# Chapter 31
# Allergies and Anaphylaxis

# Topics

- Pathophysiology
- Assessment Findings in Anaphylaxis
- Management of Anaphylaxis
- Assessment Findings in Allergic Reaction
- Management of Allergic Reactions
- Patient Education

# Allergies and Anaphylaxis

- Allergic Reaction
  - An exaggerated response by the immune system to a foreign substance
- Anaphylaxis
  - An unusual or exaggerated allergic reaction
  - A life-threatening emergency

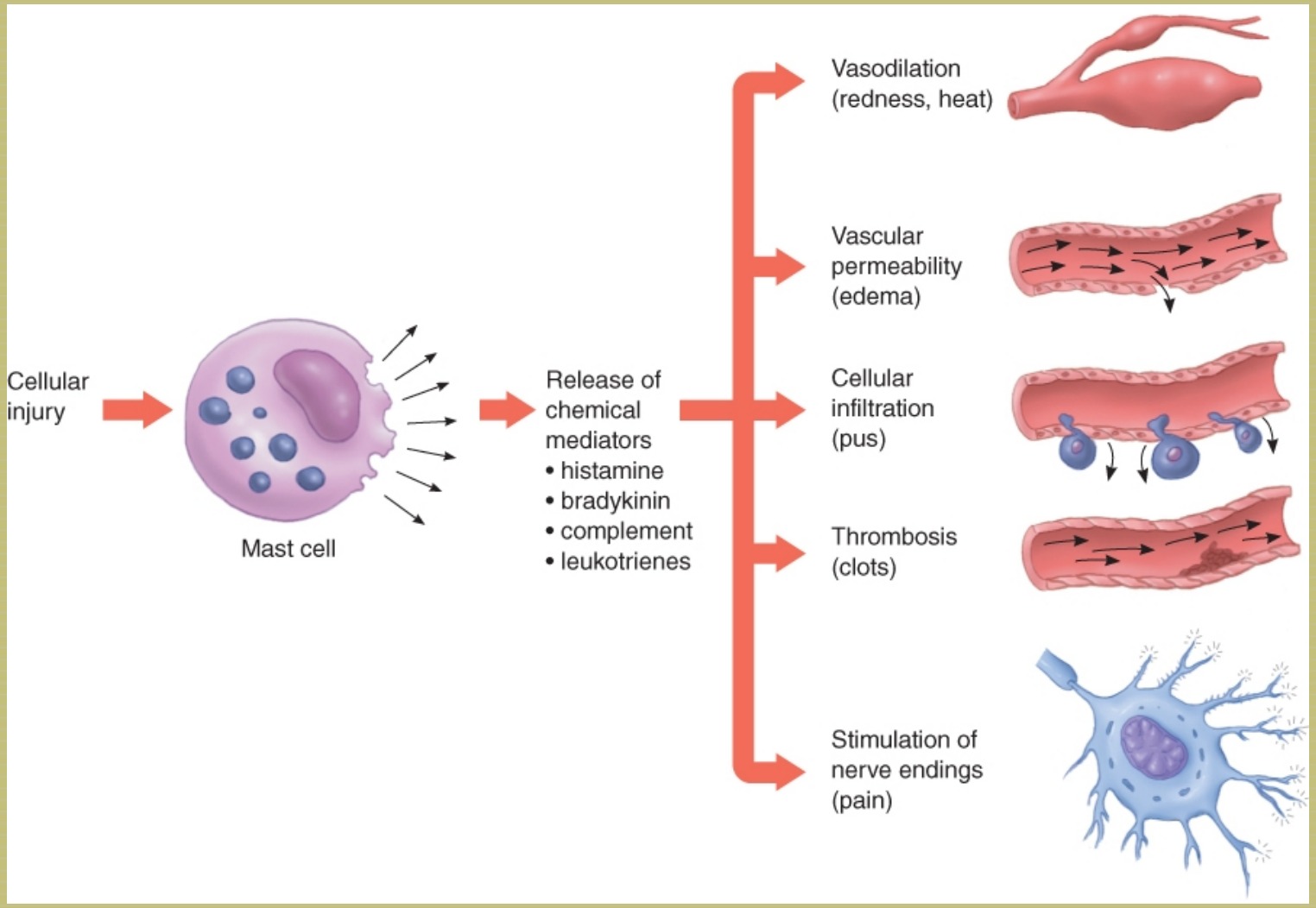
# Pathophysiology (1 of 2)

