



Bee and Wasp Stings

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Bee and Wasp Stings Overview

Although many different types of insects in the United States are able to inflict a poisonous bite or sting (meaning they are venomous), the insects most likely to cause medical problems are bees (including the domestic honey bee, its Africanized "killer bee" race, and the bumble bee), wasps (including paper wasps, hornets, and yellow jackets), and ants (including the fire ant). These insects are all in the Hymenoptera order, and thus stings from them are occasionally called Hymenoptera stings.

Because many of these species live in colonies, if one stings you, you may be stung by many. Although most stings cause only minor medical problems, some stings may cause serious medical problems and even death.

Bee and Wasp Stings Causes

Bees and wasps inject venom by stinging unlucky people. Sometimes-especially with bees-the stinger may be left in the skin. The venom is poisonous and may cause direct injury to the human body. This injury is usually confined to the areas close to the sting or stings.

- **Allergic reaction:** The vast majority of serious medical problems and deaths result from an allergic reaction. This happens in certain people whose immune systems are overly sensitive (or allergic) to the venom. When they get stung, their body may overreact to the venom, and an allergic reaction may happen throughout their body. These people are frequently described as being allergic to specific insect stings.
 - In the U.S., about 40 deaths are reported each year from insect venom [anaphylaxis \(severe allergic reaction\)](#). These fatal allergic reactions frequently, but not always, occur in people who have had a previous allergic reaction to the same type of insect.
 - Although multiple stings increase the potential danger in allergic cases, a serious or even fatal allergic reaction can (and does) occur from a single sting in a person with no known prior allergic reaction.
 - The vast majority of serious and fatal allergic reactions from stings cause a significant and obvious allergic reaction within an hour of being stung. Most deaths from stings occur within the first hour. Immediate emergency medical care is critical in known or suspected allergic reactions after an [insect sting](#). In rare cases, serious or even fatal allergic reactions may not happen for up to four or more hours after an insect sting.
- **Other complications:** Insect stings in nonallergic people, though perhaps painful, usually do not cause serious problems. However, multiple stings may cause serious complications (such as muscle breakdown or kidney failure) and, rarely, even death in nonallergic people.
 - Especially at increased risk are small children, elderly people, and people who are already weak. These serious problems may occur within the first few hours of being stung or may be delayed for days after being stung.
 - Even a single sting in the mouth or throat can cause swelling and obstruction of the airway. Children are at increased risk for these types of breathing problems from a sting.
 - A bacterial skin infection at the sting site may also develop.

Bee and Wasp Stings Symptoms

The severity of a sting is determined by a number of factors. The type of insect, the location of the sting, the number of stings, and the allergic sensitivity of the victim can all affect the outcome. Most people do not have allergic reactions to bee and wasp stings.

Medical problems from bee and wasp stings are broadly broken down into two categories:

- Local reactions (only the part of the body near the sting is affected)
 - Immediate pain, redness, swelling, and [itching](#) at the sting site may occur.
 - A large (greater than four inches across) local reaction may develop over the next 12-36 hours.
 - A bacterial skin infection, although uncommon, may also begin during the first 12-36 hours (or even after the first few days).
 - These may cause an enlarging area of redness at the sting site. It may be difficult to tell a local skin reaction and a local bacterial skin infection apart.

- Systemic or allergic reactions (parts of the body away from the sting are affected)
 - [Hives](#) (raised itchy bumps on the skin) and itching all over the body
 - Swelling of the mouth or throat or both
 - [Wheezing](#)
 - Shortness of breath or other difficulty breathing
 - [Nausea](#)
 - Vomiting
 - [Anxiety](#)
 - [Chest pain](#)
 - [Low blood pressure](#) (weakness or [fainting](#))

- In severe cases, marked difficulty breathing, unconsciousness, and even death may occur.

When to Seek Medical Care

Although most stings can be treated at home, some will require more medical care.

- Call your doctor or go to a hospital's emergency department if a large localized reaction (greater than about 10 inches in diameter) occurs, evidence of infection (increasing

pain, swelling, redness, drainage of pus or [fever](#)) is present at the sting site, or any symptoms last for more than a day or two.

- If it has been more than 10 years since your last [tetanus](#) booster immunization, contact your doctor about getting a tetanus immunization.

Although most stings do not require medical care, remember some stings can be serious or even fatal. If you have the slightest suspicion that someone is having a generalized or allergic reaction, seek emergency medical care immediately. In many areas dialing 911 for an ambulance may be your best option. (Try to avoid driving yourself to the hospital if you believe you are suffering from an allergic reaction-you may lose consciousness and have an accident.)

Go to a hospital's emergency department immediately if someone is showing evidence of an allergic reaction. Remember, an allergic reaction may occur in people with no prior history of allergic reactions. Any of the following may indicate an allergic reaction:

- Difficulty breathing
- Difficulty speaking
- Swelling in the mouth or throat
- [Rash](#) all over the body
- Faintness or decreased level of consciousness
- If more than 10-20 stings have occurred, especially with wasp stings or in children, elderly people, or people with underlying medical problems
- If the sting involves the inside of the mouth or throat, especially if in children and/or involves more than one sting
- If the sting involves the eyeball itself
- If a person has been stung by an insect species that has previously caused an allergic reaction in the person-even if there is no evidence of a current allergic reaction (The safe thing to do is to head for an emergency department in case the person suddenly develops an allergic reaction.)
- If a large localized reaction (redness greater than about 10 inches across) or evidence of infection (increasing pain, swelling, redness, drainage of pus or fever) is present at the sting site or sites and you cannot contact your personal doctor promptly

Exams and Tests

Emergency department evaluation will likely first include checking the vital signs (blood pressure, pulse, breathing rate, and temperature). The doctor will then focus on examining you for evidence of breathing or airway difficulties, [shock](#), and widespread rash.

A history, including current medications, underlying medical problems, and previous allergic reactions, will be obtained.

Your physical examination and vital signs will largely determine what treatment is given. Blood work, [x-rays](#), and other tests are rarely needed.

Bee and Wasp Stings Treatment

Treatment will depend on the severity of your condition. It is important to note that no specific antivenom is available to counteract the poison injected by the insect. The majority of problems requiring medical treatment result from the allergic reaction to the sting. Many of the complications from an allergic reaction respond well to various medications-when given in time.

