Dear EMS Educator

Welcome to the Eleventh Edition of the premier EMT education program! When the American Academy of Orthopaedic Surgeons (AAOS) published the first text for prehospital personnel in 1971, the book quickly set the standard for EMS education. Now the centerpiece of an entire series of educational teaching and learning resources, Emergency Care and Transportation of the Sick and Injured—also known as the “Orange Book” for its trademark orange cover—continues to serve as a driving force in EMS education. The Eleventh Edition of Emergency Care and Transportation of the Sick and Injured offers instructors and students comprehensive coverage of every competency statement in the National EMS Education Standards in an engaging format.

With the Eleventh Edition, Students Will Appreciate:

Current, State-of-the-Art Medical Content—

Medicine is constantly changing and prehospital medicine varies across states and regions. The content of the Eleventh Edition reflects the guidance and recommendations of an extremely experienced, geographically diverse group of authors. Supporting the efforts of this outstanding group is a team of medical editors from the AAOS. Students can feel confident that their course materials present the most cutting-edge content possible.

Targeted Reinforcement of Concepts—

Health care education can be complicated, and for many students, the EMT class is their first exposure to anatomy, physiology, medical terminology, and medical care. The Eleventh Edition is built on the premise that students need a solid foundation in the basics and then appropriate reinforcement of that content. For example, Chapter 6, The Human Body provides students with a comprehensive understanding of the entire anatomy, physiology, and pathophysiology of the human body. At the beginning of Chapter 16, Cardiovascular Emergencies, the text briefly revisits the relevant anatomy, physiology, and pathophysiology of the cardiovascular system, thus solidifying this knowledge in the students’ minds and offering them context when studying specific emergencies.
The Eleventh Edition also applies this unique approach of concept reinforcement to Patient Assessment. This critical topic is presented in a single, comprehensive chapter, ensuring that students understand patient assessment as a single, integrated process. This also allows instructors to teach patient assessment the way that students will actually practice it in the field. Recognizing the importance of assessment-based care, each medical and trauma chapter reflects the patient assessment algorithm, using the same language and visual cues to strengthen students’ command of this process.

**Primary Assessment**

When a patient presents with an allergic reaction, you should quickly identify and treat any immediate or potential life threats. It is essential that you pay careful attention to the patient's ABCs, as deterioration can occur at almost any time and with very little warning. This is not only paramount during the primary assessment; ARDs should continue to be reassessed repeatedly throughout transport to the emergency department (ED). Allergic reactions may present as respiratory distress or as cardiovascular distress in the form of shock. Patients experiencing a severe allergic reaction will often appear very anxious. If your general impression finds the person anxious and in distress, immediately call for ALS backup if available. Sometimes patients who are known to have severe allergies wear a medical identification tag (e.g., necklace or bracelet). Such clues could provide crucial information in situations where the patient is found unresponsive or is otherwise unable to answer questions about his or her medical history.

**Accessible Content**

Presented With a Clear, Direct Voice—The Eleventh Edition talks to students; not at them. Each concise chapter creates an accessible learning environment where students achieve a clear understanding and retention of the material. This strong foundation ultimately leads to better pass rates.
A Textbook that Reflects the Expertise of its Author Team—
The Eleventh Edition authors are seasoned EMS practitioners with decades of experience in both the care of patients in the prehospital setting and the education of future EMS practitioners.

Educators Will Appreciate:
Clear Application of Material to Real-World EMS Situations—Students who want to become EMTs are focused on learning to help people. They need to know why information is important to learn. “How will this help me in the field?” Through evolving patient case studies in each chapter and additional critical thinking scenarios throughout the program resources, the Eleventh Edition gives students a genuine context for the application of knowledge. This approach makes it clear how all of the new information will be used to help them and their patients in the field.

Table 20-1

<table>
<thead>
<tr>
<th>Respiratory System</th>
<th>Cardiovascular System</th>
<th>Skin</th>
<th>Other Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in pulse rate (bradycardia, tachycardia)</td>
<td>Red, flushed, hot skin</td>
<td>Cyanosis, cool skin</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Elevate in blood pressure</td>
<td>Hypotension</td>
<td>Skin rash, urticaria, angioedema</td>
<td>Hypertension</td>
</tr>
</tbody>
</table>

If the patient is responsive, begin obtaining the SAMPLE history (including OPCRST) and the following information specific to allergic reactions:

- Have any interventions already been completed? Prior to your arrival, the patient may have begun self-treatment with his or her own medication, such as an epinephrine auto-injector, a bronchodilator inhaler, or antihistamines such as chlorpheniramine (Claritin-Dimes) or diphenhydramine (Benadryl).
- Has the patient experienced a severe allergic reaction in the past? If so, what happened? The patient’s answers may indicate how severe the present reaction may become. For example, if the patient was hospitalized for a reaction, the patient’s answers may indicate the severity of the previous reaction.

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Current, State-of-the-Art Medical Content—EMS has long struggled to prove that the care delivered in the field has real impact on patients’ lives. The Eleventh Edition incorporates evidence-based medical concepts to ensure that students are taught assessment and treatment modalities that will help patients today—not simply recycle what has been taught year after year.