- The Immune System
  - Pathogens
  - Toxins
  - Cellular Immunity
  - Humoral Immunity
    - Antibodies (Immunoglobulins)
      - IgA, IgD, IgE, IgG, IgM

# Pathophysiology (2 of 2)

- Immune Response
  - Exposure to antigen produces primary response with general antibodies.
  - Immune system develops antigen-specific antibodies and memory.
  - Future exposures generate a faster secondary response.
- Natural and Acquired Immunity
- Induced Active Immunity
- Active and Passive Immunity

# Acute Immune Response






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# Allergies (1 of 2)

- Sensitization
- Hypersensitivity
  - Delayed
    - Results from cellular immunity and does not involve antibodies.
    - Commonly results in skin rash.
    - Results from exposure to certain drugs or chemicals.
  - Immediate
    - Exposure quickly results in secondary response.
    - More severe than delayed hypersensitivity.


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# Allergies (2 of 2)

- Allergen
  - Exposure generates secondary response.
    - Large quantities of IgE are released.
    - Allergen binds to IgE, causing chemical release.
      - Release is “allergic reaction.”
      - Includes histamines, heparin, and other substances that are designed to minimize the body’s exposure to an antigen.
      - Histamine causes bronchoconstriction, vasodilation, increased gastric motility, and increased vascular permeability.
      - Angioneurotic edema.


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# Anaphylaxis (1 of 2)

- Causes

| Agents that May Cause Anaphylaxis |
| --- |
| Antibiotics and other drugs |
| Foreign proteins (horse serum, streptokinase) |
| Foods (nuts, eggs, shrimp) |
| Allergen extracts (allergy shots) |
| *Hymenoptera* stings (bees, wasps) |
| Hormones (insulin) |
| Blood products |
| Aspirin |
| Nonsteroidal anti-inflammatory drugs (NSAIDs) |
| Preservatives (sulfiting agents) |
| X-ray contrast media |
| Dextran |



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# Anaphylaxis (2 of 2)

- Causes
  - Injections
    - Most anaphylaxis results from injected allergen.
    - Allergen rapidly distributes throughout the body, resulting in massive histamine release.
      - Parenteral penicillin injections and insect stings.
      - Affects cardiovascular, respiratory, gastrointestinal, and integumentary systems.
      - Significant plasma loss through increased vascular permeability.
      - Slow-reacting substance of anaphylaxis.


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# Assessment Findings in Anaphylaxis (1 of 2)

- Focused History and Physical Exam
  - Focused History
    - SAMPLE and OPQRST History
      - Rapid onset, usually 30–60 seconds following exposure.
      - Speed of reaction is indicative of severity.
      - Previous allergies and reactions.
  - Physical Exam
    - Presence of severe respiratory difficulty is key to differentiating anaphylaxis from allergic reaction.

