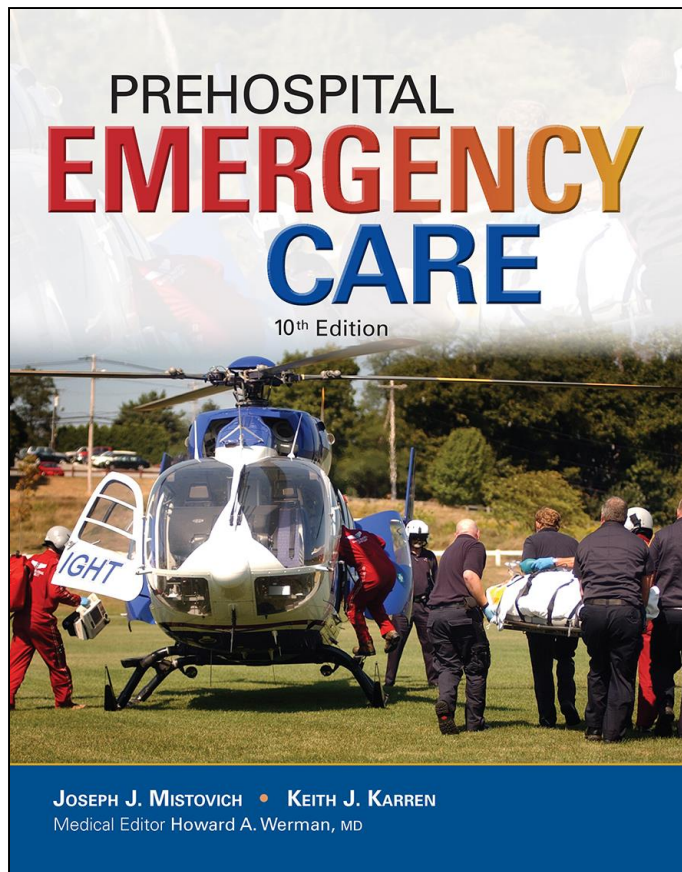


PREHOSPITAL EMERGENCY CARE

TENTH EDITION



CHAPTER 21

Anaphylactic Reactions

Learning Readiness

- EMS Education Standards, text p. 585

Learning Readiness Objectives

- Please refer to page 585 of your text to view the objectives for this chapter.

Learning Readiness

Key Terms

- Please refer to page 585 of your text to view the key terms for this chapter.

Setting the Stage

- Overview of Lesson Topics
 - Anaphylactic Reactions

Case Study Introduction

EMTs Luke Boyce and Joy Dunn arrive at Armstrong Elementary School for a report of an allergic reaction. Six-year-old Jesse Mendoza began having difficulty breathing, with weakness and a rash, within a few minutes of accidentally being exposed to peanuts, to which he has a known allergy.

The EMTs see a young boy sitting in the nurse's office with swelling of his lips, and they can hear wheezing without a stethoscope.

Case Study

- What level of concern should the EMTs have, based on their general impression?
- What is going on in the patient's body to cause his signs and symptoms?
- What steps should be considered in formulating a treatment plan for this patient?

Introduction

- An anaphylactic reaction is a severe, life-threatening allergic reaction.
- Problems include airway swelling, constriction of the bronchioles, fluid leaking from the capillaries, and vasodilation.
- Administering epinephrine can be life saving.

Anaphylactic Reaction

- The immune system responds to foreign substances called antigens.
- Allergens are a type of antigen that can provoke a reaction in some people.
- The response of the immune system upon exposure to an antigen is to produce antibodies.

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Anaphylactic Reaction

- The body can produce immunoglobulin E (IgE) in response to allergens.
- When IgE encounters an allergen, it triggers an immune system response.
- An excessive immune system response to an allergen is called an allergic reaction.

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Anaphylactic Reaction

- A severe, systemic immune response to an allergen is called an anaphylactic reaction.
- Chemicals released by the body in anaphylaxis cause airway swelling, bronchoconstriction, and vasodilation.