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This new edition has been carefully correlated to the latest standards and expert guidance documents, including the National Model EMS Clinical Guidelines (National Association of State EMS Officials), the American College of Surgeons’ Committee on Trauma recommendations, the National Registry of Emergency Medical Technicians’ Psychomotor Examination Skill Sheets, and the 2015 ECC/CPR Guidelines.
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- Assessment summaries, including detailed items analysis, are available.
- Educators can customize the prepopulated assessments by adding, editing, and removing questions.
- Plus, educators can configure the grading scheme, number of attempts, time allotted, and much more.

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- View the link between average grade and level of engagement for the course, by chapter, or by topic.
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Anatomy, physiology, pathophysiology, assessment, and Recognition and management of shock and difficulty care and transportation based on assessment findings for an
Applies fundamental knowledge to provide basic emergency Medicine

Standard Competencies
4. List the five categories of stimuli that could cause an allergic reaction. (pp 731–732)
3. Differentiate the primary assessment for a patient with an allergic reaction. (pp 731–732)
2. Explain the difference between a local and a systemic response to allergens. (pp 727, 733)

Knowledge Objectives
1. Define the terms allergic reaction and anaphylaxis. (pp 727–729)
2. Explain the difference between a local and a systemic response to allergens. (pp 727, 733)
3. Differentiate the primary assessment for a patient with a systemic allergic or anaphylactic reaction and a local reaction. (pp 731–733)
4. List the five categories of stimuli that could cause an allergic reaction or an extreme allergic reaction. (p. 729)

Skills Objectives
1. Demonstrate how to remove the stinger from a honeybee sting and proper patient management following its removal. (pp 734–735)
2. Demonstrate how to use an EpiPen auto-injector. (pp 736–737, Skill Drill 20-1)

Introduction
Death as a result of allergic reaction is rare, but is possible. As an EMT, you will often respond to calls involving an allergic reaction. When managing allergy-related emergencies, you must be aware of the possibility of acute airway obstruction and cardiovascular collapse and be prepared to treat these life-threatening complications. You must also be able to distinguish between the body’s usual response to a sting or bite and an allergic reaction, which may require epinephrine. Your ability to recognize and manage the many signs and symptoms of allergic reactions may be the only difference between a patient’s life and imminent death.

There are many conditions related to the immune system, but an allergic reaction is the only immunologic emergency you will treat as an EMT. Contrary to what many people think, an allergic reaction, an exaggerated immune response to any substance, is not caused directly by an outside stimulus, such as a bite or sting. Rather, it is a reaction by the body’s immune system, which releases chemicals to combat the stimulus. Among these chemicals are histamines and leukotrienes, both of which contribute to an allergic reaction. Given the right person and the right circumstances, almost any substance can become an allergen. However, some people do not experience allergic reactions the first time they are exposed to an allergen. First, a person becomes sensitized (exposed for the first time) to the substance, and then his or her immune system learns to recognize it. When the patient is exposed to the substance again, an allergic reaction occurs. As a result, some patients may not have any idea what is causing their allergic reactions or may not realize they are having one at all—so you must be able to recognize the signs and symptoms and maintain a high index of suspicion. An allergic reaction may be mild and local—characterized by itching, redness, or tenderness—or it may be severe and systemic, a condition known as anaphylaxis. (pp 730–731)

Anaphylaxis is an extreme allergic reaction that is life threatening and involves multiple organ systems. In severe cases, anaphylaxis can rapidly result in shock and death. Two of the most common signs of anaphylaxis are widespread urticaria or hives, small areas of generalized itching or burning that appear as multiple, small, raised areas on the skin (e.g., urticaria and angioedema, areas of localized swelling (e.g., swelling). Another often-observed
Warning signs of an impending anaphylactic reaction. Exposure to an allergen and is characterized by multiple, associated with allergic reactions. Some common plant allergens include tree pollen, mold, and severe reaction may be immediate (within 30 minutes) because these insects usually fly away after stinging, it is often impossible to identify which species was responsible for the injury. Urticaria, or hives, may appear following five general categories:

- **Food.** Certain foods, such as shellfish and peanuts, may be the most common trigger of anaphylaxis. These foods account for 30% of deaths from anaphylaxis, most commonly in adolescents and young adults. Symptoms of a food allergy may take more than 30 minutes to appear and may not include the presence of skin signs, such as hives. However, the reaction can be quite severe and involve the respiratory and/or cardiovascular systems. It is possible for a person to be unaware of the exposure; for example, a person allergic to peanuts may eat something without knowing that one of the ingredients is peanuts.

- **Medication.** The second most common source of anaphylactic reactions is medication, particularly antibiotics (eg, penicillin) and nonsteroidal anti-inflammatory drugs (NSAIDs). If the medication is injected, the reaction may be immediate (within 30 minutes) and severe (Figure 20-4). Reactions to oral medications may take more than 30 minutes to appear, but can also be very severe.