# Assessment Findings in Anaphylaxis (2 of 2)

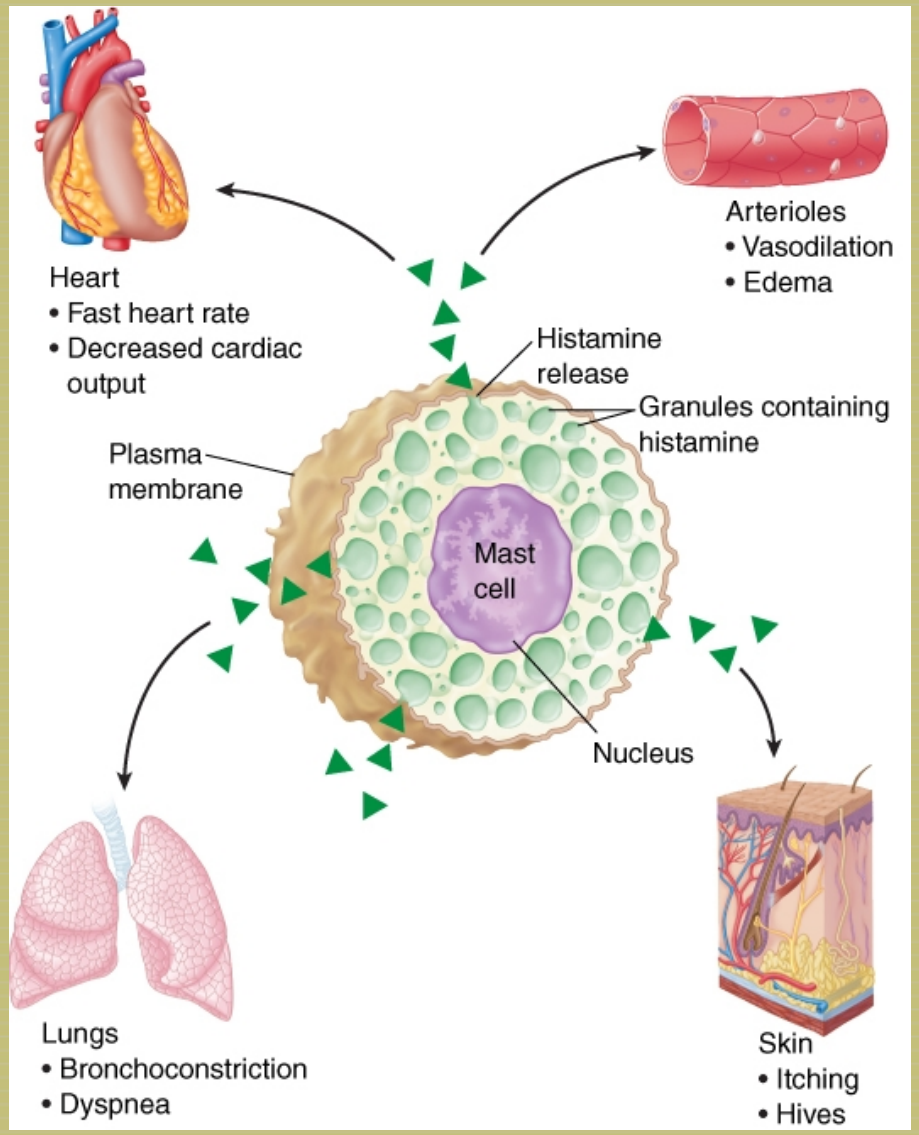
- Physical Exam
  - Facial or laryngeal edema
  - Abnormal breath sounds
  - Hives and urticaria
  - Hyperactive bowel sounds
  - Vital sign deterioration as the reaction progresses

| Clinical Presentation of Allergies and Anaphylaxis |
|---|
| **Skin** |
| Flushing |
| Itching |
| Hives |
| Swelling |
| Cyanosis |
| **Respiratory System** |
| Respiratory difficulty |
| Sneezing, coughing |
| Wheezing, stridor |
| Laryngeal edema |
| Laryngospasm |
| Bronchospasm |
| **Cardiovascular System** |
| Vasodilation |
| Increased heart rate |
| Decreased blood pressure |
| **Gastrointestinal System** |
| Nausea and vomiting |
| Abdominal cramping |
| Diarrhea |
| **Nervous System** |
| Dizziness |
| Headache |
| Convulsions |
| Tearing |



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# Symptoms of Anaphylaxis




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# Management of Anaphylaxis
(1 of 3)

- Scene Safety:
  - Consider the possibility of trauma.
- Protect the airway.
  - Use airway adjuncts with care.
  - Intubate early in severe cases to prevent total occlusion of the airway.
  - Be prepared to place a surgical airway.


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# Management of Anaphylaxis
(2 of 3)

- Support breathing.
  - High-flow, high-concentration oxygen or assisted ventilation if indicated.
- Establish IV access.
  - Patient may be volume-depleted due to "third spacing" of fluid.
    - Administer crystalloid solution at appropriate rate.
    - Place a second IV line if indicated.


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# Management of Anaphylaxis
(3 of 3)

- Administer medications:
  - Oxygen
  - Epinephrine
  - Antihistamines
  - Corticosteroids
  - Vasopressors
  - Beta-agonists
  - Other agents
- Psychological support.

