Case #1

- 21 y/o male present to E.R.- brought in by friend
- Patient is anxious, flushed, and claiming he cannot breath, and says its difficult to swallow. Says he was just on a smoke break
- Patient immediately taken to a room
- VS- RR-26, HR-120, BP- 110/75, and O2 Saturation on RA-96%
- Notice some patches of hives/urticaria on chest and shoulders/neck
- Noticeable Edema to the uvula/ and slightly in the posterior pharynx
Case #1
Case # 2

- Medics called to home of 45 y/o male because of lip swelling x4 hours
- Present to the home of the patient- He appears relaxed, and without distress
- Noticeable large upper lip- nearly 3x normal size
- Patient without any respiratory distress and VSS are within normal limits
- Patient just has a history of Hypertension and this has never occurred before
Case # 2
Case # 3

- 6 y/o female called ambulance for rash on patient left arm after gnat bites
- Patient appears well and without distress
- Scratching at her left arm, with some welts/raises area of erythema
- VSS, no respiratory issues, or facial or throat swelling
- Mother very concerned because this has never happened before.
Case # 3
Allergic reaction and Anaphylaxis

- Allergic reaction- **hypo**sensitive response to a particular antigen(allergen)-usually via exposure to Skin, Respiratory tract or G.I. tract

- Can be localized and very **minor** or become immediately **life threatening** involving multiple organ systems, and result in respiratory and cardiovascular collapse

- **Anaphylaxis** is the most dramatic, and extreme form of an allergic reaction

- **Anaphylaxis** first coined in 1902 when Portier, and Richet when they injected a second vaccinating dose of Sea Anemone toxin that caused dogs death
Anaphylaxis

- Extreme hypersensitive response of the immune system with release of chemical mediators
- These chemical mediators typically affect the cutaneous, respiratory, cardiovascular and gastrointestinal systems
- Onset can be within minutes or be delayed by a few hours
- This is a clinical diagnosis that needs immediate attention and treatment
Clinical definition of Anaphylaxis

1. Acute onset of illness with skin or mucosal involvement associated with one of the following
   - Respiratory compromise- dypnea, wheezing, stidor
   - Hypotension- reduced blood pressure
   - Or signs of end organ dysfunction/failure

2. Two more of the following that occur rapidly after exposure to allergen
   - Involvement of the skin and mucosal tissue-hives, swelling
   - Respiratory compromise
   - Reduced blood pressure or end organ dysfunction
   - Persistent G.I. symptoms (cramping, vomiting, etc)

3. Falling blood pressure after exposure to known allergen
Epidemiology

- Most common causes of **anaphylaxis** include: **foods, medications, insect stings, allergen immunotherapy injections**

- The incidence of anaphylaxis **is 2%-life time risk** and **mortality is 1%**

- Also likely **under-reported**

- **Kills 1500** people in the US yearly

- **B-lactam antibiotics**, especially **PCN** cause **400-800 deaths yearly**

- **Hymenoptera stings** cause around **100 deaths yearly**
Common Allergens:

1. **Drugs**: PCN, ASA, Trimethoprim-sulfamethoxazole, vancomycin, NSAIDS, Virtually any drug

2. **Foods and Additives**: shellfish, soybeans, nuts, wheat, milk, eggs, seeds, seed oil, sulfites

3. **Others**: **Hymenoptera** stings (wasps, yellow jackets, fire ants, etc), insect parts or molds, Radioconstrast material, Vaccines, Latex

4. Idiopathic – cause could not be identified
Pathophysiology of allergic reactions and Anaphylaxis

- **Immune system** recognizes a *foreign antigen/allergen* and via the *skin, respiratory tract, or GI tract* and **elicits an immediate response** or a response on **re-exposure** to the allergen at a later time.

- **Immune activation** of *mast cells, basophils, and IgE* play a large role in allergic reactions/ anaphylaxis.