- **Plants.** People who inhale dust, pollen, mold, mildew, or other organic materials to which they are sensitive may experience an allergic reaction. Some common plant allergens include tree pollen, mold, and severe reaction may be immediate (within 30 minutes) and severe (Figure 20-4). Reactions to oral medications may take more than 30 minutes to appear, but can also be very severe.

- **Chemicals.** Certain chemicals, makeup, soap, hair dye, latex, and various other substances can cause severe allergic reactions. Latex is of particular concern to health care providers, patients can be sensitive to it, but so can you! Up to 12% of health care providers will become sensitized to latex. For some, simply being in the same room as someone wearing powdered latex gloves can cause a reaction. It is a good practice to routinely use latex alternatives such as nitrile gloves. Follow your local protocol.

- **Insect bites and stings.** When an insect bites or stings you, the act of injecting its venom is called envenomation. Envenomation by a honeybee, wasp, ant, yellow jacket, or hornet may cause a localized reaction, causing swelling and itching at the site, or a severe and systemic reaction (ie, anaphylaxis).

## Common Allergens

The most common allergens fall into one of the following five general categories:

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Some ants, especially the fire ant, also strike repeatedly, injecting a particularly irritating toxin, or poison, at the bite site. It is not uncommon for a patient to rapidly sustain multiple ant bites, usually on the feet and legs.

Signs and symptoms of insect stings and bites include sudden pain, swelling, localized heat, itching, and sometimes a red, swollen, well-defined area on the skin. Bites are generally found on the feet and the legs and appear as multiple small, raised pustules.

Figure 20-5
Most stinging insects inject venom through a small, hollow spine that projects from the abdomen. A. The stinger of the honeybee is barbed; the honeybee cannot withdraw its stinger once it has stung someone. B. The wasp’s stinger is unbarbed, meaning that it can inflict multiple stings.

Applying ice sometim es may be helpful to reduce swelling. The swelling associated with an insect bite remains localized, they are not usually serious. In more severe (anaphylactic) cases, patients may experience bronchospasm and wheezing, chest tightness, nausea, vomiting, abdominal pain, diarrhea, or hypotension. Occasionally, respiratory distress occurs. If untreated, an anaphylactic reaction can proceed rapidly to death. In fact, more than two-thirds of patients who die of anaphylaxis do so within minutes of reaction starting. If this is unbarbed, meaning that it can inflict multiple stings.

Figure 20-6
A. The fire ant. B. Fire ants inject an irritating toxin at multiple sites. Bites are generally found on the feet and the legs and appear as multiple small, raised pustules.

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Figure 20-6
A. The fire ant. B. Fire ants inject an irritating toxin at multiple sites. Bites are generally found on the feet and the legs and appear as multiple small, raised pustules.

The most severe form of allergic reactions, anaphylaxis, can cause rapid swelling of the upper airway area. Some patients, when stung by multiple ants, may be dramatically and sometimes frightening to the patient or to you. However, the reactions remain localized unless the mechanism of injury/nature of injury is recognized. Airway, breathing, and circulation considerations; and determination of transport priority.

You are the Provider

The closest hospital is 15 minutes away, while the closest ALS ambulance is over 1 hour away. You perform a primary assessment of the patient and note the following:

**Recording Time:** 0 Minutes

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Airway</th>
<th>Breathing</th>
<th>Circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious; widespread hives</td>
<td>Open, clear of obstructions or foreign bodies</td>
<td>Rapid with audible wheezing</td>
<td>Radial pulse, rapid rate and strong; skin, flushed and warm, covered with urticaria</td>
</tr>
</tbody>
</table>

The patient reports dyspnea and states that his entire body is itching. Your partner applies high-concentration oxygen via a nonrebreathing mask.

1. Is the patient experiencing a local reaction or anaphylaxis?
2. What body system(s) should you focus on first? Why?
Investigate the patient's chief complaint and history of the present illness. Identify signs and symptoms:

- Have any interventions already been completed? Prior to your arrival, the patient may have begun self-treatment with his or her own medication, such as an epinephrine auto-injector, a bronchodilator inhaler, or antihistamines such as chlorpheniramine (Chlor-Triment) or diphenhydramine (Benadryl).
- Has the patient experienced a severe allergic reaction in the past? If so, what happened? The patient's answers may indicate how severe the present reaction may become. For example, if the patient was hospitalized or required intubation due to a previous reaction, you should perceive this as an ominous sign and assume that he or she may have another reaction of equal or even greater severity. In such cases, rapid transport and treatment, as well as ALS care, are among the highest priorities.
- Be alert for any statements regarding the ingestion of foods that commonly cause allergic reactions. What was the patient doing, or what was the patient exposed to, before the onset of symptoms? This information may be key to effective treatment, regardless of any prior history of allergic reactions.

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

### Secondary Assessment

If indicated, perform a rapid full-body scan or conduct a physical examination focused on the area(s) of chief complaint.

If the patient is unconscious or otherwise unable to communicate, remove clothing as necessary and observe for the presence of bee stingers, signs of contact with chemicals, and other clues suggestive of a reaction. Remember to look for a medical alert tag, which could indicate a severe allergy to a particular substance.