Self-Care at Home

- Most simple insect stings in a nonallergic person require no more than first aid at home.
- Avoid further stings by wearing protective clothing, using insect repellent, and avoiding infested areas.
- Remove any stingers remaining in the skin (most likely from bees) immediately. Some experts recommend scraping out the stinger with a credit card. However, it is probably more important to get the stinger out as quickly as possible than to be overly concerned about how it is removed.
- Application of ice to the sting site may provide some mild relief. Ice may be applied for 20 minutes once every hour as needed. Cloth should be placed between the ice and skin to avoid freezing the skin.
- Consider taking an antihistamine such as [diphenhydramine](#) (Benadryl) for itching.
- Consider taking [ibuprofen](#) (Motrin) or [acetaminophen](#) ([Tylenol](#)) for pain relief as needed.
- Wash the sting site with soap and water. Place an antibiotic ointment on the sting site.
- If it has been more than 10 years since your last tetanus booster immunization, get a booster within the next few days.
- Most insect stings require no additional medical care. More serious reactions may need immediate medical care.
- If you have been stung by a bee or wasp and have previously had a serious allergic reaction, seek medical attention. Consider taking an antihistamine such as diphenhydramine (Benadryl) as soon as possible. If any allergic symptoms develop, consider using the [epinephrine](#) part of an emergency [allergy](#) kit (EpiPen) if previously prescribed by a doctor.

Medical Treatment

- If you have a single sting with no allergic symptoms, you may require only local [wound care](#) (such as cleaning and antibiotic ointment). Any retained stingers will be removed. Itching may be treated with an oral antihistamine such as diphenhydramine (Benadryl). Pain may be treated with medicine such as ibuprofen (Motrin), acetaminophen (Tylenol), or both. Also tetanus immunization will be given as indicated.
- If you have mild allergic symptoms (such as a rash and itching all over the body but no problems breathing or with your vital signs), you may be treated with an antihistamine. You may also be given steroids. In some cases, you may also be given an epinephrine ([adrenaline](#)) injection. Some of these treatments may be given at the scene or in the ambulance by emergency medics. You may be sent home if you are doing well after observation in the emergency department.
- If you have a more moderate allergic reaction (such as rash all over the body, and some mild problems breathing), you will likely receive injections of [antihistamines](#), steroids, and epinephrine. Some of these treatments may be given at the scene or in the ambulance by emergency medics. You will likely need to be observed for a prolonged period of time in the emergency department. You may need to be admitted in the hospital.
- If you have a severe allergic reaction (such as low blood pressure, swelling blocking air getting into the lungs, and/or other serious problems breathing), you have a true life-threatening emergency. Treatment may include placement of a breathing tube into your trachea. You will likely be given injections of antihistamines, steroids, and epinephrine. IV fluids may also be given. Some of these treatments may be given at the scene or in the ambulance by emergency medics. You will be closely monitored in the emergency department and likely admitted into the hospital—perhaps the intensive care unit.
- If you have multiple stings (more than at least 10-20 stings) but no evidence of an allergic type reaction, you sometimes may require prolonged observation in the emergency department or admission into the hospital. Multiple blood tests may be indicated.
- If you are stung inside the mouth or throat, you may simply require observation in the emergency department, or you may need more intensive management if complications develop.
- If you are stung on the eyeball, you may require consultation or evaluation by an ophthalmologist (an eye doctor).

Next Steps

Take any medication prescribed for you as directed. This may include an antihistamine such as diphenhydramine (Benadryl) and a steroid such as [prednisone](#).

Follow-up

If you have been prescribed a self-administered injectable epinephrine emergency sting kit, such as an EpiPen, get as many kits as needed as soon as possible. Replace them after use.

If you develop (or redevelop) difficulty breathing or swelling in the mouth or throat after leaving the doctor, go to the hospital immediately.

If you develop decreased urination or dark-colored urine (especially if you suffered multiple stings), seek prompt medical attention from your doctor or emergency department.

If the sting site looks infected (worsening swelling, redness, drainage of pus), or if you develop a fever, seek prompt medical attention from your doctor or emergency department.

If you have suffered a significant allergic reaction from a sting, be sure to discuss with your doctor possible future use of a self-administered injectable epinephrine emergency sting kit, such as an EpiPen, and possible referral to an allergist.

Prevention

Some, but not all, stings can be prevented. It is especially important that people known to be allergic to certain insects make an effort to avoid those insects.

Ways to avoid stings include the following:

- Avoid known areas of concentration such as hives and nests.
- Do not molest hives and nests.
- Take care with motorized equipment such as lawnmowers, because they may provoke the insects.
- If flying insects are around, leave the area and refrain from swatting at them.
- Avoid activities outdoors with sugary drinks, brightly colored clothing, and strong fragrances or perfumes because some insects may be attracted to them.
- Wear long pants and long-sleeved shirts because they may also provide some protection.
- Keep outdoor dining and camping areas clean and free from garbage.

If you have had a previous significant allergic reaction to a sting, it is very important that you have readily available (and know when and how to use) a self-administered injectable epinephrine emergency sting kit, such as an EpiPen.

- Proper use of these kits may literally be life-saving until emergency help can be reached.
- It is important that a proper kit be readily available. Multiple kits may be needed to have one at home, at work, in a purse, and in your car.

- If you are allergic to bee or wasp stings, talk about these kits with your doctor.

If you have had a prior significant allergic reaction to a sting, talk to your doctor about seeing an allergy specialist. [Immunotherapy](#), a series of shots of low-dose sting venom, may reduce the risk of future severe allergic reactions from similar stings from about 60% to about 5%.

If you have had a prior significant allergic reaction to a sting, consider wearing a [Medic Alert](#) bracelet and carrying an emergency medical allergy card in your wallet or purse.

Outlook

In most cases involving only one or a few stings, the prognosis is excellent if only local symptoms occur. Pain and itching may last a day or so.

Cases involving many stings may occasionally cause delayed and long-term complications. Although these complications may occur despite appropriate medical care, early medical care may lessen the severity.

Serious skin infections are uncommon after a sting.

People suffering a mild allergic reaction are likely to do well if emergency medical care is sought quickly.

People who suffer a severe allergic reaction to a sting require immediate emergency medical care to lessen the chance of serious illness or even death. Any delay in emergency medical care greatly increases the risk to a person having a severe allergic reaction. In some allergic people, severe disability or even death may still occur despite appropriate medical care.

