Chapter 21

Allergy and Anaphylaxis

Unit Summary

After students complete this chapter and the related course work, they will understand the anatomy, physiology, and pathophysiology of hypersensitivity disorders and anaphylactic reactions. Additionally, students will have the knowledge and skills to recognize and manage hypersensitivity disorders and anaphylactic reactions.

National EMS Education Standard Competencies

Medicine

Applies fundamental knowledge to provide basic emergency care and transportation based on assessment findings for an acutely ill patient.

**Immunology**

Recognition and management of shock and difficulty breathing related to

• Anaphylactic reactions (pp 808–816)

Anatomy, physiology, pathophysiology, assessment, and management of

• Hypersensitivity disorders and/or emergencies (pp 804–816)

• Anaphylactic reactions (pp 804–816)

Knowledge Objectives

1. Define the terms *allergic reaction* and *anaphylaxis*. (p 804)

2. Explain the difference between a local and a systemic response to allergens. (p 804)

3. List the five categories of stimuli that could cause an allergic reaction or an extreme allergic reaction. (p 806)

4. Differentiate the primary assessment for a patient with a systemic allergic or anaphylactic reaction and with a local reaction. (pp 808–809)

5. Explain the importance of managing the ABCs of a patient who is having an allergic reaction. (p 808)

6. Discuss the steps in the primary assessment that are specific to a patient who is having an allergic reaction. (pp 808–810)

7. Explain the factors involved when making a transport decision for a patient having an allergic reaction. (p 809)

8. Review the process for providing emergency medical care to a patient who is experiencing an allergic reaction. (pp 811–816)

9. Explain the rationale, including communication and documentation considerations, when determining whether to administer epinephrine to a patient who is having an allergic reaction. (pp 813–816)

10. Describe some age-related contraindications to using epinephrine to treat an allergic reaction in a geriatric patient. (p 816)

Skills Objectives

1. Demonstrate how to remove the stinger from a honeybee sting and proper patient management following its removal. (pp 812–813)

2. Demonstrate how to use an EpiPen auto-injector. (pp 813–815, Skill Drill 21-1)

Readings and Preparation

Review all instructional materials including ***Emergency Care and Transportation of the Sick and Injured***, **Twelfth Edition**, Chapter 21, and all related presentation support materials.

• Review local protocols regarding EMT assistance with epinephrine auto-injectors.

Support Materials

• Lecture PowerPoint presentation

• Case Study PowerPoint presentation

• Skill Drill PowerPoint presentation

- Skill Drill 21-1, Using an EpiPen Auto-injector PowerPoint presentation

• Equipment needed to perform the psychomotor skills presented in this chapter

• Skill Evaluation Sheet

- Skill Drill 21-1, Using an EpiPen Auto-injector

Enhancements

• Direct students to visit Navigate.

• Provide students with copies of local and state protocols regarding the EMT assisting with epinephrine auto-injectors.

• **Content connections:** Discuss the importance of practicing the assessment and management skills that are covered in Chapter 10, “Airway Management.” Remind students that they should be prepared to use standard airway procedures and positive pressure ventilation (for those patients experiencing anaphylaxis) according to the principles identified in Chapter 11, *Airway Management*.

Teaching Tips

• Review and present local protocols for the EMT’s scope of practice in relation to epinephrine administration.

Unit Activities

**Writing assignments:** Instruct each student to choose an allergy (eg, allergy to bee stings, allergy to peanuts) and write a brief, one-page report summarizing the physiology, occurrence, and management of the allergy.

**Group activities:** Divide the class into groups of three or four, and instruct each group to first create a brief scenario depicting an anaphylactic emergency and then perform the scenario for the others in the class.

**Medical terminology review:** Ask students to research epinephrine to determine its class, mechanism of action, indications, contraindications, adverse reactions, forms supplied, dosage and administration, duration of action, and any special considerations when using the medication.