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Anaphylactic Reaction

- On first exposure to an allergen, sensitization occurs, and IgE is produced.
- After sensitization, IgE antibodies attach to two types of immune cells.
 - Mast cells (in the tissues)
 - Basophils (in the blood)

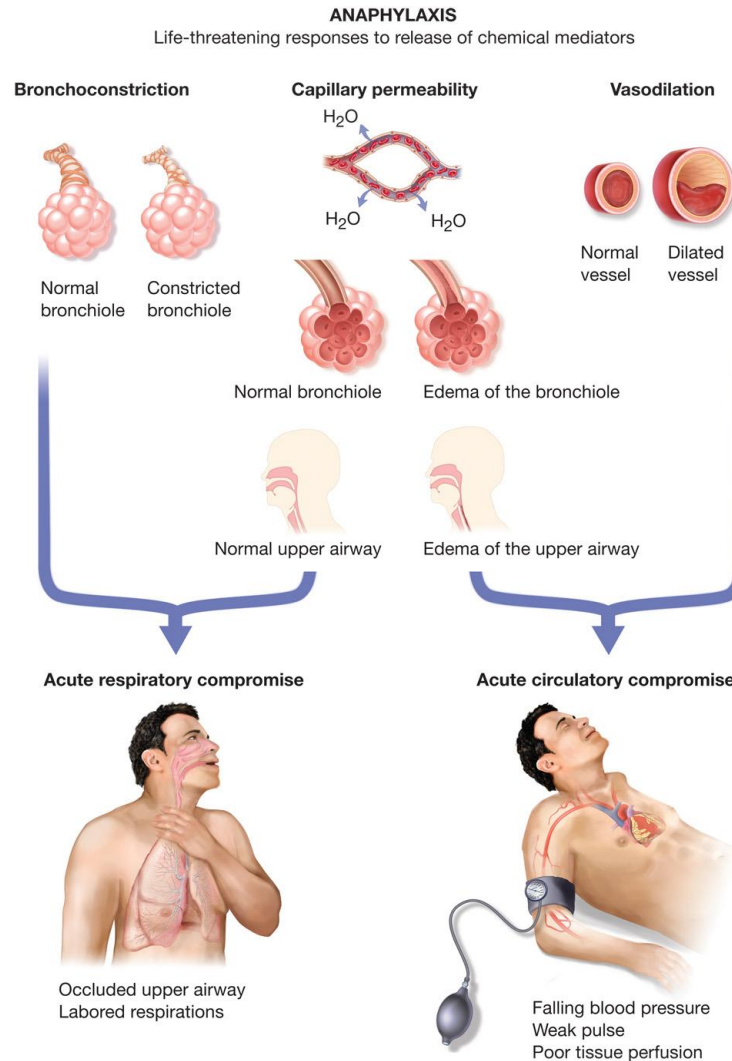
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Anaphylactic Reaction

- On subsequent exposure to an allergen, the allergen attaches to IgE.
- Mast cells and basophils release chemicals that mediate the events of anaphylaxis.
- The primary chemical mediator is histamine.

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Life-threatening responses in anaphylactic reaction: bronchoconstriction, capillary permeability, vasodilation, and an increase in mucus production.



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Anaphylactic Reaction

- An anaphylactoid reaction does not involve IgE, but the signs, symptoms, and treatment are the same as for anaphylaxis.

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Anaphylactic Reaction

- Allergens may enter the body through:
 - Injection
 - Ingestion
 - Inhalation
 - Contact

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Anaphylactic Reaction

- Common types of allergens include:
 - Venom
 - Foods
 - Pollen
 - Medications
 - Latex
 - Other substances
 - Exercise (exacerbating factor)

TABLE 21-1**Substances That Commonly Cause Anaphylactoid (Non-IgE-Mediated) Reactions**

Radiopaque contrast media

Nonsteroidal anti-inflammatory drugs (NSAIDs)

Aspirin

Protamine (heparin antagonist)

Polysaccharides (some cause IgE-mediated reactions)

Opiates

Angiotensin converting enzyme (ACE) inhibitor used during hemodialysis

Thiamine

TABLE 21-2**Medications That Commonly Cause Anaphylactic Reactions*****Antibiotics***

Penicillin
Tetracycline
Cephalosporins
Aminoglycosides
Sulfonamides
Amphotericin B
Nitrofurantoin

Local anesthetics

Procaine
Lidocaine
Tetracaine
Benzocaine

Hormones

Novocaine
Insulin
Methylprednisolone
Progesterone

Vitamins

Thiamine
Folic acid

Click on the problem below that is responsible for decreased perfusion related to the effects of histamine in anaphylactic reactions.

A. Weakening and failure of the left ventricle of the heart

B. Obstruction of blood flow through the pulmonary arterial system

C. Vasodilation and loss of fluid from the vascular space

D. Inability of cells to use the oxygen that is delivered to them

Anaphylactic Reaction

- Assessment-based approach
 - Anaphylactic reaction is often apparent because of the characteristic signs and symptoms.
 - In the scene size-up, be aware of dangers, such as wasps and bees.
 - The type of setting and medications at the scene can provide clues.

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Anaphylactic Reaction

- Primary assessment
 - The general impression may be a patient with malaise, general discomfort, or a sense of impending doom.
 - Mental status varies from alert to unresponsive.