- **Chemical mediators** such as *histamine, leukotrienes, prostaglandins* released from mast cells, may cause a local response or systemic.

- The **severity of the anaphylaxis** is dependent on how **cells in the body react** to these chemical mediators.
Pathophysiology of allergic reactions and Anaphylaxis

1. **Anaphylactic vs Anaphylactoid reaction in anaphylaxis**

   - **Anaphylactic reaction** - Body usually needs prior exposure to allergen, once or over period of time to become sensitized. Then on a repeat exposure, the immune system is primed for hypersensitivity and release of chemical mediators.

   - **Anaphylactoid reaction** - Immune system responds immediately to the allergen with release of chemical mediators without prior exposure. (Radiopaque contrast media, NSAIDS)
Pathophysiology of allergic reactions and Anaphylaxis
1. Exaggerated immune response and chemical mediator release cause:

- **Smooth muscle** spasm in the Resp and G.I. tracts
- Increase **mucous secretion** and increase **bronchial smooth muscle tone**, as well as **airway edema**
- Decrease **vascular tone** and increase **vascular permeability** - 35% of vascular volume can be transferred to extravascular space within 10 min
- **Myocardial depression**, coronary ischemia, and arrhythmias
- **Distributive**, hypovolemic, and **Cardiogenic Shock**
Risk factors for Anaphylaxis

- Patients with **Atopy** (genetically determined state of hypersensitivity to environmental allergens) – patients who may have recurrent **allergic rhinitis, asthma, atopic dermatitis**

- Patients who are on **anti-hypertensive** meds, especially **b-blockers** - will prolong and exaggerate anaphylaxis – **less responsive to epinephrine**

- Patients with **prior episodes** of severe allergic reaction

- **IV or IM** routes of allergen exposure are more likely to cause anaphylaxis over oral allergen exposure
Clinical Features of Anaphylaxis

- **Classic presentation** - begins with pruritus, cutaneous flushing, urticaria, followed by anxiety, chest tightness, sense of fullness in throat, shortness of breath, wheezing, lightheaded.

- **May progress** to decrease level of consciousness, respiratory distress, and circulatory collapse

- In general, symptoms will start suddenly. < 60 min

- Usually, the **faster the reaction**, the **more severe** the reaction is.

- Over **half of the fatalities** occur within the **1st hour**
Clinical Features of Anaphylaxis-by system

1. Skin/cutaneous
   - Warm, tingling to face, mouth, chest, feet, hands
   - Intense itching (pruritus), esp hands and feet
   - Hives (urticaria)
   - Flushing, red skin
   - Swelling to face, lips, neck, hands, feet, tongue
   - Cyanosis - late finding
Clinical Features of Anaphylaxis-by system

1. **Respiratory System:**
   - “lump in throat”
   - Tightness in chest
   - High pitched cough- like croupy cough
   - Tachypnea- rapid respiratory rate
   - Labored breathing
   - Noisy breathing (Wheezing, Stridor)
   - Inability to talk or hoarse voice
   - Excessive mucous production
   - Partially or occluded airway
Clinical Features of Anaphylaxis-by system

1. **Cardiovascular**
   - Tachycardia
   - Hypotension
   - Irregular pulse
   - Absent radial pulse
   - Chest pain

2. **Central nervous System**
   - Increased anxiety/ restlessness
   - Lightheaded
   - Disorientation
   - Seizures
   - Headache
Clinical Features of Anaphylaxis—by system

3. **Gastrointestinal**
   - Nausea/vomiting
   - Abdominal cramping
   - Diarrhea
   - Difficulty swallowing (dysphagia)
   - Loss of bowel control

4. **Genitourinary**
   - Urgent need to urinate
   - Cramping of the uterus

5. **Generalized signs and symptoms:**
   - Itchy, watery eyes, runny or stuffy nose
   - Sense of Impending doom “not feeling well”
   - Generalized weakness or discomfort
Clinical Presentation