If you have not already done so, auscultate for abnormal breath sounds such as wheezing or stridor, the skin for swelling, rashes, or blisters, and assess the patient's ability to speak. If the patient is not speaking, do not hesitate to initiate high-flow oxygen and intubate the patient if needed.

If the patient does not exhibit severe signs and symptoms, consider obtaining a SAMPLE history (including OPQRST) and retain critical information so that you can best assess the specific patient condition or patient conditions that are the Provider highest priorities.

### Tables organizing information so students can quickly locate and retain critical information.

If the patient is responsive, begin by obtaining the SAMPLE history (including OPQRST) and the following information specific to allergic reactions:

<table>
<thead>
<tr>
<th>Table 20-1</th>
<th>Additional Signs and Symptoms</th>
<th>Respiratory System</th>
<th>Cardiovascular System</th>
<th>Skin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sneezing or an itchy, runny nose (early sign)</td>
<td>1. Increase in pulse rate (tachycardia, early sign)</td>
<td>1. Increase in pulse rate (tachycardia, early sign)</td>
<td>1. Increase in pulse rate (tachycardia, early sign)</td>
<td></td>
</tr>
<tr>
<td>2. Shortness of breath (dyspnea)</td>
<td>2. Red, flushed, hot skin (early sign) or pale, cyanotic, cool skin (late sign)</td>
<td>2. Red, flushed, hot skin (early sign) or pale, cyanotic, cool skin (late sign)</td>
<td>2. Red, flushed, hot skin (early sign) or pale, cyanotic, cool skin (late sign)</td>
<td></td>
</tr>
<tr>
<td>3. Tightness in the chest or throat</td>
<td>3. Decrease in blood pressure (hypotension)</td>
<td>3. Decrease in blood pressure (hypotension)</td>
<td>3. Decrease in blood pressure (hypotension)</td>
<td></td>
</tr>
<tr>
<td>5. Hoarseness</td>
<td>5. Swelling, especially of the face, neck, hands, feet, and/or tongue, either local (angioedema) or generalized</td>
<td>5. Swelling, especially of the face, neck, hands, feet, and/or tongue, either local (angioedema) or generalized</td>
<td>5. Swelling, especially of the face, neck, hands, feet, and/or tongue, either local (angioedema) or generalized</td>
<td></td>
</tr>
<tr>
<td>6. Rapid, labored, or noisy respirations</td>
<td>6. Cyanosis or pallor around the lips</td>
<td>6. Cyanosis or pallor around the lips</td>
<td>6. Cyanosis or pallor around the lips</td>
<td></td>
</tr>
<tr>
<td>7. Wheezing and/or stridor (which may progress to a silent chest with anaphylaxis; late sign)</td>
<td>7. Warm, tingling feeling in the face, mouth, chest, feet, and hands</td>
<td>7. Warm, tingling feeling in the face, mouth, chest, feet, and hands</td>
<td>7. Warm, tingling feeling in the face, mouth, chest, feet, and hands</td>
<td></td>
</tr>
</tbody>
</table>

Table 20-1

### Respiratory System

If the patient is unconscious or otherwise unable to communicate, assist the patient into a comfortable position, generally in a high-Fowler position, in an effort to maximize ventilation. This will help the patient breathe while allowing respiratory effort to lift and the shock of exposure, the patient should be placed in the supine position as quickly as tolerated. Quickly listen to the lungs of the chest. Do not hesitate to initiate positive-pressure ventilation therapy. For a patient in severe respiratory distress, you may have to assist ventilations using a bag-valve mask (BVM), attached to a properly titrated concentration of oxygen. This can be done in an unresponsive patient or a patient with an altered level of consciousness. The positive-pressure ventilations you provide will force air beyond the swelling in the airway and into the lungs while you await more definitive treatment.

Although respiratory complaints are most common, some patients in anaphylaxis may not present with severe respiratory symptoms but primarily with signs and symptoms of circulatory distress, such as hypotension. Palpating for the presence and quality of a radial pulse will help you quickly identify how the circulatory system is responding to the reaction. The positive-pressure ventilations you provide will force air beyond the swelling in the airway and into the lungs while you await more definitive treatment. For a patient in severe respiratory distress, you may have to assist ventilations using a bag-valve mask (BVM), attached to a properly titrated concentration of oxygen. This can be done in an unresponsive patient or a patient with an altered level of consciousness. The positive-pressure ventilations you provide will force air beyond the swelling in the airway and into the lungs while you await more definitive treatment.

Assess for a rapid pulse rate; pale, cool, cyanotic skin; and delayed capillary refill, all of which may indicate hypoperfusion. Treatment for shock includes oxygen, proper positioning (the recumbent or supine as tolerated), and preventing the loss of body heat. The definitive treatment for shock resulting from anaphylaxis is epinephrine.