**Visual thinking:** Prepare handouts or slides to project on-screen depicting “mini-scenarios” (such as in the “You Are the Provider” sections of the chapter). Include vital signs, SAMPLE history, and assessment findings. Conduct a class discussion regarding what these findings might indicate and which complications may develop.

Pre-Lecture

### You Are the Provider

“You Are the Provider” is a progressive case study that encourages critical thinking skills.

### Instructor Directions

**1.** Direct students to read the “You Are the Provider” scenario found throughout Chapter 21.

**2.** You may wish to assign students to a partner or a group. Direct them to review the discussion questions at the end of the scenario and prepare a response to each question. Facilitate a class dialogue centered on the discussion questions and the Patient Care Report.

**3.** You may also use this as an individual activity and ask students to turn in their comments on a separate piece of paper.

Lecture

I. Introduction

**A. As an EMT, you will often respond to calls involving an allergic reaction.**

1. Allergy-related emergencies may involve:

a. Acute airway obstruction

b. Cardiovascular collapse

2. You must be able to treat these life-threatening complications.

3. You must be able to distinguish between the body’s usual response to an allergen and an allergic reaction.

**B. This chapter describes immunology, which is the study of the body’s immune system, and the five categories of stimuli that may provoke an allergic reaction.**

II. Anatomy and Physiology

A. The immune system protects the body from foreign substances and organisms.

B. When a foreign substance invades, the body initiates a series of responses to identify and inactivate the invader.

III. Pathophysiology

**A. An allergic reaction is an exaggerated immune response to any substance.**

1. It is not caused directly by an outside stimulus, such as a bite or sting.

2. It is caused by the body’s immune system, which releases chemicals to combat the stimulus.

a. These chemicals include histamines and leukotrienes, both of which contribute to an allergic reaction.

3. Some patients may not know what is causing their allergic reaction, so you must be able to recognize the signs and symptoms and maintain a high index of suspicion.

4. An allergic reaction may be:

a. Mild and local, characterized by itching, redness, and tenderness

b. Severe and systemic—a condition known as anaphylaxis

**B. Anaphylaxis is an extreme, life-threatening allergic reaction.**

1. Involves multiple organ systems

2. In severe cases, can rapidly result in shock and death

3. Three common signs:

a. Urticaria (hives)

b. Angioedema

c. Wheezing

4. Stridor may be heard on inspiration if there is upper airway narrowing.

5. Hypotension due to vasodilation may occur, as well as increased capillary permeability.

6. Patients may experience nausea, vomiting, and abdominal cramps.

IV. Common Allergens

**A. The most common allergens fall into five general categories:**

1. Food

a. Certain foods (eg, shellfish, peanuts) may be the most common trigger of anaphylaxis.

b. Symptoms:

i. May take more than 30 minutes to appear

ii. May not include the presence of skin signs (eg, hives)

iii. Abdominal cramping, vomiting, and diarrhea are common.

iv. The reaction can be severe and involve the respiratory and/or cardiovascular systems.

2. Medication

a. The second most common source of anaphylactic reactions

i. Antibiotics

ii. Nonsteroidal anti-inflammatory agents

b. If the medication is injected, the reaction may be immediate (within 30 minutes) and severe.

c. Reactions to oral medications may take more than 30 minutes to appear, but can also be very severe.

3. Plants

a. Dusts, pollens, and other plant materials can cause a rapid and severe allergic reaction.

b. Common plant allergens include ragweed, ryegrass, maple, and oak.

4. Chemicals

a. Certain chemicals, makeup, soap, hair dye, latex, and various other substances can cause severe allergic reactions.

b. Latex is of particular concern to health care providers.

i. Use latex alternatives such as nitrile gloves.

5. Insect bites and stings

a. Envenomation: the process of an insect injecting its venom

b. The reaction can be localized or may be severe and systemic.

**B. Insect stings**

1. Approximately 2 million Americans are allergic to the venom of bees, wasps, and hornets, and insect stings account for at least 62 deaths in the United States per year.