Mild reaction
- Itching - yes - more local
- Hives - yes more local
- Flushed skin - localized
- Cyanosis - no
- Edema - mild
- Heart rate - normal or slightly elevated
- Blood pressure - normal
- Mental status - normal
- RR - normal or slightly elevated
- Wheezing - no or very slight
- Stidor - no

Mod-severe reaction
- Itching - usually widespread
- Hives - usually widespread
- Flushed skin - widespread
- Cyanosis - possible
- Edema Severe - face, lips, tongue, ext
- HR - Significantly increased
- Blood pressure - decreased
- Mental status - may be altered or unresponsive
- RR - increase, possibly sig. increase
- Wheezing - present throughout
- Stidor - yes
Diagnosis

- **Anaphylaxis** is a clinical diagnosis.
- You have to recognize the signs of anaphylaxis on clinical presentation. **Important to start treatment early.**
- Not always easy because **many other medical problems have similar signs and symptoms**, such as asthma, anxiety, gastroenteritis, PE, vasovagal syncope.
- History from the **patient, family members or bystanders** is huge.
Treatment

- In the field- Need to make sure the scene is clear- don’t want to step into an area swarming with hornets-

**Primary Assessment:**
- Your first immediate General impression
- ABCD’s of resuscitation- airway, breathing, circulation, decontamination.
- Mental status-responsive, disoriented, or unresponsive
- Is there airway obstruction, stridor
- Does the patient need immediate airway protection
- Is breathing inadequate or compromised, wheezing
- What is the blood pressure- is there a rapid, weak pulse
- Is the skin red and warm or cyanotic, are there hives
Treatment

1. Immediate supportive care
   - Cardiac monitor
   - 2 large bore iv, or IO access, IV fluid (NS, LR)
   - High flow oxygen - maintain oxygen sat over >90%
   - Airway support - positive pressure breathing. May need endotracheal intubation or airway device-nasal or oral airway
   - Immediate administration of IM epinephrine (this is the most important initial treatment)
   - Decontamination - remove causative agent-allergen such as bee stinger - if recognized
   - Rapid transport to Emergency department
Treatment

- Upon ER. Arrival, continue **supportive care**: iv access, cardiac monitor, high flow oxygen, positive pressure ventilation, endotracheal intubation or cricothyroidomy in extreme cases.

- Administer **IM Epinephrine**- (Epi pen auto injector) or 0.3-0.5 mg (0.3-0.5 ml of 1:1000 concentration) for adults and 0.15 mg or 0.01 mg/kg for peds. Epi pen junior 0.15 mg of 1:1000 conc.

- If patient is not responding to the IM Epinephrine, then will move to **IV boluses** of epinephrine or continuous infusion.

- **IM epinephrine** in the field or the ER should be administered to the anterior, lateral thigh IM, and not Subcutaneous. **More reliable absorption, and more rapid peak serum levels**

- Epinephrine will help reduce **mucosal edema**, **decrease capillary leak**, **increase vascular tone** and reduce **hypotension**. Also will act as a **bronchodilator** and relax bronchial smooth muscle, and **increase cardiac contractility**. Also will **inhibit chemical mediators release**

- Need to be **cautious with Epi**- can cause ischemia in CAD patients or arrhythmias
EpiPen and Twinject

Information

Medication Name
1. Generic: Epinephrine
2. Trade: Adrenalin
3. Delivery System: EpiPen or EpiPen Jr. or Twinject (adult or child size)

Indications:
1. Patient exhibits signs of a severe allergic reaction, including either respiratory distress or shock (hypoperfusion).
2. Medication is prescribed for this patient by a physician or is carried on the ambulance.
3. Medical direction authorizes use for this patient.

Contraindications
No contraindications when used in a life-threatening situation.

Medication Form
Liquid administered by auto-injector – an automatically injectable needle – and-syringe system.

