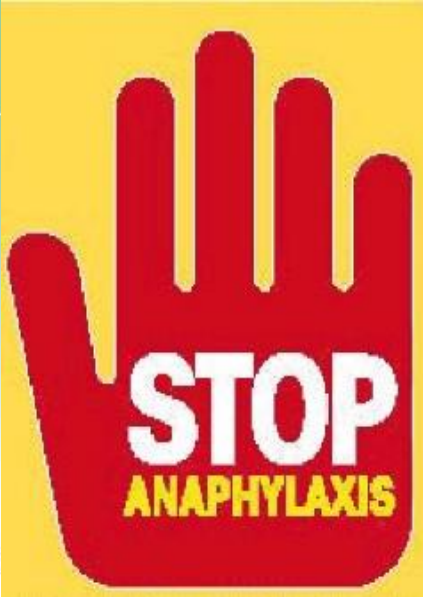




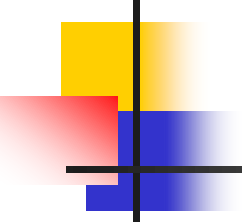
By:  
 Zahra Parsian M.D  
 Assistant professor of Emergency medicine



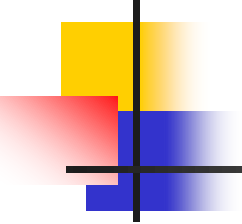
# Allergy principles

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- **Allergy:** mast cell mediated hypersensitivity reaction  
( type I or immediate)
- **Allergens:** substances that elicit an allergic reaction
- **Antigens:** antibody response

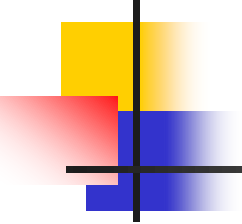
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- 
- Urticaria: rash  
allergic reaction
  - Angioedema: edema  
allergic or non allergic
  - Anaphylaxis: acute, multi-organ  
immunologic, non-immunologic

# Epidemiology



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- 1500 annual deaths US
- 50% misdiagnosed in ED
- 80% inappropriate first line treatment



# Risk factors for having Anaphylaxis

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- Pregnant women
- Infants
- Teenagers
- Elders
- History of atopy
- Time of the year
- Higher socioeconomic status
- Emotional stress
- Acute infection
- Physical exertion
- History of mastocytosis



# Increased severity and mortality

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- Extremes of age
- Comorbid conditions
- Concurrent antihypertensive drug use
- Concurrent comorbidity
- Recent anaphylaxis episode



# Common triggers

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- Foods
- Drugs
- Insect stings
- Natural rubber latex
- Occupational allergens
- Aeroallergens

# Clinical features



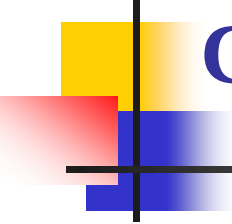
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- Skin
- Respiratory tract
- Gastrointestinal tract
- Cardiovascular
- Central nervous system