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Anaphylactic Reaction

- Primary assessment
 - There is a high risk of airway obstruction.
 - Stridor or crowing indicate upper airway swelling.
 - Airway adjuncts will not help with laryngeal edema.

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Anaphylactic Reaction

- Primary assessment
 - Wheezing may be prominent.
 - Positive pressure ventilation may be necessary.

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Anaphylactic Reaction

- Primary assessment
 - Maintain SpO₂ at 94% or greater.
 - Ventilations may be difficult from increased airway resistance.
 - Consider requesting ALS for airway management.

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Anaphylactic Reaction

- Primary assessment
 - The pulse may be weak and rapid.
 - There may be edema, and the skin may be red and warm or cyanotic.
 - Hives and itching are characteristic.

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Localized angioedema to the tongue from an anaphylactic reaction. (© Edward T. Dickinson, MD)



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Hives (urticaria) from an allergic reaction to a penicillin-derivative drug. (© Charles Stewart, MD EMDM MPH)



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Hives to the upper body. (© Science Photo Library/CMSP)



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Anaphylactic Reaction

- Signs and symptoms include:
 - Rhinitis
 - Tachycardia
 - Pruritus
 - Faintness

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Anaphylactic Reaction

- Signs and symptoms include:
 - Warm, flushed skin (may be pale)
 - Agitation, anxiety
 - Urticaria
 - Edema

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Anaphylactic Reaction

- Be prepared for immediate intervention and transport.
- Determine whether the patient has an epinephrine auto-injector.

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TABLE 21-3 Signs and Symptoms of Anaphylaxis and Related Pathophysiology

Organ System Reaction	Signs and Symptoms	Pathophysiology Causing the Signs and Symptoms
<i>Rhinitis</i>	Nasal congestion, itchy nose, sneezing, swollen nasal mucosa, runny nose	Increased capillary permeability, vasodilation and stimulation of nerve endings
<i>Laryngeal edema</i>	Stridor, dyspnea, hoarseness, tightness in the throat, excessive salivation	Increased capillary permeability, vasodilation and stimulation of nerve endings
<i>Increased bronchiole airway resistance</i>	Wheezing, rhonchi, cough, dyspnea, tightness in the center of the chest, tachypnea, respiratory distress, cyanosis	Increased capillary permeability, vasodilation, stimulation of nerve endings, and bronchiole smooth muscle contraction
<i>Cardiovascular collapse and poor perfusion</i>	Tachycardia, hypotension, syncope, light-headedness, general weakness, syncope, chest pain	Increased capillary permeability, vasodilation, stimulation of nerve endings, and bronchiole smooth muscle contraction, and increased venous capacitance
<i>Skin: Urticaria (Hives)</i>	Pruritus (itching), tingling and warmth sensation, flushing, redness	Increased capillary permeability and vasodilation
<i>Skin: Edema</i>	Swelling especially around eyes, mouth, and extremities	Increased capillary permeability
<i>Eye: Conjunctivitis</i>	Red and itchy eyes, increased tears, swelling to eyes	Stimulation of nerve endings
<i>Gastrointestinal</i>	Cramping, abdominal pain, nausea, vomiting, diarrhea, difficulty swallowing (dysphagia), feeling of constantly having to move bowels (tenesmus)	Increased mucous secretion and gastrointestinal smooth muscle contraction
<i>Central nervous system</i>	Anxiety, apprehension, headache, sense of impending doom, confusion	Cerebral hypoperfusion and hypoxia secondary to vasodilation, increased capillary permeability and bronchiole constriction
<i>Genitourinary</i>	Urinary incontinence, vaginal bleeding, pelvic pain	Uterine smooth muscle contraction and bladder smooth muscle contraction

Anaphylactic Reaction

- Secondary assessment
 - For the history of the present illness, use OPQRST.
 - Time is critical—generally, the more quickly the reaction develops, the more severe it will be.

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Anaphylactic Reaction

- Determine the following:
 - Are signs and symptoms consistent with anaphylaxis?
 - Are signs and symptoms mild, moderate, or severe?
 - Are signs and symptoms getting worse or better?

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Anaphylactic Reaction

- Determine the following:
 - Does the patient have a history of allergies or anaphylactic reaction?
 - Does the patient have an epinephrine auto-injector?
 - Has the patient taken any other medications?
 - What medications is the patient taking?
Any new medications?

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Anaphylactic Reaction

- Determine the following:
 - Has the patient had an anaphylactic reaction in the past?
 - How severe was the last reaction?
 - Does the patient have other illnesses?