Dosage
Adult: One Adult Auto-Injector (0.3mg)
Infant and Child: One Infant/Child Auto-Injector (0.15mg)

Actions
1. Dilates the bronchioles
2. Constricts blood vessels

Side Effects
1. Increased heart rate
2. Pallor
3. Dizziness
4. Chest pain
5. Headache
6. Nausea
7. Vomiting
8. Excitability, anxiety

Reassessment Strategies
1. Transport
2. Continue focused assessment of airway, breathing, and circulatory status.

If patient’s condition continues to worsen (decreasing mental status, increasing breathing difficulty, decreasing blood pressure):
   a. Obtain medical direction for an additional dose of epinephrine
   b. Treat for shock (hypoperfusion)
   c. Prepare to initiate basic life support procedure

If patient’s condition improves, provide supportive care:
   a. Continue oxygen
   b. Treat for shock (hypoperfusion)
1) Remove Twinject from its case.
EpiPen and Twinject
How to Administer

EpiPen & Twinject
1. Obtain patient’s prescribed auto-injector Esure:
   a. Prescription is written for the patient who is experiencing the severe allergic reaction or your protocols permit carrying the auto-injector on the ambulance.
   b. Medication is not discolored (if visible)
2. Obtain order from medical direction, either on-line or offline.
3. Remove safety cap(s) from auto-injector
4. Place tip of auto-injector against patient’s thigh.
   a. Lateral portion of the thigh
   b. Midway between waist and knee
5. Push the injector firmly against the thigh until the injector activates.
6. Hold the injector in place until the medication is injected (at least 10 seconds).
7. Record activity and time.
8. Dispose of a single-dose injector, such as the EpiPen, in a biohazard container. Save a two-dose injector, such as Twinject, and transport it with the patient in case the second dose is later required.
Hold firmly in place for ten seconds, then remove. Massage the area of injection.
Most often occurs to a finger
Potentially can cause local tissue death
Often can be treated with application of heat, local massage, topical nitrates.
Requires **IMMEDIATE** ED visit!
Treatment

- **IV Fluids** (Isotonic crystalloid solutions) *0.9 NS, and LR*

- Typically give a **1 Liter bolus to adults**, and a **20 ml/kg to peds.** May need additional fluids based on how patient responds

- If the patient is **wheezing** or showings signs of **bronchospasm** - provide inhaled **Beta-agonists nebs** such as albuterol-will relax bronchial smooth muscle

- **Racemic Epinephrine** nebs may reduce **airway edema**

- **Magnesium sulfate IV** may also reduce wheezing and improve pulmonary function
Treatment

- **Antihistimines**
  - Patients should receive at least a **H1 blocker** (histamine 1 blocker) such as diphenhydramine
    - 25-50 mg iv for adults, and 1 mg/kg iv for peds
  - Consider giving and **H2 (histamine 2 blocker)** as well. Such as **Famotidine** (pepcid) or **ranitidine** (zantac)
  - Antihistamines **primarily treat the cutaneous effects** of anaphylaxis, but also may improve cardiac, vascular, and respiratory function
  - **H1 and H2 blockers together** have an **additive** benefit than using either alone.
Treatment

• **Corticosteroids**
  • Not shown to have an immediate effect on anaphylaxis, but may prevent or reduce the chance of later biphasic reaction (delayed reaction where 2nd phase of mediators are released)
  • It's thought that 5% of anaphylactic reactions will have a biphasic reaction
  • Solumedrol 80-125 mg IV for adults, and 1-2 mg/kg IV for Peds.