For More Information

[American Academy of Allergy, Asthma and Immunology](#)

555 East Wells Street, Suite 1100
Milwaukee, WI 53202-3823
(800) 822-2762

[National Institute of Allergy and Infectious Diseases](#)

6610 Rockledge Drive, MSC 6612
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Web Links

Nemours Foundation, KidsHealth for Parents, [What to Do: Bee, Wasp, Hornet, and Yellow Jacket Stings](#)

CDC, National Ag Safety Database, [First Aid for Bee and Insect Stings](#)

Synonyms and Keywords

Hymenoptera stings, [yellow jacket sting](#), insect sting, bumblebee, honey bee, paper wasp, hornet, yellow jacket, fire ant, killer bee, bee and wasp stings, bee stings, wasp stings

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Wasp Stings

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Introduction

Background

Wasps are members of the order Hymenoptera, suborder Apocrita. Members of this order, which includes bees, yellow jackets, hornets, and ants, are found in all 50 states.

Wasps can be further divided into social wasps and solitary wasps. Social wasps include the aggressive wasps found in northern temperate regions, such as the yellow jacket (black and yellow bands on abdomen) and the hornet (mostly black with yellow markings on the face and thorax). Social wasps live in colonies that may contain from a dozen to many hundred mature insects. The colonies can range in size and position from the underground nest of the yellow jacket, which is found in rotted tree stumps and mammal burrows, to the hornet's paper nest that hangs from shrubbery, trees, or is plastered to the side of a shed or house.

Solitary wasps acts as a predator feeding on smaller insects and bringing the paralyzed prey back to its nest for its young. Solitary wasps include the mud wasp, which makes its nest in crevices of windows.

More than 25,000 species of wasps exist worldwide. They include yellow jackets, which are members of the genus *Vespula* and are large and aggressive. The female yellow jacket begins to construct her nest in the springtime. The nest is composed of a paperlike substance that wasps regurgitate from chewed wood or plant material. The nest consists of multiple vertically oriented cells, with the opening on the bottom of the nest.

Envenomation or stings by members of the order Hymenoptera is a major cause of morbidity and mortality and accounts for more fatalities than any other venomous animal. The skin is the most commonly affected organ system. The result of a wasp sting can vary from a single area of localized inflammation to a generalized urticarial rash.

Pathophysiology

Local reaction

Upon penetration of the skin, the muscles around the wasp's venom sac begin to inject the venom. Wasp venom contains up to 13 different antigens. The wasp sting first causes an intense stinging sensation that is believed to be mediated by the presence of acetylcholine and serotonin, which make up to 5% of the dry weight of the venom. The acetylcholine causes an intense depolarization of the nociceptors within the dermis. The serotonin causes multiple effects through the 5-hydroxytryptamine (5-HT) receptors, including an intense localized vascular spasm.

In addition, the wasp venom also contains phospholipase A, phospholipase B, as well as mastoparan peptide, which can cause direct mast cell degranulation with the release of histamine. The resultant localized ischemia increases the inflammatory response with subsequent vasodilation. This produces increased capillary permeability and localized swelling and redness at the site of the wasp sting. For most individuals who are stung and who have not been sensitized previously to the various antigens within the venom, this reaction is the extent of the injury, and the swelling and pain resolve in several hours.

Systemic reaction

For individuals who have been sensitized to the venom by a past exposure to Hymenoptera venom, symptoms may progress. This progression involves elements of both cellular and humoral immunity. The cellular components consist of lymphocytes, both T cells (CD4⁺ and CD8⁺) and B cells, macrophages, and mast cells. The humoral factors include immunoglobulin E (IgE) and cytokines. The process begins with sensitization. This occurs after the protein peptide moieties in the wasp venom, the allergen or immunogen, are processed by antigen-presenting cells, such as macrophages, to form major histocompatibility complex molecules located on the cell wall. This complex is then presented to the T-cell receptor (TCR) on the CD4⁺ cells. This is followed by the production of IgE and ends with the binding of IgE to the high-affinity receptor, designated FcRI, on the mast cells.

An immediate type of hypersensitivity occurs when the sensitized mast cells contact the offending immunogen. The mast cells become activated, causing solubilization and enlargement of the crystalline granules within their cytoplasm. This is followed by degranulation with the release of these chemical mediators, which include histamine, heparin, and tumor necrosis factor (TNF), into the surrounding tissue. In addition to degranulation, mast cell activation also initiates generation of bioactive products through lipid metabolism of arachidonic acid and the production of cytokines such as TNF, interleukin (IL)-6, IL-4, and IL-5. The nature and degree of the immediate hypersensitivity reaction depends on the location and the degree of activation of the mast cells. Mast cells are located in the connective tissue of the dermis, GI tract, airway, and lungs and around the vascular system, thus producing the symptoms discussed below.

Urticaria, which has also been termed anaphylaxis of the skin, typically presents as raised pruritic erythematous wheals. Urticaria develops because of the presence of activated mast cells in the connective tissue of the dermis with the production of chemical mediators, such as histamine, that increase local vascular permeability. In general, localized vasculitis is thought to be caused by several factors. IgE triggers the release of vasoactive amines (eg, histamine, bradykinin, leukotrienes) from platelets or from mast cells, increasing vessel wall permeability. The antigen-antibody complexes also result in the activation of complement components, particularly plasmin-activated complement 5 (C5a). The C5a then causes neutrophilic infiltration of the vessel wall to phagocytose the immune complexes. The release of intracytoplasmic enzymes further damages the vessel wall.

Systemic symptoms can include nausea, vomiting, abdominal cramping, and diarrhea due to mast cell activation in the GI tract. Coughing, dyspnea, and wheezing can occur after mast cell activation in the airway.

Severe systemic or anaphylactic reaction

Anaphylactic shock is an immediate-type hypersensitivity reaction that occurs when mast cells are activated within multiple organ systems and vascular collapse occurs. This is an IgE-mediated reaction to the sting. Six percent of blood donors are estimated to have elevated IgE levels to Hymenoptera venom. In one study of postmortem sera from patients with sudden death, 23% had elevated levels to Hymenoptera venom. As a rule, the severity of the response can be estimated by how quickly it occurs after the sting. Most fatalities occur within 1 hour, with most severe reactions occurring within 10 minutes of the wasp sting.¹ This is more related to the existing level of circulating IgE than to the number of wasp stings or the amount of venom injected.

Frequency

United States

Hymenoptera stings and wasp stings account for 90-100 deaths each year. This may be an underestimation because sudden death syndrome is usually attributed to cardiac causes. In one series of 2606 patients, the frequency of the various presentations was as follows:

- Local reaction - 16% (This may be an underestimation because many patients with a single wasp sting and only a local reaction do not seek medical attention.)
- Severe systemic reaction - 24%
- Systemic reaction - 40%

In the general population, 3% of adults and less than 1% of children have systemic reactions. This is probably because adults are more likely to have developed sensitization from a prior wasp sting.

