



By Cathy Cassata

When patients with severe allergies are exposed to an allergen, it can cause anaphylaxis, a life-threatening allergic reaction.

“It will start rapidly and continue to progress rapidly,” says Shu-Yung James Wu, MD, an allergy and immunology physician at Northwell Staten Island University Hospital.

Anaphylaxis affects the respiratory system, causing wheezing, breathing trouble, and a drop in blood pressure. The condition

usually involves the skin, lungs, and cardiac and gastrointestinal systems, explains Dr. Wu.

“The main causative agent involved here is histamine, [which] causes itching. It also causes swelling and hives,” says Dr. Wu.

During an allergic reaction, histamine is released by specialized cells in the body called mast cells and basophils. Histamine causes the blood vessels in the body to become leaky, which causes fluid to move out of the blood vessels into the surrounding tissues. “This is what causes rapid swelling,” says Dr. Wu. “At the same time, this loss of

fluid from the blood vessels causes blood pressure to drop since the usually closed circulatory system is now leaky and cannot maintain pressure.”

During anaphylaxis, histamine causes more histamine to be released into the body by triggering more mast cells and basophils to release it, leading to a chain reaction that worsens over time. “This loss in blood pressure, along with swelling in places like the airways, can lead rapidly to death if untreated,” says Dr. Wu.



One *for* All

**Advocate for Anaphylaxis
Preparedness—Epinephrine
with Every Person**

Rapid Response

Anaphylaxis is most frequently caused by allergies to food, insect stings, medications, and latex.¹

As soon as a person has an anaphylactic reaction, they should be immediately injected with epinephrine. Epinephrine—the adrenaline that is naturally produced in the body by the adrenal glands when the body is under stress—is used as a medicine that is injected into the body during anaphylaxis.²

The effects of epinephrine cause breathing to become deeper and faster and dilate

the airways, helping to reduce swelling.² It prepares the body for a fight-or-flight response by increasing heart rate and blood pressure. When this happens, the small blood vessels constrict and force blood into vital organs and away from the surface of the skin.

“This effect is rapid and happens within seconds once the drug is administered. So, as a first line when every second and minute counts, it is lifesaving because it can work so quickly to try to stop the swelling and blood pressure drop,” says Dr. Wu.

While epinephrine begins to work immediately, the full effect of the medicine can take five to 10 minutes and begin to wear off within 20 to 30 minutes.²

Additional treatments called adjunctive medications are sometimes used. For instance, Albuterol can help open the constricted airways, and oxygen may be given to help with respiration.

Antihistamines such as Benadryl are ineffective first-line therapies for anaphylaxis. “They may help with itching but do not reverse the airway constriction or low

blood pressure,” says Lenard Markman, DO, member of the Advocacy Committee of the Wisconsin Association of Osteopathic Physicians and Surgeons.

Steroids might also be given to stop the later effects of an allergic reaction, especially for patients who have asthma, but steroids do not take effect for hours. Even if steroids are injected, Dr. Wu notes it will take two or more hours for steroids to have any benefit.

“So, in terms of saving someone’s life during anaphylaxis, there is no real alternative to epinephrine,” he says.

If a person does not recover within five minutes of an epinephrine dose, they should be given another dose.

A biphasic or rebound reaction may occur in up to 20% of patients who experience anaphylaxis, which means they may have another episode of anaphylaxis, usually within six to 12 hours after their symptoms subside.

“This is why it is so important to make sure patients have additional epinephrine at the time of discharge and know how to use it,” says Dr. Markman.

Symptoms of Anaphylaxis

While initial symptoms of anaphylaxis may be mild and include a runny nose or a skin rash, they can progress quickly to the following severe symptoms¹:

- Abdominal pain
- Cardiac arrest
- Diarrhea
- Dizziness
- Fainting
- Feeling of doom
- Hives
- Hoarse voice
- Low blood pressure
- Nausea
- Rapid heartbeat
- Swelling
- Throat tightness
- Trouble breathing
- Vomiting

Be Prepared

Epinephrine is available with a prescription as a nasal spray, a pre-filled auto-injector, and a vial that can be used to fill a syringe. However, the medication has been prescribed to only patients with a diagnosis of life-threatening allergies.

For those unaware that they have an allergy, not having epinephrine on hand can be life-threatening. Such was the case for Dillon Mueller, an 18-year-old from Wisconsin who was unaware that he was allergic to bees. In October 2014, while helping his best friend with yard work, Dillon was stung by a bee, causing anaphylaxis. His friend performed CPR until an ambulance arrived. However, the ambulance did not have epinephrine on hand. After spending a week on artificial cardiopulmonary support, Dillon’s parents had to make the decision to discontinue care. Dillon did not survive.

“Most ambulances still do not have epinephrine; they’re not required to have it. At the time of Dillon’s reaction, it was very expensive for ambulances to have it,” says Dr. Markman. “Wisconsin now allows all first responders to have drawn up epinephrine that is injected. It’s very easy and very inexpensive.”

After learning about Dillon’s story, Dr. Markman teamed up with Dillon’s parents and the Wisconsin Association of Osteopathic Physicians and Surgeons to advocate for wider access to epinephrine. Together, they created state legislation called Dillon’s Law, which was signed into law in Wisconsin in 2017. The law allows any individual in Wisconsin to be trained on the use of epinephrine; after completing training, they can obtain epinephrine from a pharmacy and use it to save a person having a severe allergic reaction. All people involved are covered under the state Good Samaritan liability law.