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Anaphylactic Reaction

- Determine the following:
 - When did the patient last eat or drink? What did he recently eat or drink?
 - What was the patient doing before the onset of the reaction?
 - Was the patient exposed to anything that could have caused the reaction, and by what route?

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Anaphylactic Reaction

- Obtain baseline vital signs.
 - Hypotension may be present.
 - Respirations may be fast and labored.
 - Wheezing may be heard without a stethoscope.
 - The pulse may be rapid and weak.

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Anaphylactic Reaction

- Emergency medical care
 - Distinguish between a systemic and a local reaction.
 - Treatment depends on this distinction.

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Anaphylactic Reaction

- Two key categories of signs and symptoms
 - Airway and respiratory compromise
 - Shock

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TABLE 21-4 Indicators of a Systemic Anaphylactic Reaction

Acute onset (minutes to several hours) with involvement of skin, mucosal tissue, or both (hives, itching, flushing, redness, edema to face, lips, tongue)

AND

Signs or symptoms of respiratory distress (e.g., dyspnea, wheezing, stridor, SpO₂ <94%)

OR

Signs or symptoms of poor perfusion or hypotension

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Anaphylactic Reaction

- Maintain a patent airway; airway adjuncts may not be effective.
- Suction secretions.
- Maintain an SpO₂ of 94% or greater.

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Anaphylactic Reaction

- Be prepared to provide positive pressure ventilation.
- Administer epinephrine by prescribed auto-injector, according to protocol.
- Consider requesting ALS.
- Initiate transport early.

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Anaphylactic Reaction

- Reassess
 - Look for indications a mild or moderate reaction is progressing.
 - Monitor the effects of treatment.
 - Closely monitor airway, breathing, oxygenation, and circulation.
 - Reassess vital signs.

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Anaphylactic Reaction

- Epinephrine auto-injector
 - Epinephrine mimics the effects of the sympathetic nervous system to treat the signs and symptoms of anaphylaxis.
 - Alpha₁ effects cause vasoconstriction.
 - Beta₂ effects cause bronchodilation.
 - Beta₁ effects result in side effects.

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Anaphylactic Reaction

- Epinephrine auto-injector
 - The effects of epinephrine are rapid, but short-lived.
 - Auto-injectors may be packed singly or in pairs.
 - There are two dosages.
 - 0.3 mg for patients 66 lb. or greater
 - 0.15 mg for patients less than 66 lb.

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Epinephrine auto-injectors: EpiPen auto-injectors for infant/child and adult.



(a)

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Anaphylactic Reaction

- Epinephrine auto-injector
 - If the patient has more than 1 injector, transport the second device.
 - The dose can be repeated in 5 to 15 minutes, if needed.

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Anaphylactic Reaction

- Epinephrine auto-injector side effects
 - Increased heart rate
 - Pale skin
 - Dizziness
 - Chest pain
 - Headache
 - Nausea and vomiting
 - Excitability and anxiousness

EMT SKILLS 21-1

Administering an EpiPen Epinephrine Auto-Injector

Administer oxygen by nonrebreather mask.



Check the EpiPen epinephrine auto-injector to ensure it is prescribed for the patient. Check the expiration date and clarity of the drug.



Remove the safety cap from the EpiPen auto-injector.



Place the tip of the auto-injector on the anterolateral aspect of the thigh, midway between the hip and knee. Push the injector firmly against the thigh until it activates. Hold it in place until the medication is injected.



Properly dispose of the auto-injector. Then record the time of the epinephrine injection.



Case Study Conclusion

Luke and Joy quickly gather information to confirm their initial impression of anaphylaxis. Jesse has an epinephrine auto-injector in the nurse's office, but the nurse is not currently at the school.

As Joy reassures Jesse and completes a rapid secondary assessment, including vital signs, Luke confirms that the auto-injector is prescribed to Jesse and administers it.

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Case Study Conclusion

Recognizing the short duration of action of epinephrine, the EMTs do not spend further time at the scene, but transport immediately.

Jesse's wheezing decreases en route, and there is no worsening of his swelling or rash. His blood pressure remains normal, as well as his SpO₂, although his heart rate has increased from an initial 104 to 116.

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Case Study Conclusion

At the emergency department, Jesse receives additional epinephrine, as well as an antihistamine. After being observed and monitored for several hours, Jesse's parents are grateful to be able to take him home.

Lesson Summary

- An anaphylactic reaction is a severe allergic reaction.
- The pathophysiology includes airway edema, bronchoconstriction, and vasodilation.
- Care includes airway management, ventilation and oxygenation, and administration of epinephrine.

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Lesson Summary

- Anaphylaxis can progress rapidly; reassess the patient frequently.