### History Taking

If the patient is responsive, begin by obtaining the SAMPLE history (including OPQRST) and the following information specific to allergic reactions:

- Have any interventions already been completed? Prior to your arrival, the patient may have begun self-treatment with his or her own medication, such as an epinephrine auto-injector, a bronchodilator inhaler, or antihistamines such as chlorpheniramine (Chlor-Triment) or diphenhydramine (Benadryl).
- Has the patient experienced a severe allergic reaction in the past? If so, what happened? The patient’s answers may indicate how severe the present reaction may become. For example, if the patient was hospitalized or required intubation due to a previous reaction, you should perceive this as an ominous sign and assume that he or she may have another reaction of equal or even greater severity. In such cases, rapid transport and treatment, as well as ALS care, are among the highest priorities.
- Be alert for any statements regarding the ingestion of foods that commonly cause allergic reactions. What was the patient doing, or what was the patient exposed to, before the onset of symptoms? This information may be the key to effective treatment, regardless of any prior history of allergic reactions.

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

### Secondary Assessment

If indicated, perform a rapid full-body scan or conduct a physical examination focused on the area(s) of chief complaint.

If the patient is unconscious or otherwise unable to communicate, assist the patient into a comfortable position, generally in a high-Fowler position, in an effort to maximize ventilation. This will help the patient breathe while allowing respiratory effort to lift and the shock of exposure, the patient should be placed in the supine position as quickly as tolerated. Quickly listen to the lungs of the chest. Do not hesitate to initiate positive-pressure ventilation therapy. For a patient in severe respiratory distress, you may have to assist ventilations using a bag-valve mask (BVM), attached to a properly titrated concentration of oxygen. This can be done in an unresponsive patient or a patient with an altered level of consciousness. The positive-pressure ventilations you provide will force air beyond the swelling in the airway and into the lungs while you await more definitive treatment.

Although respiratory complaints are most common, some patients in anaphylaxis may not present with severe respiratory symptoms but primarily with signs and symptoms of circulatory distress, such as hypotension. Palpating for the presence and quality of a radial pulse will help you quickly identify how the circulatory system is responding to the reaction. The positive-pressure ventilations you provide will force air beyond the swelling in the airway and into the lungs while you await more definitive treatment. For a patient in severe respiratory distress, you may have to assist ventilations using a bag-valve mask (BVM), attached to a properly titrated concentration of oxygen. This can be done in an unresponsive patient or a patient with an altered level of consciousness. The positive-pressure ventilations you provide will force air beyond the swelling in the airway and into the lungs while you await more definitive treatment.
In a patient experiencing an allergic reaction, pulse oximetry can be a useful method to assess the patient’s perfusion status. However, it is important to remember that pulse oximetry is just another tool in your toolbox. The decision to apply oxygen to a patient experiencing an allergic reaction should be based on a careful assessment of the patient’s way patency, work of breathing, and abnormal lung sounds upon auscultation, not solely on the oximetry readings.

**Reassessment**

En route to the receiving hospital, repeat the primary assessment, reassess vital signs, and repeat a focused physical examination of the affected body systems. Reassess vital signs, and repeat a focused assessment. Reassess vital signs, and repeat a focused physical examination of the affected body systems. Do not forget to remember that pulse oximetry is just another tool in your toolbox. The decision to apply oxygen to a patient experiencing an allergic reaction should be based on a careful assessment of the patient’s way patency, work of breathing, and abnormal lung sounds upon auscultation, not solely on the oximetry readings.

**Emergency Medical Care of Immunologic Emergencies**

If the patient appears to be having a severe allergic or anaphylactic reaction, you should administer basic life support and provide prompt transport to the hospital. If the allergic reaction was caused by an insect sting and the stinger is still in place, attempt to remove the stinger by scraping the skin with the edge of a sharp, stiff object such as a credit card. Do not use tweezers or forceps to remove the stinger because this may squeeze more venom into the wound. Gently wash the area with soap and water or a mild antiseptic. Do not use ice to dull the pain. Placing ice over the injury site may slow absorption of the toxin, diminish swelling, and relieve pain, but like any other attempt to reduce swelling with ice, you should be careful not to place the ice pack directly on the skin or leave it in place for too long, as doing so may cause more damage. It is not recommended that ice be placed for longer than 30 minutes at a time.

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. Place the patient in the supine position, and give oxygen if needed. Monitor the patient’s vital signs and symptoms, requiring more aggressive treatment, including epinephrine and ventilatory support. In either situation, the patient should be transported to a medical facility for further evaluation.

**Epinephrine**

The body normally produces epinephrine, which is a sympathomimetic hormone. This glossary appears a comprehensive definition of the term in the text. A vocabulary list concludes each chapter, and a comprehensive glossary appears at the end of the textbook.

**Key Terms**

- **Epinephrine**
- **Allergic reaction**
- **Anaphylaxis**
- **Anaphylactic reaction**
- **Auto-injector**
- **Immunologic emergency**

**Table 20-2**

<table>
<thead>
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<th>Epinephrine</th>
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<td><strong>Indications</strong></td>
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<td><strong>Contraindications</strong></td>
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<td><strong>Typical dose</strong></td>
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<td>Adults: 0.3 mg (EpiPen)</td>
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<td>Children: 0.15 mg (EpiPen Jr)</td>
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**Figure 20-8**

To remove the stinger of a honeybee, gently scrape the skin with the edge of a sharp, stiff object such as a credit card. Do not use tweezers or forceps to remove the stinger because this may squeeze more venom into the wound. Gently wash the area with soap and water or a mild antiseptic. Do not use ice to dull the pain. Placing ice over the injury site may slow absorption of the toxin, diminish swelling, and relieve pain, but like any other attempt to reduce swelling with ice, you should be careful not to place the ice pack directly on the skin or leave it in place for too long, as doing so may cause more damage. It is not recommended that ice be placed for longer than 30 minutes at a time.