Mortality/Morbidity

The anaphylactic reaction begins with the onset of symptoms distal to the wasp sting. The patient frequently feels increased anxiety, lightheadedness, headache, nausea, abdominal cramps, and palpitations. This is followed by objective findings of the patient appearing flushed, hypotensive, and tachycardic. This is due to the circulating levels of histamine and kinins that cause decreased systemic vascular resistance, increased capillary permeability, and resulting reduction of intravascular volume. The resulting reduction in perfusion pressure causes the neurologic symptoms of lightheadedness, syncope, and seizures.

Sensitization to Hymenoptera or wasp venom occurs in almost 1% of all stings. Each year, 90-100 deaths occur. Risk factors that tend to increase morbidity and mortality include age, cardiopulmonary risk factors, medication, and prior history of an allergic reaction to a Hymenoptera or wasp sting. Factors that favor a systemic reaction include multiple simultaneous wasp stings or single sequential wasp stings within several weeks. In most cases of Hymenoptera stings, death is the result of airway and respiratory compromise. Edema of the larynx, epiglottis, and supraglottic area is found in 69% of fatal cases. These structures are particularly vulnerable target areas because of their rich vascular supply. Prior history of sensitivity or an allergic reaction to a Hymenoptera sting places the patient at higher risk for another reaction.

Individuals who are atopic, individuals with a history of multiple allergies, and individuals who have had a prior anaphylactic reaction to a different allergen may be at increased risk for sensitization to their first Hymenoptera sting. The following factors also increase the risk of sensitization:

- Age: Children and elderly people are at increased risk. Infants and small children are at risk after multiple wasp stings because of the relatively large amount of venom per body mass. The smaller-diameter pediatric airway may also occlude more readily from edema. Elderly people may have poor cardiac reserves to compensate for the allergic reaction.
- Cardiopulmonary risk factors: People with coronary artery disease, a history of ischemia, prior myocardial infarctions, or reduced cardiac ejection fractions may not be able to compensate for the increased insult to their circulatory system from circulating vasoactive peptides or from the catecholamines administered to resuscitate them. People with pulmonary disease (eg, asthma, chronic bronchitis, emphysema) may experience acute decompensation of the respiratory system because of increased bronchospasm or pulmonary edema.
- Medications: Beta-blockers may increase morbidity and mortality because they inhibit attempts to improve cardiac output by either endogenously produced or exogenously administered catecholamines.
 - Calcium channel blockers may exacerbate the reduced systemic vascular resistance caused by circulating vasoactive peptides. The vasodilating antihypertensive agents may blunt the body's physiologic response to hypotension. As the circulating vasoactive chemical mediators of anaphylaxis cause vasodilation, the systemic vascular resistance falls. This causes a

subsequent drop in the glomerular filtration rate, resulting in increased activation of the renin-angiotensinogen-angiotensin system.

- Angiotensin-converting enzyme (ACE) inhibitors and ACE receptor blockers, as well as other vasodilators, can interfere with the body's ability to increase vasoconstriction and increase the systemic vascular resistance and the blood pressure (BP). The effect that nonsteroidal anti-inflammatory drugs (NSAIDs) and leukotriene inhibitors may have in modulating the severity or the morbidity and mortality of Hymenoptera-induced allergic reactions is unclear.

Sex

Wasp stings are more common in males than in females, likely because of increased occupational and recreational exposure in men.

Age

More reported wasp stings occur in adults than in children. Children tend not to have reactions as severe as those in adults, possibly because adults tend to have had more opportunity to have developed sensitization to the allergens in the venom. However, when a child develops an allergic reaction to a wasp sting, it tends to be worse than an adult's reaction because of the higher ratio of venom quantity to body mass.

Clinical

History

Symptoms can vary depending on the reaction of the patient to the wasp sting.

- A localized reaction causes symptoms of redness, swelling, and pain over the site of the wasp sting. The pain begins immediately and gradually worsens as the redness and edema gradually worsen. The localized reaction may last 6-12 hours.
- A patient with a mild allergic reaction may experience itching and hives.
- Severe allergic reactions and anaphylaxis may present in patients as symptoms of a throat-closing sensation, dyspnea, chest tightness, lightheadedness, increased anxiety, headache, nausea, abdominal cramps, and palpitations.

Physical

Physical signs vary in severity, depending on host sensitivity to the protein allergens in the venom. This can vary from a local reaction at the site of the wasp sting to a more generalized pruritic urticarial reaction to angioedema, laryngeal spasm, bronchial spasm, and vasomotor collapse of anaphylactic shock.

- Local reaction
 - A raised, painful, erythematous inflammatory reaction may be observed at the site of each wasp sting, usually developing several minutes after the sting.
 - A minute punctate lesion is visible at the center of the lesion where the wasp sting occurred.
- Generalized urticarial reaction
 - A generalized, allergic, immunoglobulin E (IgE)-mediated reaction that involves only the skin can occur within minutes to hours of the wasp sting.
 - Patients present with multiple pruritic hives.
- Angioedema
 - Patients may present with signs of airway obstruction with stridor and dyspnea.

- The voice may be muffled or hoarse.
- Patients may not be able to process their own secretions and may be drooling or appear to have odynophagia.
- Inspection of the oral pharynx may show soft tissue swelling of the mucosa or of the tongue. Normal results on examination of the oral pharynx do not preclude edema and impending obstruction of the larynx.
- Anaphylaxis
 - Impending vasomotor collapse may be associated with the appearance of restlessness or anxiety in patients.
 - Vital signs include tachycardia, tachypnea, and thready pulses. In the early phase, the BP may be maintained because of increased cardiac output until the patient decompensates.
 - Skin appearance may vary from a warm flushed appearance shortly after the wasp sting (due to increased vasodilation caused by circulating vasoactive amides) to a cold, pale, diaphoretic appearance late in the event.
 - Auscultation of the chest may reveal variable results, from wheezing due to bronchospasm and prolongation of the expiratory phase to poor air movement or coarse crackles due to pulmonary edema.
 - Anaphylaxis is highly likely when any one of the following 3 criteria is fulfilled:
 1. The acute onset of illness (minutes to several hours), with involvement of the skin, mucosal tissue, or both (eg, generalized hives; pruritus or flushing; swollen lips, tongue, or uvula) and at least one of the following:
 - Respiratory compromise (eg, dyspnea, wheeze or bronchospasm, stridor, reduced peak expiratory flow [PEF], hypoxemia)
 - Reduced BP or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope, incontinence)
 2. Two or more of the following that occur rapidly after exposure to a likely allergen for that patient (minutes to several hours):
 - Involvement of the skin or mucosal tissue (eg, generalized hives; itch or flush; swollen lips, tongue, or uvula)
 - Respiratory compromise (eg, dyspnea, wheeze or bronchospasm, stridor, reduced PEF, hypoxemia)
 - Reduced BP or associated symptoms (eg, hypotonia [collapse], syncope, incontinence)
 - Persistent GI symptoms (eg, crampy abdominal pain, vomiting)
 3. Reduced BP after exposure to a known allergen for that patient (minutes to several hours), as follows:
 - Infants and children - Low systolic BP (age specific) or greater than 30% decrease in systolic BP (Low systolic BP in children is defined as less than 70 mm Hg in those aged 1 mo to 1 y, less than 70 mm Hg + [2 X age] in those aged 1-10 y, and less than 90 mm Hg in those aged 11-17 y.)
 - Adults - Systolic BP of less than 90 mm Hg or greater than 30% decrease from that person's baseline