• **Glucagon**
  • Beneficial in severe anaphylaxis refractory to Epinephrine and IV fluids, especially in patients who are on Beta-blockers. Also may help reverse bronchospasm, and increase force of cardiac contraction. Stimulates release of endogenous catecholamines. 5-10 mg IV
Emergency department Disposition

- With appropriate treatment and observation, admission is rare < 4% of the time

- ICU admission is appropriate for patients with anaphylaxis not responding to treatment or if airway interventions were needed

- Controversy surrounds how long we need to observe patients because of Biphasic reactions - 5%

- If patient has received epinephrine, and has recovered, then a few hours of observation should be fine, but this is more based on your experience and on individual patients

- Consider prolonged observation: patients on b-blockers, past severe recurrent reactions, if patient lives far from immediate care, patient does not have a good support system or is homeless, or if patient has other comorbidities such as age, and certain medical conditions such as asthma
Outpatient Care and Prevention

- Patients with more severe reaction, recommended to send home on a few days of **anti-histamine**, Benadryl 25-50 every 6 hours, or 1 mg/kg Peds

- Consider **prednisone** for a few days. 40-60 mg per day for 2-3 days.

- **Dispense** with patient – **Epi- pen** auto-injector or prescribe one. **Education** on how to administer

- Inform the patient to try to **identify** the potential **allergen**, and how to **avoid re-exposure**

- Advise possible **personal identification/allergy tags**
Angioedema

- May occur with typical allergic reactions, anaphylactic or anaphylactoid, but also may be in a class of its own, and have non-immunologic pathways of development

- Swelling normally involves lips, face, and tongue- deep dermal swelling

- Commonly occurs in individuals who take ACE inhibitor anti-hypertensives- such as lisinopril

- Typically does not respond to typical anaphylactic treatment drugs: epi, antihistimines, steroids

- Supportive management with attention to potential airway obstruction.

- Patients will recover if the drug is withdrawn, and leaves system

- Patients with mild swelling and showing signs of improvement can be discharged, but if there is moderate swelling or dysphagia, or potential for airway obstruction, then patient should be admitted for observation

- Hereditary Angioedma- Autosomomal dominant disorder with complement pathway defect- low levels of C1 esterase inhibitor
  - Involves upper respiratory and g.i. tracts
  - Can last a few hours to a few days
  - Typical allergic drug treatment (epi, antihistimines, steroids) do not work. May consider C1 esterase concentrate, or FFP for treatment
Angioedema
Angioedema
Angioedema
Case # 1

- 21 y/o male present to E.R.- brought in by friend
- Patient is anxious, flushed, and claiming he cannot breath, and says its difficult to swallow. Says he was just on a smoke break
- Patient immediately taken to a room
- VS- RR-26, HR-120, BP- 110/75, and O2 Saturation on RA- 96%
- Notice some patches of hives/urticaria on chest and shoulders/neck
- Noticeable Edema to the uvula/ and slightly in the posterior pharynx
Case #1
Case #1

- Immediately took patient to room
- Cardiac monitor
- IV access
- Immediate IM epinepherine administered
- Prepared for intubation with glide scope - patient airway was closing fast
- Just prior to the administration of Succinocholine, the patient’s throat started to rapidly decrease in swelling, and patient was showing immediate signs of improvement, and intubation was avoided
- Patient was admitted to the hospital for observation
Case #2

- Medics called to home of 45 y/o male because of lip swelling x4 hours
- Present to the home of the patient- He appears relaxed, and without distress
- Noticeable large upper lip- nearly 3x normal size
- Patient without any respiratory distress and VSS are within normal limits
- Patient just has a history of Hypertension and this has never occurred before
Case # 2
Case # 2

- Patient brought to Emergency department
- Discovered the patient was taking an ACE-inhibitor antihypertensive
- Determined clinically that this was most likely ACE-inhibitor induced angioedema
- Did give IV diphenhydramine, IV famotadine, solumedrol, and continued supportive care
- Patient did not have an oral pharynx swelling or dysphagia, and swelling did subside 50% while in the E.R. Patient discharged home after two hours of observation
Case #3

- Patient brought in to the ER- BLS, which was appropriate
- Patient was in no distress, and had no signs of oral swelling or respiratory or circulatory distress
- Small, patchy, slightly urticarial rash on left forearm
- Given oral diphenhydramine, and observed for 30 min, and then safely discharged home with mother.