2. In half of these deaths, the victim had never experienced a reaction to prior stings.

3. The stinging organ of most insects is a small, hollow spine projecting from the abdomen.

4. Honeybees cannot withdraw their stinger.

a. If the stinger is not removed, it can continue to inject venom for as long as 20 minutes.

5. Wasps and hornets can sting multiple times.

6. Some ants, especially fire ants, strike repeatedly.

7. Signs and symptoms:

a. Sudden pain

b. Swelling

c. Localized heat

d. Widespread urticaria

e. Redness in light-skinned individuals

f. Itching and possibly a wheal (raised, swollen, well-defined area on the skin)

g. As long as these manifestations remain localized, they are not usually serious.

9. In more severe (anaphylactic) cases, patients may experience:

a. Stridor

b. Bronchospasm and wheezing

c. Chest tightness and coughing

d. Dyspnea

e. Anxiety

f. Gastrointestinal complaints

g Hypotension

h. Occasionally, respiratory failure

i. If untreated, an anaphylactic reaction can proceed rapidly to death.

j. More than two-thirds of patients who die of anaphylaxis do so within the first 30 minutes.

V. Patient Assessment in an Immunologic Emergency

**A. Scene size-up**

1. Scene safety

a. The patient’s environment or recent activity may indicate the source of the allergic reaction.

b. A respiratory problem reported by dispatch may be an allergic reaction.

i. Until a field impression of allergic reaction is firmly established, be mindful of other potential causes of respiratory distress.

ii. Traumatic injury may be present, secondary to the medical emergency.

c. Follow standard precautions, with a minimum of gloves and eye protection.

d. Consider the need for additional resources, such as ALS personnel.

B. Primary assessment

1. Quickly identify and treat any immediate or potential life threats.

a. ABCs should be reassessed repeatedly throughout transport.

2. Form a general impression.

a. Allergic reactions may present as respiratory or cardiovascular distress in the form of shock.

b. If the patient is anxious and in distress, immediately call for ALS backup if available.

c. Look for a medical identification tag if the patient is found unresponsive or is unable to answer questions.

3. Airway and breathing

a. Anaphylaxis can cause rapid swelling of the upper airway.

b. Not all allergic reactions are anaphylactic reactions.

c. Quickly assess for increased work of breathing, use of accessory muscles, head bobbing, tripod positioning, nostril flaring, and abnormal breath sounds.

d. Assist the patient into a comfortable position to maximize ventilations.

e. If signs of shock emerge, immediately place the patient in the supine position as tolerated.

f. Initiate high-flow oxygen therapy or assist ventilations as necessary.

4. Circulation

a. Some patients in anaphylaxis may present with signs and symptoms of circulatory distress, such as hypotension.

b. Assess for signs of hypoperfusion.

c. Treat for shock.

d. The definitive treatment for anaphylactic shock is epinephrine.

5. Transport decision

a. If anaphylaxis is suspected, or if a relatively mild allergic reaction appears to be worsening, immediate transport is warranted.

b. If the patient is calm and does not exhibit severe symptoms, consider continuing the assessment, but err on the side of emergency transport.

**C. History taking**

1. Investigate the chief complaint or history of present illness. Identify signs and symptoms.

2. SAMPLE history

a. If the patient is responsive, obtain the SAMPLE history (including OPQRST) and ask the following questions specific to an allergic reaction:

i. Have any interventions already been completed?

ii. Has the patient experienced a severe allergic reaction in the past?

3. Be alert for any statements regarding the ingestion of foods that commonly cause allergic reactions.

4. Inquire about the presence of gastrointestinal complaints such as nausea and vomiting.

**D. Secondary assessment**

1. Physical examination

a. If indicated, perform a rapid exam of the body from head to toe or conduct a physical examination focused on the area(s) of chief complaint.

b. If the patient is unconscious or otherwise unable to communicate:

i. Remove clothing as necessary and look for the presence of bee stingers, signs of contact with chemicals, and other clues suggestive of a reaction.

ii. Look for a medical alert tag that could indicate a severe allergy.

c. Auscultate for abnormal breath sounds and inspect the skin for swelling, rashes, or urticaria.