Causes

Potential risk factors include outdoor activities (recreational or occupational) during the mild-to-warm months of the year. The disturbance of an established wasp nest, which can occur during routine yard work, raking, or trimming bushes that may contain a concealed nest, can result in multiple wasp stings.

- The wearing of any scented material (eg, perfume, hairspray, soaps, deodorants, sunscreen) or brightly colored clothing, especially floral designs, may attract wasps and insects.
- Odors near the home environment (eg, open garbage pails, rotting fruit from fruit trees) may also attract wasps.
- Partially closed or protected areas (eg, in a wood shed, under a car hood) may harbor a wasp nest, and an attack may result if the nest is disturbed.

Differential Diagnoses

Anaphylaxis	Pulmonary Edema, Cardiogenic
Angina Pectoris	Pulmonary Edema, Neurogenic
Angioedema	Pulmonary Embolism
Anxiety Disorders	Septic Shock
Asthma	Serum Sickness
Cardiogenic Shock	Shock, Distributive
Food Allergies	Shock, Hemorrhagic
Foreign Body Aspiration	Snakebite
Hymenoptera Stings	Sudden Cardiac Death
Hypersensitivity Pneumonitis	Syncope
Hypersensitivity Reactions, Delayed	Tension Pneumothorax
Hypersensitivity Reactions, Immediate	Toxicity, Mushroom
Injecting Drug Use	Urticaria
Multisystem Organ Failure of Sepsis	Wasp Stings
Panic Disorder	
Peritonsillar Abscess	

Other Problems to Be Considered

Sudden death syndrome: 23% of patients who experience sudden death syndrome had elevated levels of immunoglobulin E (IgE) in their sera.

Workup

Laboratory Studies

- Laboratory data are usually not helpful in patients with mild symptoms. Patients who present with anaphylaxis resulting from a wasp sting may benefit from studies such as arterial blood gas, CBC count, electrolytes, BUN and creatinine, glucose, and liver function studies in order to provide their baseline values as part of the admission profile.
- CBC count: Patients may have mild leukocytosis related to demargination from catecholamine release.
- Arterial blood gas values reflect the pathophysiology of the illness progression. The initial pH level should be normal or may be slightly elevated to reflect a respiratory alkalosis due to anxiety-produced hyperventilation with the corresponding decrease in the partial pressure of carbon dioxide (PCO₂). As the patient becomes more hypotensive, the pH level may begin to fall. Conversely, this fall may also be due to increased respiratory distress with bronchospasm. This can be due to several factors. A respiratory acidosis can be caused by carbon dioxide retention from the respiratory bronchospasm and

the development of pulmonary edema. At this point, the partial pressure of oxygen (PO₂) level begins to fall. The decreased pH level can also be due to the development of a metabolic acidosis as the patient becomes more hypotensive and tissue perfusion decreases.

Imaging Studies

- Lateral neck radiography to evaluate for soft tissue swelling may be helpful in patients who experience throat tightness after a wasp sting, although direct fiberoptic visualization of the airway (eg, with a Machida scope) is optimal.
- Perform chest radiography in patients who present with dyspnea or chest tightness or who have an anaphylactic episode after a wasp sting. Chest radiography should be obtained by using a portable machine in the emergency department (ED) with equipment for aggressively managing the airway close to the bedside.

Other Tests

- Perform an ECG on patients who experience palpitations, chest tightness, dyspnea, or lightheadedness after a wasp sting.
- A baseline peak flow measurement helps to assess the progression of distress in patients who present with wheezing, dyspnea, or prolongation of the expiratory phase of respiration after a wasp sting.

Procedures

Flexible fiberoptic visualization of the larynx and vocal chords may be useful to exclude laryngeal edema or spasm. This should be performed by a clinician experienced in emergency airway management; use caution to avoid precipitating laryngospasm.

Treatment

Medical Care

- Local wound care: Apply ice to keep the area comfortably cool and to reduce swelling. Unlike honeybee stings, members of the wasp family (including hornets and yellow jackets) generally do not lose their stinging apparatus in the wound. Consider a secondary bacterial infection at the site in patients who present several days after the sting with fever or continued redness, warmth, swelling, and tenderness over the site or progression of the redness—red streaks that progress proximally.
- Urticaria: Antihistamines remain the mainstay of therapy. H1 blockers such as oral diphenhydramine (Benadryl) or hydroxyzine (Atarax) have proven useful in reducing the severity of the itching and rash. Oral steroids (eg, prednisone, methylprednisolone [Medrol]) can be added to the regimen if needed, depending on the extent and severity of the patient's symptoms. Epinephrine, 0.3-0.5 mL subcutaneously in a 1:1000 solution, can also be used. Although it reverses the extent and itching of the urticaria, its benefit-to-risk ratio must be considered. The alpha effect of epinephrine increases the systemic vascular resistance, while its beta effect has a positive inotropic and chronotropic effect on the heart. This produces an increase in the heart's work and increases the myocardial oxygen demand. This may have a deleterious effect in patients with preexisting heart disease or coronary artery disease.
- Anaphylaxis: The patient may present with airway obstruction due to angioedema, respiratory compromise due to bronchospasm, or circulatory collapse or with a combination of these 3 conditions.