# Clinical Manifestations of Anaphylaxis and Related Pathophysiologic Changes

| ORGAN SYSTEM          | REACTION             | SYMPTOMS                                                                  | SIGNS                                                                                                                                                                                         | PATHOPHYSIOLOGIC CHANGES                                                                                                                                                                                                                                |
|-----------------------|----------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Respiratory tract     |                      |                                                                           |                                                                                                                                                                                               |                                                                                                                                                                                                                                                         |
| Upper                 | Rhinitis             | Nasal congestion<br>Nasal itching<br>Sneezing                             | Nasal mucosal edema<br>Rhinorrhea                                                                                                                                                             | Increased vascular permeability<br>Vasodilation<br>Stimulation of nerve endings                                                                                                                                                                         |
|                       | Laryngeal edema      | Dyspnea<br>Hoarseness<br>Throat tightness<br>Hypersalivation              | Laryngeal stridor<br>Supraglottic and glottic edema                                                                                                                                           | As above, plus increased exocrine gland secretions                                                                                                                                                                                                      |
| Lower                 | Bronchospasm         | Cough<br>Wheezing<br>Retrosternal tightness<br>Dyspnea                    | Cough<br>Wheeze, rhonchi<br>Tachypnea<br>Respiratory distress<br>Cyanosis                                                                                                                     | As above, plus bronchiole smooth muscle contraction                                                                                                                                                                                                     |
| Cardiovascular system | Circulatory collapse | Lightheadedness<br>Generalized weakness<br>Syncope<br>Ischemic chest pain | Tachycardia<br>Hypotension<br>Shock                                                                                                                                                           | Increased vascular permeability<br>Vasodilation<br>Loss of vasomotor tone<br>Increased venous capacitance                                                                                                                                               |
|                       | Dysrhythmias         | As above, plus palpitations                                               | ECG changes:<br>Tachycardia<br>Nonspecific and ischemic ST-T wave changes<br>Right ventricular strain<br>Premature atrial and ventricular contractions<br>Nodal rhythm<br>Atrial fibrillation | Decreased cardiac output<br>Decreased mediator-induced myocardial suppression<br>Decreased effective plasma volume<br>Decreased preload<br>Decreased afterload<br>Hypoxia and ischemia<br>Dysrhythmias<br>Iatrogenic effects of drugs used in treatment |
|                       | Cardiac arrest       |                                                                           | Pulseless<br>ECG changes:<br>Ventricular fibrillation<br>Asystole                                                                                                                             | Preexisting heart disease                                                                                                                                                                                                                               |

|                                         |                                                            |                                                                                                      |                                                                                                                      |                                                                                                                  |
|-----------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Skin                                    | Urticaria                                                  | Pruritus<br>Tingling and warmth<br>Flushing<br>Hives                                                 | Urticaria<br>Diffuse erythema                                                                                        | Increased vascular permeability<br>Vasodilation                                                                  |
|                                         | Angioedema                                                 | Nonpruritic extremity,<br>periorbital and perioral<br>swelling                                       | Nonpitting edema,<br>frequently asymmetrical                                                                         | Increased vascular permeability                                                                                  |
| Eye                                     | Conjunctivitis                                             | Ocular itching<br>Increased lacrimation<br>Red eye                                                   | Conjunctival inflammation                                                                                            | Stimulation of nerve endings                                                                                     |
| Gastrointestinal tract                  |                                                            | Dysphagia<br>Cramping, abdominal pain<br>Nausea and vomiting<br>Diarrhea (rarely bloody)<br>Tenesmus | Nonspecific                                                                                                          | Increased secretion of mucus<br>Gastrointestinal smooth muscle<br>contraction                                    |
| Miscellaneous central<br>nervous system |                                                            | Apprehension<br>Sense of impending doom<br>Headache<br>Confusion                                     | Anxiety<br>Seizures (rarely)<br>Coma (late)                                                                          | Secondary to cerebral hypoxia and<br>hypoperfusion<br>Vasodilation                                               |
| Hematologic                             | Fibrinolysis and disseminated<br>intravascular coagulation | Abnormal bleeding and<br>bruising                                                                    | Mucous membrane<br>bleeding, disseminated<br>intravascular coagulation<br>Increased uterine tone<br>Vaginal bleeding | Mediator recruitment and<br>activation<br>Uterine smooth muscle contraction<br>Bladder smooth muscle contraction |
| Genitourinary                           |                                                            | Pelvic pain<br>Urinary incontinence                                                                  | Urinary incontinence                                                                                                 |                                                                                                                  |



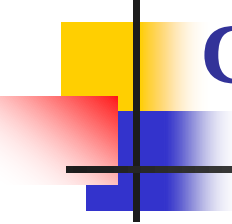
# Clinical Criteria for Diagnosing anaphylaxis

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

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

- a. Respiratory compromise** ( dyspnea, wheeze-bronchospasm, stridor, hypoxemia)
- b. Reduced BP** or associated symptoms ( hypotonia , syncope, incontinence)

