D. Excuse yourself to grab coffee

**CORRECT ANSWER C**

Listen to your PGY-1 resident or else

# Evidence from Literature

- In the USA the lifetime prevalence of anaphylaxis is 1.6 %
- It is underrecognized and undertreated
- Short duration of time between onset and death
  - iatrogenic : 5 minutes
  - insect venoms : 15 minutes
  - food induced : 30 minutes

## Diagnostic criteria for anaphylaxis

Anaphylaxis is highly likely when any **ONE** of the following three criteria is fulfilled:

**1. Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (eg, generalized hives, pruritus or flushing, swollen lips-tongue-uvula)**

**AND AT LEAST ONE OF THE FOLLOWING:**

A. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, hypoxemia)

B. Reduced BP\* or associated symptoms of end-organ dysfunction (eg, hypotonia, collapse, syncope, incontinence)

**2. TWO OR MORE OF THE FOLLOWING that occur rapidly after exposure to a LIKELY allergen for that patient (minutes to several hours):**

A. Involvement of the skin-mucosal tissue (eg, generalized hives, itch-flush, swollen lips-tongue-uvula)

B. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, hypoxemia)

C. Reduced BP\* or associated symptoms (eg, hypotonia, collapse, syncope, incontinence)

D. Persistent gastrointestinal symptoms (eg, crampy abdominal pain, vomiting)

**3. Reduced BP\* after exposure to a KNOWN allergen for that patient (minutes to several hours):**

A. Infants and children - Low systolic BP (age specific)\* or greater than 30 percent decrease in systolic BP

B. Adults - Systolic BP of less than 90 mmHg or greater than 30 percent decrease from that person's baseline

BP: blood pressure.

\* Low systolic blood pressure for children is defined as:

- Less than 70 mmHg from one month to one year,
- Less than (70 mmHg + [2 x age]) from 1 to 10 years, and
- Less than 90 mmHg from 11 to 17 years

*Adapted with permission from: Sampson HA, Munoz-Furlong A, Campbell RL, et al. Second symposium on the definition and management of anaphylaxis: summary report-Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network symposium. J Allergy Clin Immunol 2006; 117:391. Copyright © 2006 The American Academy of Allergy, Asthma, and Immunology.*

## Question 2

- A 4 year old boy was brought into the ER for a rash that developed within a few minutes after eating brownies at the school cafeteria. He has no known allergies.
- On arrival to the ER his vitals are as follows  
T 38 PR 160 RR 30 SpO2 98% BP 70/58
- Examination reveals diffuse pruritic erythematous wheals, cap refill < 2s and significant scattered wheezes

Which of the following is the **NEXT BEST** step?

- A. Tylenol at 15mg/kg/dose immediately
- B. Diphenhydramine 1mg/kg/dose IV stat
- C. Epinephrine SC, albuterol neb and diphenhydramine IV
- D. Epinephrine 1:1000 at 0.01 mg/kg IM , recumbent position
- E. Epinephrine 1:10000 at 0.01 mg/kg IM stat

Correct Answer D

Epinephrine 1:1000 at 0.01 mg/kg IM , recumbent position



## Rapid overview: Emergent management of anaphylaxis in infants and children\*

### Diagnosis is made clinically:

The most common signs and symptoms are cutaneous (eg, sudden onset of generalized urticaria, angioedema, flushing, pruritus). However, 10 to 20 percent of patients have no skin findings.

**Danger signs: Rapid progression of symptoms, evidence of respiratory distress (eg, stridor, wheezing, dyspnea, increased work of breathing, retractions, persistent cough, cyanosis), signs of poor perfusion, abdominal pain, dysrhythmia, hypotension, collapse.**

### Acute management:

The first and most important therapy in anaphylaxis is epinephrine. There are **NO absolute contraindications** to epinephrine in the setting of anaphylaxis.

**Airway:** Immediate intubation if evidence of impending airway obstruction from angioedema; delay may lead to complete obstruction; intubation can be difficult and should be performed by the most experienced clinician available; cricothyrotomy may be necessary.

**IM epinephrine (1 mg/mL preparation):** Epinephrine 0.01 mg per kilogram should be injected intramuscularly in the mid-outer thigh. For large children (>50 kilograms), the maximum is 0.5 mg per dose. If there is no response or the response is inadequate, the injection can be repeated in 5 to 15 minutes. If epinephrine is injected promptly IM, patients respond to one, two, or at most, three injections. If signs of poor perfusion are present or symptoms are not responding to epinephrine injections, prepare IV epinephrine for infusion (see below).

**Place patient in recumbent position,** if tolerated, and elevate lower extremities.

**Oxygen:** Give 8 to 10 liters per minute via facemask, or up to 100 percent oxygen as needed.

**Normal saline rapid bolus:** Treat poor perfusion with rapid infusion of 20 mL per kilogram; reevaluate and repeat fluid boluses (20 mL per kilogram) as needed; massive fluid shifts with severe loss of intravascular volume can occur; monitor urine output.