“We feel epinephrine administration is something that everyone should be trained in. With 1 in 13 kids having food allergies, every daycare and school should have epinephrine available. Parents should have it with first aid kits,” says Dr. Markman.

He led the Do It for Dillon Anaphylaxis Training Program, the first state-approved hands-on anaphylaxis train-

ing program offered at no cost with no age restrictions. Over 5,000 people have been trained through the program, and at least 16 lives have been saved by people who took the course.

“Dillon’s parents have become amazing anaphylaxis instructors. Last year, they led over 46 different anaphylaxis training courses. They are determined to prevent the tragedy they faced from happening to you, your family, or patients,” says Dr. Markman.

Dillon’s Law also passed in Indiana, Minnesota, and Colorado and is under consideration in Illinois. A national Dillon’s Law was introduced in 2023 but was not voted on in the 2023–2024 Congress. Dr. Markman hopes it will be voted on in 2025. In the meantime, he continues to work with individual states.

The national organization Food Allergy Research & Education also offers a free online course³ on how to administer different epinephrine auto-injectors that anyone across the country can access.

Window of Opportunity

In 2019, at the annual convention for the Wisconsin State Society of Medical Assistants, Dr. Markman certified over 100 medical assistants on the administration of epinephrine. He was thrilled that 16 medical assistants volunteered to become instructors of the Do It for Dillon Anaphylaxis Training Program.

“I should have expected this. The medical assistants I have known and worked with have such a wonderful, sincere commitment to their patients and community,” says Dr. Markman. “Medical assistants know how important it is to have epinephrine available.”

If medical assistants can use epinephrine to save a patient in the practice, he believes they should be allowed to obtain epinephrine and use it anywhere to help others.

Colleen Conklin, CMA (AAMA), agrees. As an assistant professor for the College of Western Idaho, she points out that medical assistants are trained to administer injections.

“We do not specifically teach how to inject epinephrine; however, it is a standard intramuscular injection,” she says.

Medical assistants are also equipped to

Most Common Food and Insect Allergens

About 8% of children and 11% of adults in the United States have a food allergy.⁴ Over the past few decades, the prevalence of food allergies in kids has increased. Food allergies in children have risen by 50% since 1990, according to the Centers for Disease Control and Prevention.⁵

The following are the most common foods people are allergic to, according to the Food Safety and Inspection Service⁶:

- Eggs
- Fish
- Milk
- Peanuts
- Sesame
- Shellfish
- Soybeans
- Tree nuts
- Wheat

Regarding insect sting allergies, between 1.6% and 5.1% of U.S. citizens have experienced life-threatening allergic reactions. Moreover, an average of 72 deaths per year occur from stings in the United States.⁷

Most insect stings in the United States come from wasps, yellow jackets, hornets, and honeybees. Lenard Markman, DO, warns that red and black imported fire ants are now a concern in southern parts of the country.

"7% of the population is allergic to bees and fire ants. Fire ants are like bees without wings; they bite and sting. They are a huge problem for Texas and are migrating north because it's getting warmer," says Dr. Markman.

educate patients on the seriousness of anaphylaxis and how to self-administer epinephrine.

"Patients should be taught that anaphylaxis is deadly and that epinephrine will reverse the situation, so it's imperative that medical assistants stress this and that patients who have anaphylaxis carry their EpiPens with them," says Conklin.

Her experience as a paramedic taught her how to administer epinephrine in syringe form; however, she says most patients who medical assistants will interact with need to understand how to use an epinephrine auto-injector like EpiPen or AUVI-Q.

"The pre-loaded pens make it easier so that the needle will be the right size and the medicine will reach the muscle, but you still need to know where to administer it so that it quickly gets into the system," says Conklin.

Because epinephrine causes the small blood vessels to constrict and redirects blood flow to vital organs, Dr. Wu says it must not be injected into extremities like hands and feet but rather into a body part with large amounts of blood flow so it will circulate around the body as fast as possible.

"Therefore, we inject epinephrine into a large muscle. Typically, this is the outer thigh, as that is one of the largest muscles in the body," says Dr. Wu.

For auto-injector forms, he says to remove the protective cap from the device, arm the device, and jab the device into the outer thigh. At this point, the needle automatically injects the patient.

"Injection is typically done within two seconds, but as a matter of timing when your adrenaline is running, we typically teach people to count to 10," he says.

Health care professionals must communicate with patients about the effects of epinephrine in case they ever need to administer it.

"Since it is basically a shot of pure adrenaline, the patient will experience heart racing like their heart is going to jump out of their chest. They will feel agitated and shaky, and because the blood vessels in the skin will constrict, they will start to feel cold," says Dr. Wu.

Lastly, patients should know that the most common cause of preventable death in an anaphylactic reaction is a delay in the administration of epinephrine. Anaphylaxis is a chain reaction, and if you can interrupt the effects early enough, it does not progress as far, says Dr. Wu.

"People often fear giving it because it seems like such a drastic measure. Most patients, especially children, will not have any lasting negative effects from epinephrine

as long as it is injected properly into a large muscle and not a finger," he says.

Note that people with heart conditions are at increased risk of death from anaphylaxis, so it is important to treat them quickly. However, epinephrine may cause the heart to beat faster and stronger.

"But this is to be balanced with the likelihood of death if anaphylaxis progresses," says Dr. Wu. "So, in summary, you should not be afraid to administer epinephrine to an otherwise healthy patient in anaphylaxis. The side effects are temporary, and you could be saving the life of a patient." ♦

The CE test for this article can be found on page 29.



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