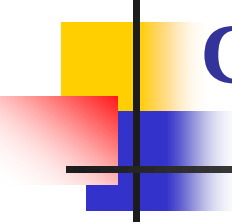


# Clinical Criteria for Diagnosing anaphylaxis

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**2.** Two or more of the following occurring rapidly (minutes to several hours) after exposure:

- a. ***Involvement of the skin-mucosal tissue*** (generalized hives, itch-flush, swollen lips-tongue-uvula)
- b. ***Respiratory compromise*** (dyspnea, wheeze, bronchospasm, stridor, hypoxemia)
- c. ***Reduced BP*** or associated symptoms ( hypotonia, syncope, incontinence)
- d. ***Sudden GI symptoms*** (crampy abdominal pain, vomiting)



## Clinical Criteria for Diagnosing anaphylaxis

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### **3. Reduced BP** after exposure to known allergen for that patient (minutes to several hours):

- a. Infants and children:* low systolic BP (age specific) or greater than 30% decrease in systolic BP
- b. Adults:* systolic BP of less than **90 mm Hg** or greater than 30% decrease from that person's baseline



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## ***Low systolic blood pressure for children :***

1 month to 1 year: less than 70 mm Hg

1 to 10 years: less than ( 70 mm Hg + 2 × age)

11 to 17 years: less than 90 mm Hg

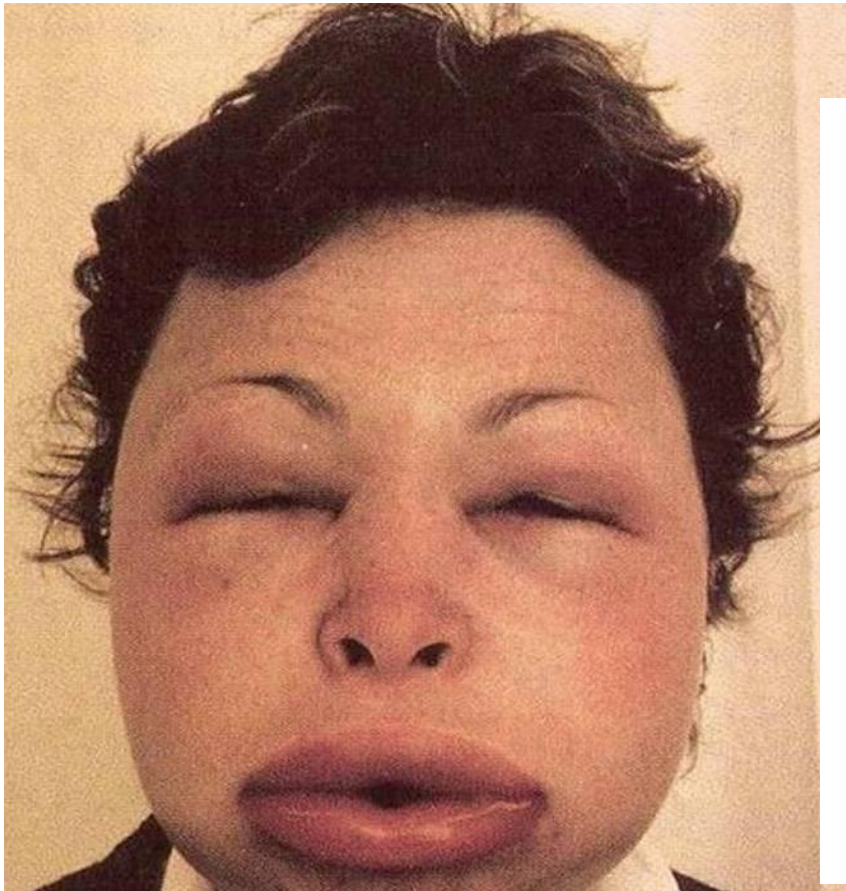


# Hives (urticaria)

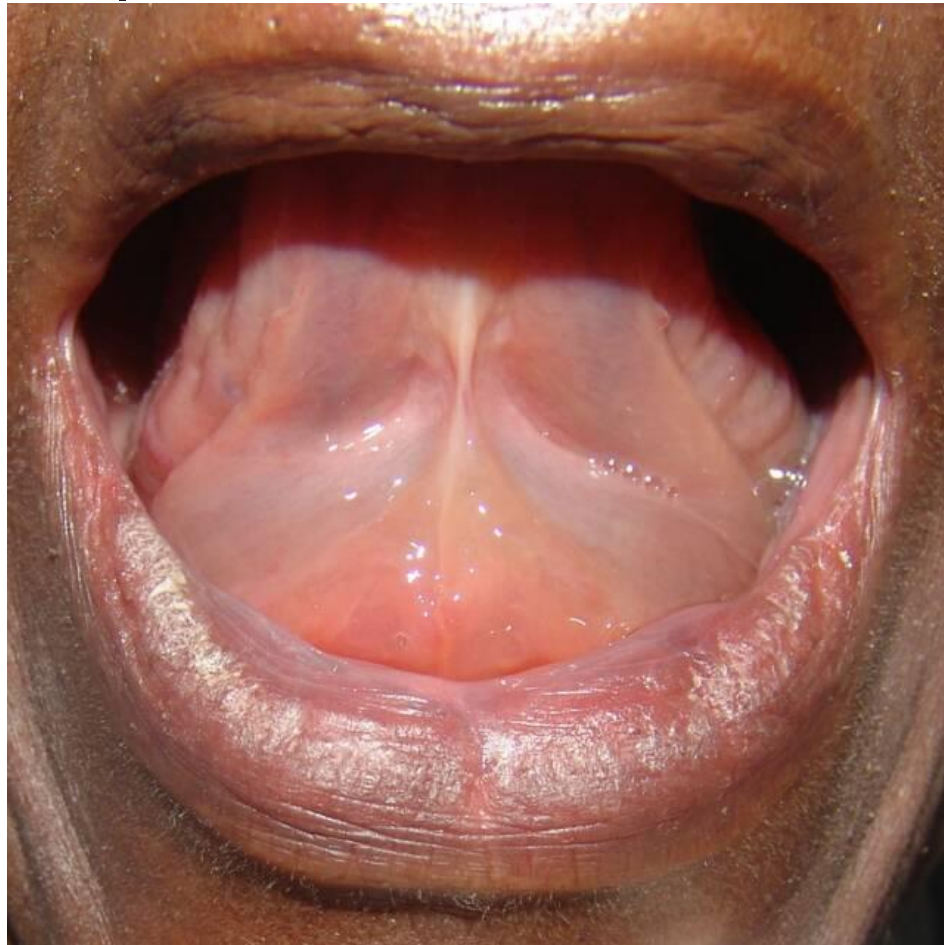
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# Angioedema



# angioedema



New England Journal Of Medicine 365:2, July 14, 2011



# Emergency measures

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Remove any triggering agent.

Place patient in supine position.

Begin cardiac monitoring, pulse oximetry, and blood pressure autonomic monitoring.

Begin supplemental oxygen if indicated.

Establish large-bore IV lines (eg, 16 or 18 gauge).

Establish a patent airway.

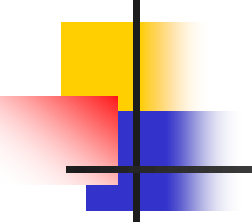
Be prepared for endotracheal intubation with or without rapid sequence intubation.

Be prepared to use adjunct airway technique (eg, awake fiberoptic intubation, surgical airway).