# Assessment Findings in Allergic Reaction

## Signs and Symptoms of Allergic and Anaphylactic Reactions

| Mild Allergic Reaction | Severe Allergic Reaction or Anaphylaxis |
|---|---|
| *Onset:* Gradual | *Onset:* Sudden (30–60 seconds but can be more than an hour after exposure) |
| *Skin/vascular system:* Mild flushing, rash, or hives | *Skin/vascular system:* Severe flushing, rash, or hives; angioneurotic edema to the face and neck |
| *Respiration:* Mild bronchoconstriction | *Respiration:* Severe bronchoconstriction (wheezing), laryngospasm (stridor), breathing difficulty |
| *GI system:* Mild cramps, diarrhea | *GI system:* Severe cramps, abdominal rumbling, diarrhea, vomiting |
| *Vital signs:* Normal to slightly abnormal | Vital signs: Increased pulse early, may fall in late/severe case; increased respiratory rate early, falling respiratory rate late; falling blood pressure late |
| *Mental status:* Normal | *Mental status:* Anxiety, sense of impending doom, may decrease to confusion and to unconsciousness |
| | *Other clues:* Symptoms occur shortly after exposure to parenteral penicillin, *Hymenoptera* sting (fire ant, wasp, yellow-jacket, hornet, bee), or ingestion of foods to which patient is allergic such as nuts or shellfish |
| | *Ominous signs:* Respiratory distress, signs of shock, falling respiratory rate, falling pulse rate, falling blood pressure |

**Note:** Not all signs and symptoms will be present in every case.



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# Management of Allergic Reactions

- Scene safety.
- Protect the airway.
- Support breathing.
- Establish IV access.



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- Administer medications:
  - Antihistamines
  - Epinephrine

# Patient Education

- Prevention of Reactions
- Recognition of Signs/Symptoms
  - Patient-initiated treatment
    - Epinephrine auto-injectors
- Desensitization


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# Maryland Protocol

## Allergic Reaction Adult

# Allergic Reaction Adult

- Indications
- Mild symptoms: localized swelling and itching at the site
- Moderate symptoms: hives OR mild wheezing
- Severe symptoms (Refer to Allergic Reaction: Anaphylaxis Protocol):
  - Acute onset of severe illness after exposure to a known or suspected allergen with two or more of the following:
    - Urticaria (hives) or acute swelling of the mucosa (e.g., tongue, airway, stridor, lips)
    - Respiratory compromise
    - Hypotension
    - GI symptoms, such as persistent nausea/vomiting, abdominal pain, or diarrhea
    - Hypotension after exposure to a known or suspected allergen




mptoms (if history of life-threatening allergic reaction to same allergen)

Epinephrine auto-injector (BLS) 0.3 mg IM in the lateral thigh OR

If BLS epinephrine OSP approved, epinephrine (BLS) (1 mg/mL) 0.5 mg IM in the lateral thigh

**Moderate symptoms**

Epinephrine auto-injector (BLS) 0.3 mg IM in the lateral thigh OR

If BLS epinephrine OSP approved, epinephrine (BLS) (1 mg/mL) 0.5 mg IM in the lateral thigh. Albuterol (BLS) inhaler (2 puffs inhaled) or nebulized albuterol (BLS). May repeat dose one time, as needed, within 30 minutes.

# ALS

**Mild symptoms**

Diphenhydramine 25 mg SLOW IV or IM. OR

Epinephrine (1 mg/mL) 0.5 mg IM if patient has a history of life-threatening allergic reaction to the same allergen.

**Moderate symptoms**

Epinephrine (1 mg/mL) 0.5 mg IM. May repeat every 5 minutes, for a total of 3 doses, for recurrent or worsening symptoms.

Establish IV access.

Diphenhydramine 50 mg SLOW IVP or IM.

Albuterol 2.5 mg and ipratropium 500 mcg nebulizer. May repeat albuterol one time for recurrent or worsening symptoms.