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. Place the patient in the supine position, and give oxygen if needed. Monitor the patient’s vital signs and symptoms, requiring more aggressive treatment, including epinephrine and ventilatory support. In either situation, the patient should be transported to a medical facility for further evaluation.

**Administering an Epinephrine Auto-Injector**

All allergic emergency kits should contain a prepared, auto-injectable syringe of epinephrine, ready for intramuscular (IM) injection, along with instructions for its use. The adult EpiPen system delivers 0.3 mg of epinephrine via a spring-loaded needle and syringe system, the infant/child EpiPen (EpiPen Jr) delivers 0.15 mg. The spring-loaded needle automatically injects the epinephrine when the user firmly presses the device into the lateral thigh (thus the term auto-injector). If the patient is known to have an allergy, he or she may carry his or her own EpiPen. If the patient is able to use the auto-injector on his or her own, your role is limited to assisting him or her if needed.

To use, or help the patient use, the auto-injector, you should first receive a direct order from medical control or follow local protocol. Follow standard
precautions, and make sure the medication has been prescribed specifically for that patient. If it has expired or is discolored, do not give the medication. In such an instance, you should inform medical control, and continue to provide emergency transport.

Once you have done these things, follow the steps in Skill Drill 20-1.

1. Remove the safety cap from the auto-injector, and, if possible, quickly wipe the patient’s thigh with alcohol or some other antiseptic. (Note: though it is best practice to clean the site, do not delay administration of the drug to do so.) If the patient is displaying signs of life-threatening anaphylaxis, it is possible to administer the auto-injector directly through the patient’s clothing.

2. Place the tip of the auto-injector against the lateral part of the patient’s thigh, midway between the groin and the knee.

3. Push the injector firmly against the thigh until a click is heard. This indicates that the injector has activated and medication is being administered. Maintain steady pressure to prevent kickback from the spring in the syringe, and prevent the needle from being pushed out of the injection site too soon. Hold the injector in place until the medication has been injected (10 seconds).

4. Remove the injector from the patient’s thigh and dispose of it in the proper biohazard container.

5. Rub the area for 10 seconds.

6. Record the time and dose of the injection on your patient care report.

7. Reassess and record the patient’s vital signs after using the auto-injector.

8. If the patient’s signs and symptoms do not improve after 5 minutes and the patient has another auto-injector, consider assisting the patient with the administration of a second (and final) dose of epinephrine.

Other allergy kits may contain oral or IM anti-histamines, agents that block the effect of histamine. These work relatively slowly, within several minutes to 1 hour. Because epinephrine can have an effect within 1 minute, it is the primary way to save the life of someone having a severe anaphylactic reaction.

Because epinephrine constricts blood vessels, it may cause the patient’s blood pressure to rise significantly. Other side effects include increased pulse rate, anxiety, cardiac arrhythmias, pallor, dizziness, chest pain, headache, nausea, and vomiting. In a life-threatening situation, the administration of epinephrine outweighs the risk of side effects. Remember that patients who do not exhibit signs of respiratory compromise or hypotension and do not meet the criteria for a diagnosis of anaphylaxis should not be given epinephrine.
Administering Intramuscular Epinephrine

Some areas may allow for epinephrine IM injection. However, epinephrine is always available, but are not used in IM injections for allergic reactions. Be familiar with whether your protocols allow for epinephrine IM injection.

When you encounter a geriatric patient experiencing anaphylaxis, obtain a complete and accurate medical history. Because of the potential side effects of epinephrine, such as increased pulse rate, increased myocardial oxygen demand, and increased workload of the heart, you must weigh the risk versus benefit in epinephrine administration. If the patient has a history of cardiac problems, such as a previous heart attack or coronary artery disease, the administration of epinephrine is relatively contraindicated, meaning potential harm could occur to the patient if he or she receives epinephrine. In situations such as these, if available, online medical control should be contacted for guidance. If the patient is prescribed an EpiPen and has signs and symptoms of anaphylaxis, assist the patient with administration if needed.

1. What, if any, additional resources should you request?

You should consider requesting the response of an advanced life support (ALS) unit. Consider the time it will take to reach the nearest hospital versus the time needed to rendezvous with an ALS unit, the feasibility of requesting transport by helicopter, etc. Understand and follow your local protocols.

2. What intervention(s) should you perform without delay?

Because the patient’s respiratory distress is an immediate life threat, providing high-concentration oxygen is the first action you should take.