Follow the ABCs of emergency medicine as expediently as possible. The airway must be secured. Intubate the patient with rapid sequence technique upon evidence of impending airway obstruction due to swelling or evidence of respiratory failure due to bronchospasm. Establish 2 large-bore intravenous lines to provide a route for medication administration and for fluid bolus in the event of circulatory collapse. Place the patient on both pulse oximetry and a cardiac monitor.

- Angioedema: If intubation is impossible because of the degree of swelling, obtain a surgical airway through cricothyrotomy. Surgical cricothyrotomy is contraindicated in patients younger than 8 years. In these cases, perform needle cricothyrotomy using the largest-bore needle practical as a temporizing measure. Obtain an emergency consultation with an anesthesiologist and an otorhinolaryngologist (ENT) to prepare the child for the operating room for definitive angioedema/airway management if parenteral beta agonists, histamine 1 (H1) blockers, and glucocorticoids do not relieve the obstruction.
- Bronchospasm
 - Treatment of bronchospasm without obstruction depends on the acuity of the patient's presentation. Treat mild-to-moderate distress with a combination of nebulized beta agonist (eg, albuterol 0.5 mL of 0.5% solution in 2.5 mL of normal saline nebulized q15min) and parenteral glucocorticoids (eg, methylprednisolone 125 mg IV). As the severity of the respiratory distress increases, weigh the benefit-to-risk ratio of using a parenteral beta agonist (eg, epinephrine). As bronchospasm worsens, a point of peaked expiratory flow and forced expiratory volume decrease occurs and the only area being ventilated with the nebulized beta agonist is the appropriately named dead space.
 - Epinephrine, 0.3-0.5 mL of a 1:1000 solution, may be administered intramuscularly. Its onset of action should be 3-5 minutes; however, impending circulatory collapse with peripheral vasoconstriction due to anaphylaxis may make this route ineffective. Intravenous epinephrine using 3-5 mL (0.3-0.5 mg) of the 1:10,000 solution (0.1 mg/mL) diluted in 10 mL of normal saline or distilled water should be administered slowly over a 1- to 2-minute period, depending on the patient's condition.
 - As an alternative, 3-5 mL of 1:10,000 solution can also be administered via the endotracheal tube. Administer this solution via a catheter with the tip placed below the end of the endotracheal tube and then flushed through with several milliliters of saline or distilled water. Several positive ventilations follow to force the epinephrine into the terminal bronchioles and alveoli.
 - Vasopressin 40IU has also been used for refractory hypotension.
- Hypotension: The cause of hypotension is multifactorial. Histamine, prostaglandin, and leukotriene can reduce the systemic vascular resistance by vasodilating the peripheral vessels and increase the capillary endothelial permeability, allowing extravasation of fluid into the third space. The net effect of both of these processes increases the vascular bed and decreases the amount of fluid in the vascular compartment. Begin treatment with the establishment of 2 large-bore intravenous lines and crystalloid fluid boluses. Vasopressors then can be added, depending on the patient's clinical appearance. Epinephrine can be administered via continuous infusion by mixing 1 mg in 250 mL of normal saline and infusing at a rate of 0.5-1 mL/min. Norepinephrine (Levophed) can also be used. It has the advantage of having more of an alpha effect and less of a beta effect than epinephrine.

Surgical Care

Consider a surgical airway in any patient with evidence of upper airway edema or laryngeal spasm who is experiencing respiratory deterioration. The equipment and expertise to perform a cricothyrotomy should be readily available if orotracheal or nasotracheal intubation cannot be achieved.

Consultations

- A consultation with an otorhinolaryngologist may be necessary to visualize the epiglottic and supraglottic regions with a flexible fiberoptic laryngoscope in patients who experience throat tightness or throat closing and who present with little or no objective signs of airway compromise.
- In patients with symptoms of throat tightness or throat closing with mild-to-moderate signs of airway compromise or patients who have evidence of early airway obstruction on flexible fiberoptic laryngoscopy, consultation with an anesthesiologist may be necessary to assist in securing the airway.
 - Patients who have moderate-to-severe signs and symptoms of airway compromise, such as increasing dyspnea, hoarseness, dysphagia, inability to clear secretions, use of accessory muscles, or decreasing oxygen saturation on pulse oximetry, require emergent consultation with both an anesthesiologist and an otorhinolaryngologist to place a surgical airway if intubation is unsuccessful. Rapid sequence intubation in these patients should be used with caution. The airway may be maintained open only by the patient's laryngeal muscles. The use of paralytics may allow the airway to be completely occluded.

Activity

- Advise patients who have experienced an allergic reaction to prior wasp stings or to any Hymenoptera stings to exercise caution while outdoors during mild-to-warm weather.
 - Advise these patients to avoid wearing any scented material (eg, perfume, hairspray, soaps, deodorants, sunscreen).
 - Brightly colored clothing, especially floral designs, should be avoided.
 - Tell patients who have experienced a severe reaction to a wasp sting to curtail solitary outdoor activities. Advise that the patient should be accompanied when outdoors and away from populated areas (eg, hiking, fishing) in case help is needed.
- Because odors tend to attract wasps, tell patients and their families to examine the home environment to decrease risks of attracting insects.
 - Cover garbage pails.
 - Remove rotting fruit on the vine or tree or after having fallen to the ground.
- Encourage patients to carry EpiPen autoinjectors when outdoors and to have one device in the home. Advise the patient that autoinjectors left in the car for prolonged periods during hot days may not be effective. They should periodically review the expiration date of the autoinjectors.

Medication

Medication use varies depending on the severity of the wasp sting. Antihistamines are used to treat mild urticarial symptoms. Catecholamines are needed in extreme cases (eg, anaphylaxis).

Antihistamines

H1-receptor antagonists block the effects of histamine. Diphenhydramine and hydroxyzine are two of the most widely used H1 blockers for oral and parenteral use in wasp stings.

Diphenhydramine (Benadryl)

For symptomatic relief of symptoms caused by release of histamine in allergic reactions.

Dosing

Adult

25-50 mg PO/IV/IM q4-6h

Pediatric

2 mg/kg PO q4-6h

1-2 mg/kg IV/IM q4-6h

Interactions

Potentiates effect of CNS depressants; because of alcohol content, do not administer syrup dosage form to patients who are taking medications that can cause disulfiramlike reactions

Contraindications

Documented hypersensitivity; MAOIs may prolong and intensify its effects

Precautions

Pregnancy

C - Fetal risk revealed in studies in animals but not established or not studied in humans; may use if benefits outweigh risk to fetus

Precautions

May exacerbate angle-closure glaucoma, hyperthyroidism, peptic ulcer, and urinary tract obstruction; drowsiness or visual disturbances may occur (advise patients against driving); MAOIs may prolong or intensify its effects

Hydroxyzine (Atarax, Vistaril)

Antagonizes H1 receptors in periphery. May suppress histamine activity in subcortical region of CNS.