Start rapid infusion of isotonic crystalloid (normal saline):

Adults: 1000 mL IV in the first 5 minutes in the adult (several liters of normal saline may be required)

Pediatrics: 20 to 30 mL/kg IV increments



# Anaphylaxis treatment medications first line

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## Epinephrine

*Adult: 0.3–0.5 mL (IM/ 1 : 1000)*

*Pediatric: 0.01 mL/kg every 5 min as necessary*

Repeat every 5 to 10 min as necessary

Epinephrine :EpiPen 0.3 mL or EpiPen Jr 0.15 mL



# Anaphylaxis treatment medications

## second line

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H1 blocker **Diphenhydramine**: IV (or oral)

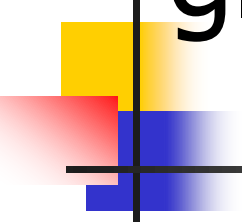
Adult: 50 mg

Pediatric: 1 mg/kg

H2 blocker **cimetidine**

Adult: 300 mg iv

Pediatric: 4-8 mg/kg



# glucocorticoids

## **Methylprednisolone:**

*Adult: 125–250 mg IV*

*Pediatric: 1–2 mg/kg/IV*

## **Prednison:**

*Adult: 40–60 mg oral*

*Pediatric: 1–2 mg/kg oral*

## **Hydrocortisone:**

*Adult: 250–500 mg IV*

*Pediatric: 5–10mg/kg/IV*



# Refractory hypotension

---

**epinephrine:** concentration of  $1\mu\text{g}/\text{ml}$

(0.1 mL of 1 : 1000 in 1000 mL of NS or D<sub>5</sub>W)

Adults:  $1-10\mu\text{g}/\text{min}$

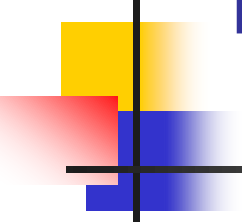
pediatric:  $0.1-1.5\mu\text{g}/\text{kg}/\text{min}$

**Dopamine:**  $5-20\mu\text{g}/\text{kg}/\text{min}$

**Norepinephrine:**  $0.05-0.5\mu\text{g}/\text{kg}/\text{min}$

**Phenyephine:**  $1-5\mu\text{g}/\text{kg}/\text{min}$

**Vasopressin:**  $0.01-0.4$  units/min



# bronchospasm

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## Albuterol (salbutamol)

**Adults: 2.5-5 mg nebulized**

**Pediatric: 1.25-2.5mg nebulized**

## Atrovent (Ipratropium)

**Adults: 250-500 microgram nebulized**

**Pediatric: 125-250microgram nebulized**

## Magnesium Sulfate

**Adults: 2g iv over 20 min**

**Pediatric: 25-50mg/kg iv over 20 min**



# Special situations

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## Patients on beta-blockade

**Glucagon:** 1–5 mg IV over 5 min, followed by 5–15 µg/min infusion

**Pediatric:** 50 micro g/kg iv every 5 min

Transcutaneous pacing for bradycardia

Atropine for bradycardia

Adult: 0.3–0.5 mg IV/ SC , to a maximum of 3 mg

Pediatric: 0.02 mg/kg IV/SC, to a maximum of 2 mg



# Anaphylaxis treatment

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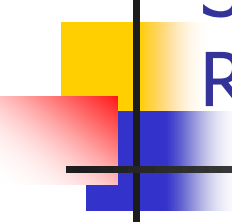
- Epinephrin
- Corticosteroids
- Antihistamines
- Bronchodilators
- Glucagon



# Disposition

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- All patients who receive epinephrine should be observed for 2-6 hours
- If symptom free, discharge home
- If on beta blockers or h/o severe reaction in past, consider admission
- An oral antihistamine diphenhydramine hydrochloride 25 to 50 mg every 6 hours for 48 hours, may prevent possible relapse



# Standard Protocol For Patients With A History Of Radiocontrast-induced Anaphylaxis

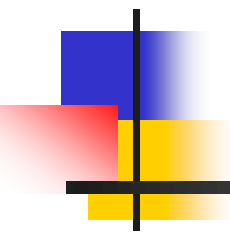
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**Prednisone** : 50 mg PO given *13, 7, and 1 hour* before the procedure

**Diphenhydramine** : 50 mg IM given *1 hour* before the procedure

**Ephedrine** : 25 mg PO given *1 hour* before the procedure

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Rosen 2018 (chapter109)  
Tintinali 2016(chapter 14)