3. Is this patient experiencing a local reaction or anaphylaxis?

The presence of widespread urticaria (hives) that the patient is experiencing a systemic reaction. Systemic reactions vary in severity, range from diffuse (widespread) hives and cardiovascular collapse and death. A local reaction is characterized by tenderness, itching, and swelling and immediate edema of the skin. In many cases, this is not “allergic” in nature—it is simply inflammation that causes the skin to become red and swollen. It is important to perform a careful and thorough assessment of patients who are exposed to something to which they have a confirmed allergy. A seemingly local and mild reaction can become systemic and severe within a matter of minutes.

4. What body system(s) should you focus your secondary assessment on and why?

Further assessment of the patient should focus on body systems that are commonly affected by an allergic reaction—the respiratory and circulatory systems and the skin. In most cases, a severe allergic reaction occurs within minutes of exposure; however, it may be delayed for up to an hour in some patients. Your primary assessment has revealed no immediate threats to your patient’s airway, breathing, or circulation; however, the presence of a widespread rash indicates a systemic reaction and warrants a more thorough assessment. As you continue to assess the patient, look for clinical signs that indicate a worsening reaction and be prepared to assist ventilations and treat for shock.

Signs of respiratory system involvement include respirations that become rapid, labored, or noisy, wheezing, stridor, an irritating, persistent dry cough, hoarseness, and tightness in the chest or throat.

5. During the primary assessment, why did the patient first present with warm skin?

Epinephrine (adrenaline)—a hormone that is normally produced by the body—works to rapidly increase the heart rate, dilate the bronchioles in the lungs, and raise produced by the body—works to rapidly increase the heart rate, dilate the bronchioles in the lungs, and raise blood pressure by constricting the blood vessels. During anaphylaxis, however, the body may not produce enough epinephrine to enable these actions; therefore, epinephrine is administered to compensate for the body’s slow response.

If epinephrine does not stop the allergic reaction itself, it reverses the negative effects of bronchoconstriction and vasodilation, which are caused by the reaction.
Therefore, when epinephrine is administered to the patient, it dilates the bronchioles, which improves breathing, and constricts the blood vessels, which increases the blood pressure and improves perfusion.

7. In addition to the patient’s vital signs, what else should you reassess?

Ask him if he still feels like he has a lump in his throat; this was likely the result of mild upper airway swelling caused by angioedema and must be reassessed. Even though he did not present with obvious external angioedema, you should still reassess his face, lips, tongue, neck, and other parts of his body for swelling.

Auscultate his breath sounds to determine if wheezing is still present. Scattered wheezing may still be heard, even though the patient is not exhibiting any outward signs of respiratory distress.

Reassess his skin to determine if his hives are resolving or if they are still present. In most cases, hives will persist, at least to some degree, following the administration of epinephrine. You will usually notice improvement in the patient’s breathing and perfusion status (e.g., mental status, blood pressure, peripheral pulse quality) before you see resolution of hives.

8. How often should you reassess this patient?

This patient should be considered high-priority or critical and, therefore, should be reassessed every 5 minutes en route to the receiving facility.

9. What is the dose and concentration of epinephrine contained in an adult EpiPen?

The adult EpiPen contains 0.3 milligrams (mg) of a 1:1,000 concentration for intramuscular injection. A 1:1,000 concentration contains 1 mg of epinephrine per 1 milliliter (mL). Therefore, 0.3 mL contains 0.3 mg of epinephrine—all of which is injected into the patient’s thigh.

The patient denied chest discomfort and other past medical history. The patient was unable to self-administer his EpiPen; therefore, it was given by EMS, following standing orders, in the lateral aspect of his right thigh; dose given was 0.3 mg of 1:1,000 concentration. Reassessment showed that his symptoms had begun to resolve; his mental status had improved and he stated that it was easier to breathe. Blood pressure and oxygen saturation also improved. Hives were still present, although they appeared to be resolving. However, the wheezing continued; thus, per standing orders, assisted ventilation was initiated.

Medic 85 responded to a local restaurant where a 33-year-old man presented with dyspnea, generalized urticaria, and itching approximately 20 minutes after eating his meal. The patient was conscious and alert; his airway was patent and his breathing was rapid with audible wheezes. The patient was placed on oxygen via nonrebreathing mask. He further stated that the last time he ingested a product containing peanuts, he had to be hospitalized. Patient denied chest discomfort and other past medical history. The patient was unable to self-administer his EpiPen; therefore, it was given by EMS, following standing orders, in the lateral aspect of his right thigh; dose given was 0.3 mg of 1:1,000 concentration. Reassessment showed that his symptoms had begun to resolve; his mental status had improved and he stated that it was easier to breathe. Blood pressure and oxygen saturation also improved. Hives were still present, although they appeared to be resolving. However, the wheezing continued; thus, per standing orders, the patient was assisted in the administration of his albuterol inhaler. Continued to monitor patient’s condition throughout transport; he continued to improve and was delivered to the ED staff without incident. Gave verbal report to charge nurse and returned to service. **End of report**
Allergic reactions occur most often in the skin, but they can also involve other body areas as well. Anaphylaxis is a life-threatening allergic reaction to an internal or surface agent. The body releases to combat certain stimuli, such as vasodilation.

The body's response to a substance perceived by the body as foreign. The act of injecting venom. A poison or harmful substance.