Dosing

Adult

Atarax: 25 mg PO q8h

Vistaril: 25-100 mg IM q6-8h

Pediatric

Atarax:

<6 years: 50 mg/d PO in divided doses

>6 years: 100 mg/d PO in divided doses

Vistaril: 2 mg/kg IM q6-8h

Interactions

CNS depression may increase with alcohol or other CNS depressants

Contraindications

Documented hypersensitivity

Precautions

Pregnancy

C - Fetal risk revealed in studies in animals but not established or not studied in humans; may use if benefits outweigh risk to fetus

Precautions

Associated with clinical exacerbations of porphyria (may not be safe for porphyric patients); ECG abnormalities (alterations in T waves) may occur; may cause drowsiness

Glucocorticoids

These agents modulate and decrease the inflammatory response to the sting. Onset of action is delayed for several hours; therefore, glucocorticoids have very little effect in the acute setting. Early administration continues to stabilize the patient.

Methylprednisolone (Solu-Medrol, Medrol)

Steroids ameliorate delayed effects of anaphylactoid reactions and may limit biphasic anaphylaxis. In severe cases of serum sickness, parenteral steroids may be beneficial to reduce inflammatory effects of this immune complex-mediated disease.

Dosing

Adult

125 mg IV

Pediatric

30 mg/kg IV q4h

Interactions

Coadministration with digoxin may increase digitalis toxicity secondary to hypokalemia; estrogens may increase levels of methylprednisolone; phenobarbital, phenytoin, and rifampin may decrease levels of methylprednisolone (adjust dose); monitor patients for hypokalemia when taking medication concurrently with diuretics

Contraindications

Documented hypersensitivity; viral, fungal, or tubercular skin infections

Precautions

Pregnancy

C - Fetal risk revealed in studies in animals but not established or not studied in humans; may use if benefits outweigh risk to fetus

Precautions

Hyperglycemia, edema, osteonecrosis, peptic ulcer disease, hypokalemia, osteoporosis, euphoria, psychosis, growth suppression, myopathy, and infections are possible complications of glucocorticoid use

Prednisone (Deltasone, Orasone, Meticorten)

May decrease inflammation by reversing increased capillary permeability and suppressing PMN activity.

Dosing

Adult

20-40 mg PO

Pediatric

Not established

Interactions

Coadministration with estrogens may decrease prednisone clearance; concurrent use with digoxin may cause digitalis toxicity secondary to hypokalemia; phenobarbital, phenytoin, and rifampin may increase metabolism of glucocorticoids (consider increasing maintenance dose); monitor for hypokalemia with coadministration of diuretics

Contraindications

Documented hypersensitivity; viral infection; peptic ulcer disease; hepatic dysfunction; connective tissue infections; fungal or tubercular skin infections; GI disease

Precautions

Pregnancy

B - Fetal risk not confirmed in studies in humans but has been shown in some studies in animals

Precautions

Abrupt discontinuation of glucocorticoids may cause adrenal crisis; hyperglycemia, edema, osteonecrosis, myopathy, peptic ulcer disease, hypokalemia, osteoporosis, euphoria, psychosis, myasthenia gravis, growth suppression, and infections may occur with glucocorticoid use

Sympathomimetics

Epinephrine and the inhaled beta agonist albuterol reverse the effect of histamine (rather than blocking the effect).

Epinephrine (Adrenalin, EpiPen)

DOC for treating anaphylactoid reactions. Has alpha-agonist effects that include increased peripheral vascular resistance, reversed peripheral vasodilatation, systemic hypotension, and vascular permeability. Beta-agonist effects of epinephrine include bronchodilatation, chronotropic cardiac activity, and positive inotropic effects. Epinephrine can be administered SC for mild-to-moderate reactions and IV and via ET.

Dosing

Adult

0.01 mg/kg to maximum dose of 0.5 mg IM of 1:1000 solution q5-15min

Pediatric

Not established

Interactions

Increases toxicity of beta- and alpha-blocking agents, MAOIs, and halogenated inhalational anesthetics

Contraindications

Documented hypersensitivity; cardiac arrhythmias; angle-closure glaucoma; local anesthesia in areas such as fingers or toes is contraindicated because vasoconstriction may produce sloughing of tissue; do not use during labor (may delay second stage of labor)

Precautions

Pregnancy

C - Fetal risk revealed in studies in animals but not established or not studied in humans; may use if benefits outweigh risk to fetus

Precautions

Caution in elderly patients, prostatic hypertrophy, hypertension, cardiovascular disease, diabetes mellitus, hyperthyroidism, and cerebrovascular insufficiency; rapid IV infusions may cause death from cerebrovascular hemorrhage or cardiac arrhythmias

Albuterol (Proventil, Ventolin)

Beta agonist for bronchospasm refractory to epinephrine. Relaxes bronchial smooth muscle by action on beta₂ receptors with little effect on cardiac muscle contractility.

Dosing

Adult

Albuterol sulfate 0.5% inhalation solution: 2.5 mg of albuterol

To administer 2.5 mg of albuterol, dilute 0.5 mL of the 0.5% solution with 2.5 mL of sterile normal saline solution; adjust flow rate of nebulizer to administer solution over 5-15 min

Pediatric

<2 years: Not established

2-12 years: Base initial dose on body weight, 0.1-0.15 mg/kg; not to exceed 2.5 mg

>12 years: 2.5 mg of albuterol

To administer 2.5 mg of albuterol, dilute 0.5 mL of the 0.5% solution with 2.5 mL of sterile normal saline solution; adjust flow rate of nebulizer to administer solution over 5-15 min

Interactions

Beta-adrenergic blockers antagonize effects; inhaled ipratropium may increase duration of bronchodilatation by albuterol; cardiovascular effects may increase with MAOIs, inhaled anesthetics, tricyclic antidepressants, and sympathomimetic agents

Contraindications

Documented hypersensitivity

Precautions

Pregnancy

C - Fetal risk revealed in studies in animals but not established or not studied in humans; may use if benefits outweigh risk to fetus

Precautions

Caution in hyperthyroidism, diabetes mellitus, and cardiovascular disorders

Glucagon

DOC for severe anaphylaxis in patients who take beta-blockers (should be used in addition to epinephrine, not as a substitute).