**Albuterol:** For bronchospasm resistant to IM epinephrine, give albuterol 0.15 mg per kilogram (minimum dose: 2.5 mg) in 3 mL saline inhaled via nebulizer; repeat as needed.

<b>H1 antihistamine:</b> Consider giving diphenhydramine 1 mg per kilogram (max 40 mg) IV.
<b>H2 antihistamine:</b> Consider giving ranitidine 1 mg per kilogram (max 50 mg) IV.
<b>Glucocorticoid:</b> Consider giving methylprednisolone 1 mg per kilogram (max 125 mg) IV.
<b>Monitoring:</b> Continuous noninvasive hemodynamic monitoring and pulse oximetry monitoring should be performed; urine output should be monitored in patients receiving IV fluid resuscitation for severe hypotension or shock.
<b>Treatment of refractory symptoms:</b>
<b>Epinephrine infusion*:</b> Patients with inadequate response to IM epinephrine and IV saline, give epinephrine continuous infusion at 0.1 to 1 microgram per kilogram per minute, titrated to effect.
<b>Vasopressors*:</b> Patients may require large amounts of IV crystalloid to maintain blood pressure; if response to epinephrine and saline is inadequate, dopamine (5 to 20 micrograms per kilogram per minute) can be given with the dose titrated to effect on continuously monitored blood pressure, cardiac rate, and function.

IM: intramuscular; IV: intravenous.

\* A child is defined as a prepubertal patient weighing less than 40 kg.

- All patients receiving an infusion of epinephrine and/or another vasopressor require continuous noninvasive monitoring of blood pressure, heart rate and function, and oxygen saturation. We suggest that pediatric centers provide instructions for preparation of standard concentrations and also provide charts for established infusion rate for epinephrine and other vasopressors in infants and children.

## Incorrect A : Tylenol immediately

- Though patients may be febrile in acute allergic/anaphylactic reactions administering Tylenol is not lifesaving

## **Incorrect B** :Diphenhydramine 1mg/kg/dose IV stat

- Diphenhydramine is an adjunctive treatment in anaphylaxis. It must not be used alone
- Other adjunctive treatments include H1 and H2 antihistamines, albuterol nebulisers and methylprednisolone

## **Incorrect C** :Epinephrine SC, albuterol neb and diphenhydramine IV

- SC Epinephrine is no longer recommended due to slow onset of action

## Incorrect E: Epi 1:10000 at 0.01 mg/kg IM stat

- This solution of Epinephrine is given Intravenously
- IV epinephrine is reserved for patients unresponsive to IM Epinephrine or those with uncompensated shock

# References

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## Question 3

- A 10 year old girl presents to the ER with generalized hives, nasal congestion, vomiting x 2 episodes associated with crampy abdominal pain and dizziness. She reports that about 10 minutes ago she was stung by a bee at Vizcaya Gardens
- On arrival to the ER his vitals were as follows:  
T 37.6 PR 140 RR 28 SpO2 97 BP 70/60
- Examination revealed generalized hives, cap refill 3.5 s normal findings on chest and abdomen
- She received 2 doses of IM epinephrine, IV Fluid bolus and diphenhydramine
- On reassessment all her symptoms were completely resolved and vitals all within normal range

Which of the following is the **NEXT BEST** step?

- A. Prescribe an Epi autoinjector and discharge home
- B. Admit patient for observation
- C. Discharge home with an Epi autoinjector and teach patient on how to use it prior to discharge
- D. Discharge home with an anaphylaxis emergency action plan, one or more epinephrine autoinjectors, a plan for arranging further evaluation, and printed information about anaphylaxis and its treatment.

## Correct B : Admit patient for observation

- Biphasic reaction
  - 4.5-23 %
  - occur within 8-10h and sometimes up to 72 h
- Patients with moderate and severe anaphylaxis should be admitted to an observation unit or to a hospital.
- If resolved promptly and completely with treatment, observe for at least 8-10 hours
- Prior to discharge must be trained to use an epinephrine autoinjector and should actually be supplied with one, rather than simply handed a prescription for one.

# Summary

- Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death.
- Epinephrine is **the treatment of choice for anaphylaxis of any severity**.
- The dose of epinephrine is 0.01 mg/kg of 1:1000 IM and can be given every 5-15mins.
- IV epinephrine used in profound hypotension or if unresponsive to IM epinephrine and fluid resuscitation.
- Massive fluid shifts can occur in anaphylaxis, and all patients with orthostasis, hypotension, or incomplete response to epinephrine should receive large volume fluid resuscitation with normal saline
- Patients should be observed for at least 8-10 hours

# References

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- Uptodate
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