When assessing a person who may be having an allergic reaction, you should check for flushing, itching, and swelling skin, hives, wheezing and stridor, a persistent cough, a decrease in blood pressure, a weak pulse, dizziness, abdominal cramps, and headache. Because epinephrine can have an effect within minutes, it is the primary way to save the life of someone having a severe anaphylactic reaction. It may help a patient to administer an epinephrine auto-injector (EpiPen) with authorized medical control. Always provide prompt transport to the hospital for any patient who is having an allergic reaction. Remember that signs and symptoms can quickly become more severe. Carefully monitor the patient's vital signs en route; be especially alert for airway compromise.

An allergic reaction that may include shock and respiratory failure. A substance produced by the body commonly called adrenaline), and a drug produced by pharmaceutical companies that increases blood pressure and pulse rate and blood flow, and is used to treat anaphylaxis.

Summary:
- **allergen**: Substance that cause an allergic reaction.
- **allergic reaction**: The body’s exaggerated immune response to an internal or surface agent.
- **anaphylaxi**: An extreme, life-threatening, systemic allergic reaction that may include shock and respiratory failure.
- **angioedema**: Localized areas of swelling beneath the skin, often around the eyes and lips, but it can also involve other body areas as well.
- **envenomation**: The act of injecting venom.
- **epinephrine**: A substance produced by the body commonly called adrenaline), and a drug produced by pharmaceutical companies that increases blood pressure and pulse rate and blood flow, and is used to treat anaphylaxis.
- **leukotrienes**: Chemical substances released by the immune system in allergic reactions.
- **stridor**: A harsh, high-pitched respiratory sound, which is most prominent on expiration, and which occurs in asthma and bronchiolitis.
- **urticaria**: A raised, swollen, well-defined area on the skin; hives.
- **wheezing**: A high-pitched, whistling breath sound that is most prominent on expiration, and which suggests an obstruction or narrowing of the lower airways; occurs in asthma and bronchiolitis.

Vital Vocabulary:
- Anaphylaxis: An extreme, life-threatening, systemic allergic reaction that may include shock and respiratory failure.
- Angioedema: Localized areas of swelling beneath the skin, often around the eyes and lips, but it can also involve other body areas as well.
- Envenomation: The act of injecting venom.
- Epinephrine: A substance produced by the body commonly called adrenaline), and a drug produced by pharmaceutical companies that increases blood pressure and pulse rate and blood flow, and is used to treat anaphylaxis.
- Leukotrienes: Chemical substances released by the immune system in allergic reactions.
- Stridor: A harsh, high-pitched respiratory sound, which is most prominent on expiration, and which occurs in asthma and bronchiolitis.
- Urticaria: A raised, swollen, well-defined area on the skin; hives.
- Wheezing: A high-pitched, whistling breath sound that is most prominent on expiration, and which suggests an obstruction or narrowing of the lower airways; occurs in asthma and bronchiolitis.

Immunology: The study of the body’s immune system.

1. The raised red spots are most likely:
   - A. angioedema.
   - B. anaphylaxis.
   - C. urticaria.
   - D. a fungal infection.

2. What should you do first?
   - A. Administer albuterol.
   - B. Transport to the hospital.
   - C. Administer epinephrine.
   - D. Coach the patient to slow his breathing.

3. What possible chemical is being released into this patient’s body during this reaction?
   - A. Histamine
   - B. Anhydrohistamine
   - C. Epinephrine
   - D. Glucose

4. Which medication should be administered first for this patient?
   - A. Albuterol
   - B. Epinephrine
   - C. Acetaminophen (Tylenol)
   - D. Diphenhydramine (Benadryl)

5. Your partner indicates that he heard a high-pitched whistling sound from the patient’s chest. How should you respond? Why?
   - A. A high-pitched whistling sound caused by bronchoconstriction.
   - B. A coarse, low-pitched breath sound heard in patients with chronic mucus in the upper airways.
   - C. A high-pitched noise heard primarily on inspiration.
   - D. Cracking, moist breath sounds.

6. Your partner notes the presence of a medical alert bracelet around the patient’s wrist. What should be done and why?
   - A. A high-pitched noise heard in patients with chronic mucus in the upper airways.
   - B. A coarse, low-pitched breath sound heard in patients with chronic mucus in the upper airways.
   - C. A high-pitched noise heard primarily on inspiration.
   - D. Cracking, moist breath sounds.

7. Your partner suggests that, in addition to epinephrine, the two of you should assist the patient in using his albuterol inhaler. How should you respond? Why?
   - A. Anaphylaxis is a life-threatening allergic reaction. It may help the patient to administer an epinephrine auto-injector (EpiPen) with authorized medical control.
   - B. A high-pitched noise heard primarily on inspiration.
   - C. Cracking, moist breath sounds.
   - D. A fungal infection.

8. Following the administration of epinephrine, the patient reports that his heart is beating “very fast.” How should you respond?
   - B. A fungal infection.
   - C. Cracking, moist breath sounds.
   - D. A fungal infection.

9. Besides an allergic reaction, provide an example of another illness or injury you should consider as part of the differential diagnosis.