Pancreatic alpha cells of the islets of Langerhans produce glucagon, a polypeptide hormone. Exerts opposite effects of insulin on blood glucose. Glucagon elevates blood glucose levels by inhibiting glycogen synthesis and enhancing formation of glucose from noncarbohydrate sources, such as proteins and fats (gluconeogenesis). Increases hydrolysis of glycogen to glucose (glycogenolysis) in liver in addition to accelerating hepatic glycogenolysis and lipolysis in adipose tissue. Glucagon also increases force of contraction in the heart and has a relaxant effect on GI tract.

Dose used for anaphylaxis is higher than the usual dose of 1 mg (1 U) IV/IM/SC used to treat hypoglycemia.

Dosing

Adult

1-5 mg IV bolus, followed by infusion of 5-15 mcg/min titrated against BP

Pediatric

Hypoglycemia:

<20 kg: 0.5 mg (0.5 U) or a dose equivalent to 20-30 mcg/kg

>20 kg: 1 mg (1 U) IV/IM/SC

Anaphylaxis: May need higher doses

Interactions

Effects of anticoagulants may be enhanced by glucagon (although onset may be delayed); monitor prothrombin activity and for signs of bleeding in patients receiving anticoagulants; adjust dose accordingly

Contraindications

Documented hypersensitivity; pheochromocytoma

Precautions

Pregnancy

B - Fetal risk not confirmed in studies in humans but has been shown in some studies in animals

Precautions

Monitor blood glucose levels in hypoglycemic patients until they are asymptomatic; glucagon is effective in treating hypoglycemia only if sufficient liver glycogen is present; since liver glycogen availability is necessary to treat hypoglycemic patients, glucagon has virtually no effects on patients in states of starvation, adrenal insufficiency, or chronic hypoglycemia

Follow-up

Further Inpatient Care

- All patients who present with a moderate-to-severe reaction to a wasp sting that required treatment should be observed. A rebound or biphasic reaction has been reported in –1-20% of patients as initial treatment wears off.
- Airway: Proactively treat patients who experience throat tightness resulting from a wasp sting. A treatment spectrum progresses from the asymptomatic patient to the patient with symptoms of mild throat tightness to the patient in respiratory distress from angioedema.
 - Assess the airway as soon as possible in the patient who experiences throat tightness.
 - Although cross-lateral neck radiography to assess soft tissue can be helpful to rule out gross swelling, it has several disadvantages. It may not reveal early swelling. If transferred to the radiology department for the radiograph, the patient should be accompanied by both an intubation tray and a physician capable of managing the airway.
 - The airway is best visualized by either an otorhinolaryngologist or an emergency department (ED) physician using a Machida scope or, if a flexible fiberoptic scope is not available, indirect laryngoscopy. An intubation tray must be available at the bedside.
 - Supplemental oxygen supplied by a humidified cool mist is often helpful in the patient with minimal inflammation who does not need immediate intubation and is being observed.
- Breathing: Continually monitor patients with pulse oximetry. Peak flow measurement may help evaluate the progression of bronchial spasm.

- Evidence of poor ventilation with decreasing oxygen saturations, poor air movement, wheezing, poor air exchange, prolongation of the expiratory phase, or increased work of breathing requires aggressive management.
- A nebulized beta agonist (eg, albuterol) can reduce bronchial spasm and improve oxygenation.
- Use methylprednisolone 125 mg IV to decrease the inflammatory response of the airways.
- Circulation: The cardiac rate and rhythm and the intravascular fluid compartment are 2 components of circulation that must be monitored.
 - Put the patient on a cardiac monitor and observe in an area where the patient can be intubated if necessary.
 - The BP must be monitored continuously because of the release of multiple factors in anaphylaxis that can reduce capillary integrity, increase capillary permeability, and subsequently decrease the amount of fluid in the vascular compartment and, at the same time, decrease the systemic vascular resistance.

Further Outpatient Care

- Direct outpatient care at preventing any further reaction.
- Provide patient education to reduce high-risk activities that may lead to exposure (see Activity).
- Prescribe self-administered autoinjectors (eg, EpiPen) to patients who have the potential for a severe reaction or who may be away from readily available medical assistance.
- Refer patients to an allergist for desensitization. This follow-up referral should be made expeditiously. The factors to consider are include initial reaction of the patient and the patient's risk of being stung again, such as the patient's occupation and time of year.

Inpatient & Outpatient Medications

- Autoinjectors (eg, EpiPen)
- Oral H1 blockers (eg, diphenhydramine, hydroxyzine)
- Corticosteroids (eg, prednisone, methylprednisolone)

Transfer

- Transfer the patient to the nearest facility capable of providing critical care monitoring if critical care monitoring cannot be performed at the facility initially treating the patient (in accordance with the current standards established by the Emergency Medical Treatment and Labor Act [EMTALA]).
 - A person capable of aggressively managing the patient's airway and monitoring and managing the patient's cardiopulmonary function should accompany the patient.
 - The transporter should have all the equipment and medication necessary to resuscitate the patient.

Deterrence/Prevention

- Teach the patient how to modify behavior, to dress, and to use toiletries and perfumes appropriately (see Activity).
- Refer the patient to an allergist for desensitization to Hymenoptera venom.
- Prescribe autoinjectors (eg, EpiPen) and oral H1 blockers (eg, diphenhydramine, hydroxyzine).

Complications

Consider local wound infection in any wasp sting site that worsens, persists, or partially resolves only to swell up with increased redness, swelling, or pain. Other symptoms and signs that should be elicited include fever, chills, red streaks extending proximally from the site, and purulent drainage from the site.

Prognosis

- The prognosis for mild-to-moderate reactions is good.
- The goal is prevention of another exposure.

Patient Education

Teach the patient how to modify behavior, to dress, and to use toiletries and perfumes appropriately (see Activity).

Miscellaneous

Medicolegal Pitfalls

- Failure to prescribe an EpiPen autoinjector to patients who have had a moderate-to-severe reaction to a wasp sting prior to discharge from the hospital (may cause the physician to be held accountable if this patient should have increased morbidity or mortality from a subsequent wasp sting)
- Failure to encourage patients to carry a Medic Alert bracelet or card
- Failure to search patients for Medic Alert card or bracelet when they present with a sudden unexplained shocklike state, respiratory distress, or airway swelling and obstruction and are unable to provide a history

Special Concerns

Patients on beta-blockers or vasodilators may have increased mortality or morbidity following a wasp sting.

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