2. Vital signs

a. Assess baseline vital signs, including pulse and respiratory rates, blood pressure, pupillary response, and oxygen saturation.

b. Skin signs may be unreliable indicators of hypoperfusion, as they may vary widely or be hidden by rashes and swelling.

3. Monitoring devices

a. Pulse oximetry can be a useful method to assess the patient’s perfusion status.

b. The decision to apply oxygen should be based on airway patency, work of breathing, and abnormal lung sounds on auscultation, not solely on pulse oximetry readings.

E. Reassessment

1. En route to the hospital, repeat the primary assessment, reassess the patient’s vital signs, and repeat a focused physical examination of the affected body systems.

a. If the patient is unstable, reassess every 5 minutes; if the patient is stable, reassess every 15 minutes.

b. Watch for signs of shock and treat immediately if present.

2. Interventions

a. Treatment is determined by the severity of the reaction.

i. Mild reactions may require only supportive care and monitoring.

ii. Anaphylaxis requires more aggressive treatment, including epinephrine and ventilatory support.

b. Recheck your interventions.

i. Even if the patient is experiencing relief, transport to the emergency department is still warranted because the medication’s effect will wear off and symptoms will return.

3. Communication and documentation

a. Documentation should include:

i. Signs and symptoms found during the assessment

ii. Reasons why you chose to provide the care you did

iii. The patient’s response to your treatment

VI. Emergency Medical Care of Immunologic Emergencies

A. If the patient appears to be having a severe allergic (or anaphylactic) reaction:

1. Administer BLS and provide prompt transport to the hospital.

2. If the stinger is present, scrape the skin with the edge of a sharp, stiff object such as a credit card (do not use tweezers or forceps).

a. Gently wash the area with soap or mild antiseptic.

b. Remove jewelry from the area before swelling begins.

c. Position the injection site slightly below the level of the heart.

d. Apply ice or cold packs to the area, but not directly on the skin and not for more than 10 minutes at a time

3. Be alert for signs of airway swelling and other signs of anaphylaxis such as nausea, vomiting, and abdominal cramps, and do not give the patient anything by mouth.

4. Place the patient in the supine position as indicated, and give oxygen if needed.

5. Monitor the patient’s vital signs, and be prepared to provide further support as needed.

B. Epinephrine

1. Epinephrine is a sympathomimetic hormone.

a. It mimics the sympathetic (fight-or-flight) response.

2. Causes the blood vessels to constrict, which reverses vasodilation and hypotension

3. Other properties of epinephrine increase cardiac contractility and relieve bronchospasm in the lungs.

4. It can rapidly reverse the effects of anaphylaxis.

5. Epinephrine is prescribed by a physician and comes pre-dosed in an automatic epinephrine injector (EpiPen or Auvi-Q).

6. Some EMS systems are authorized to carry epinephrine as part of their regular on-board medications; in others, EMS providers may be permitted to help patients self-administer their own medication.

7. Refer to local protocols or consult online medical control.

8. The adult EpiPen system delivers 0.3 mg of epinephrine via a spring-loaded needle and syringe system; the infant–child system delivers 0.15 mg.

9. See **Skill Drill 21-1** for instructions on using an EpiPen auto-injector.

10. Epinephrine can have an effect within 1 minute, so it is the primary way to save the life of someone with a severe anaphylactic reaction.

11. Side effects:

a. High blood pressure

b. Increased pulse rate

c. Anxiety

d. Cardiac arrhythmias

e. Pallor

f. Dizziness

g. Chest pain

h. Headache

i. Nausea

j. Vomiting

12. Patients who do not have signs of respiratory compromise or hypotension and who do not meet the criteria for a diagnosis of anaphylaxis should not be given epinephrine.

Post-Lecture

## Assessment in Action

A. Assessment in Action is available in the Navigate course.