# Medical Consult

Additional doses of epinephrine auto-injector, epinephrine, albuterol, ipratropium, diphenhydramine beyond those listed above require medical consultation

# Clinical Pearls

- Clinical Pearls
- Re-check dosing and concentration of epinephrine prior to administration.
- Epinephrine 1 mg/mL (previously known as 1:1,000) is appropriate for the IM route only.
- Epinephrine should never be given by IV route, except for an epinephrine infusion for patients in anaphylaxis or for patients in cardiac arrest

# Allergic Reaction – Pediatric



# Indications

- Mild symptoms: localized swelling and itching at the site
- Moderate symptoms: hives OR mild wheezing
- Severe symptoms (Refer to Allergic Reaction: Anaphylaxis Protocol): Acute onset of severe illness after exposure to a known or suspected allergen with two or more of the following:
  - Urticaria (hives) or acute swelling of the mucosa (e.g., tongue, airway, stridor, lips)
  - Respiratory compromise
  - Hypotension
  - GI symptoms, such as persistent nausea/vomiting, abdominal pain, or diarrhea
  - Hypotension after exposure to a known or suspected allergen

# Mild Symptoms- If history of life threatening allergic reaction to same allergen




Less than 5 years of age: pediatric epinephrine auto-injector (BLS) 0.15 mg IM in the lateral thigh OR

If BLS epinephrine OSP approved, epinephrine (BLS) (1 mg/mL) 0.15 mg IM in the lateral thigh

5 years of age or greater: epinephrine auto-injector (BLS) 0.3 mg IM in the lateral thigh OR

If BLS epinephrine OSP approved, epinephrine (BLS) (1 mg/mL) 0.5 mg IM in the lateral thigh

# Moderate Symptoms

Less than 5 years of age:

- Pediatric epinephrine auto-injector (BLS) 0.15 mg IM in the lateral thigh OR
- If BLS epinephrine OSP approved, epinephrine (BLS) (1 mg/mL) 0.15 mg IM in the lateral thigh 5 years of age or greater:
- Epinephrine auto-injector (BLS) 0.3 mg IM in the lateral thigh OR
- If BLS epinephrine OSP approved, epinephrine (BLS) (1 mg/mL) 0.5 mg IM in the lateral thigh

Albuterol (BLS) inhaler (2 puffs inhaled) or albuterol (BLS) nebulizer. May repeat dose one time, as needed, within 30 minutes.

For infants and children less than 2 years of age, administer nebulized albuterol (BLS) 1.25 mg.

For patients 2 years of age or greater, administer nebulized albuterol (BLS) 2.5 mg.

# Mild Symptoms

- Mild symptoms
  - Diphenhydramine 1 mg/kg SLOW IV or IM for patients greater than 6 months old. Maximum single dose 25 mg OR
  - Epinephrine if history of life-threatening allergic reaction to the same allergen.
    - Less than 5 years of age: epinephrine (1 mg/mL) 0.15 mg IM in the lateral thigh
    - 5 years of age or greater: epinephrine (1 mg/mL) 0.5 mg IM in the lateral thigh

# Moderate Symptoms




- Epinephrine
  - Less than 5 years of age: epinephrine (1 mg/mL) 0.15 mg IM in the lateral thigh
  - 5 years of age or greater: epinephrine (1 mg/mL) 0.5 mg IM in the lateral thigh
  - Establish IV access.
  - If age-related vital signs and patient's condition indicate hypoperfusion, administer initial fluid bolus of 20 mL/kg LR IV. If patient's condition does not improve, administer the second bolus of fluid at 20 mL/kg LR IV.
  - Diphenhydramine 1 mg/kg SLOW IVP or IM for patients greater than 6 months old. Maximum single dose 50 mg.
  - Albuterol / ipratropium nebulized.
    - For an infant less than 1 year of age: albuterol 1.25 mg via nebulizer; ipratropium is contraindicated.
    - For a child 1 year of age or greater, but less than 2 years of age: albuterol 1.25 mg and ipratropium 250 mcg.
    - For a patient 2 years of age or greater: albuterol 2.5 mg and ipratropium 500 mcg.
    - May repeat albuterol one time for recurrent or worsening symptoms.




Additional doses of epinephrine auto-injector, epinephrine, albuterol, ipratropium, diphenhydramine beyond those listed above require medical consultation. l If blood pressure goals are not met upon reaching epinephrine infusion rate of 2 mL/min (120 drops/min), obtain medical consultation.

# Summary

- Pathophysiology
- Assessment Findings in Anaphylaxis
- Management of Anaphylaxis
- Assessment Findings in Allergic Reaction
- Management of Allergic Reactions
- Patient Education
- Maryland Protocol
  - Review Maryland Anaphylaxis Protocol