

Anaphylaxis in the School Setting: Guidelines for Rapid Recognition and Treatment



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Foreword & Acknowledgements

Florida Senate Bill 284 — School Emergencies took effect July 1, 2013 and authorizes both public and private schools to maintain a stock supply of epinephrine auto-injectors in a secure location for use in an emergency situation by authorized students and trained school personnel. The bill also provides immunity from liability for public and private school employees from any injury related to the use of epinephrine administered by trained school personnel. Schools that choose to purchase and maintain a stock supply of epinephrine auto-injectors must adopt a *protocol* developed by a licensed physician for the administration of an epinephrine auto-injection by trained school personnel.

Accordingly, the Florida Allergy, Asthma & Immunology Society (FAAIS) has published the following physician-directed, best-practice guidelines to assist Florida school staff with the training and tools needed to implement an anaphylaxis protocol for their school. The intent of these guidelines is to prepare school staff with the knowledge and ability to rapidly identify and treat life threatening allergic reactions occurring in the school setting. These guidelines are not intended to supersede existing physician instructions/orders for individual students with life-threatening allergies.

*The Mission of FAAIS is to promote the highest quality, evidence-based, specialty care for patients with allergy, asthma and immunologic diseases while providing cutting-edge education to our patients, to our members and to the health care community at large. **FAAIS would like to thank the following physicians who dedicated their time, direction and collaborative effort to make these guidelines available to Florida schools:***

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KEY POINTS

- a. Anaphylaxis is a life-threatening allergic reaction that can be caused by allergies to foods, medicines, or stinging/biting insects.
- b. Food allergies are the most common cause of anaphylaxis in schools and approximately 2 children per classroom possess at least one food allergy.
- c. Anaphylaxis progresses very quickly and therefore early recognition of allergic symptoms is essential.
- d. All school staff must know and be able to recognize the warning signs/symptoms of anaphylactic reactions.
- e. Epinephrine is the first line treatment for anaphylaxis and is the *only* treatment capable of stopping and reversing an anaphylactic reaction.
- f. Many anaphylactic reactions occur in students who are not known to possess life-threatening allergies. These children will not have access to their own prescribed epinephrine auto-injector and therefore it is crucial that the school have a stock supply of non-student specific epinephrine available.
- g. Every effort should be made to minimize the time to epinephrine administration once it is determined that a student is having an anaphylactic reaction.

I. Introduction and Overview

Anaphylaxis (or systemic allergic reaction) is a sudden, rapidly progressing and life-threatening allergic reaction that requires immediate treatment. There are a variety of culprits that can trigger an anaphylactic reaction but most events are due to ingestion of allergenic foods, stinging by venomous insects, medications ingested or injected, or latex particles which have been inhaled by or have made mucosal contact with an allergic individual (see Table 1). Anaphylaxis can result in shock, airway closure (suffocation) and death if not treated early and appropriately. Epinephrine (adrenaline) is the only treatment shown to stop and reverse the life threatening effects of a systemic allergic reaction. Anaphylaxis can occur within seconds or minutes of allergen contact and may happen without any prior history of allergies. In fact, up to 25% of reported epinephrine administrations in schools occurred in children with no known history of life threatening allergies [1]. These situations are the most perilous because the child and staff may not recognize the initial symptoms and warning signs.



The incidence of anaphylaxis in Florida schools is uncertain; however, studies estimate that the prevalence in the general population may be as high as 2% and is rising among school age individuals [2]. Deaths and hospitalizations due to anaphylaxis are also increasing [3-9] and parallel the increasing prevalence of food allergies among children. According to the American College of Allergy & Immunology, approximately 1 in 13 children (about 2 children per classroom) have at least one food allergy and nearly 40 percent of these children have suffered a severe allergic reaction to foods [10].

It is not possible to entirely prevent anaphylaxis while children are at school. Therefore, it is imperative that all school staff know the warning signs and symptoms of anaphylactic reactions. Furthermore, it is critical that schools have a concise protocol in place for the timely treatment of life-saving epinephrine and mobilization of emergency medical personnel to the school for additional medical management.

All students with a known life-threatening allergic condition should have access to his/her own prescribed epinephrine injector and individualized emergency plan as directed by the prescribing physician. According to [Florida statute 1002.20, K-12 Student and Parent Rights](#), students may carry their own auto-injector with parental and physician authorization:

(i) Epinephrine use- A student who has experienced or is at risk for life-threatening allergic reactions may carry an epinephrine auto-injector and self-administer epinephrine by auto-injector while in school, participating in school-sponsored activities, or in transit to or from school or school-sponsored activities if the school has been provided with parental and physician authorization.

II. Triggers of Anaphylaxis

There are many causes of anaphylaxis. Table 1 lists the more common and school-relevant triggers.

Table 1. COMMON TRIGGERS OF ANAPHYLAXIS IN THE SCHOOL SETTING	
FOODS	Cow’s milk (dairy products), Eggs, Soy, Peanut, Tree Nut (almonds, walnuts, pecans, etc.), Shellfish, Finned Fish
INSECT VENOM	Fire Ant, Honey Bee, Hornet, Yellow Jacket, Wasp
NATURAL RUBBER LATEX	Toy balloons, bottle nipples, latex gloves, pacifiers, teething rings
MEDICINES	Antibiotics and nonsteroidal anti-inflammatory agents (i.e. ibuprofen, naproxen, aspirin, etc...)
<i>**Less common triggers include low-powder chalk (may contain cow’s milk protein) and exercise.</i>	

III. Recognizing Anaphylaxis: Symptoms and Signs

Initial signs and symptoms of anaphylaxis may vary from student to student. Furthermore, some children may only complain of one symptom, therefore it is crucial that school staff be able to recognize the various warning signs of anaphylaxis as severe attacks are usually preceded by milder reactions. Symptoms of anaphylaxis typically begin with *seconds-minutes* of allergen exposure although may be delayed up to 2 hours (see Table 2). It is important to question the student about recent food or medicine ingestions or if he/she was recently bitten or stung by an insect if there is suspicion for anaphylaxis.



Table 2. COMMON SIGNS AND SYMPTOMS OF ANAPHYLAXIS*

SKIN	Flushing (red/pink skin), warmth, hives/ itchy rashes, swelling (eyelids, face)
EYES	Itchy, red, watery
MOUTH	Itching or tingling of lips, tongue, or roof of mouth. Swelling of lips or tongue
THROAT	Tightness, hoarseness, trouble breathing or swallowing, trouble speaking, change in quality of voice (due to swollen vocal cords).
RESPIRATORY	Nasal itching, stuffy nose, drainage or sneezing. Shortness of breath, increased work of breathing, chest tightness, repetitive coughing, wheezing (high-pitched whistle while exhaling)
GASTROINTESTINAL	Abdominal cramping, nausea, vomiting, diarrhea
CARDIOVASCULAR	Pale, blue, faint, dizzy, weak pulse, lethargic
NEUROLOGIC	Anxiety, sense of impending doom, confusion, irritable, sudden behavioral changes

***NOTE:** Skin involvement is the most common manifestation, occurring in 90 percent of anaphylactic reactions and usually includes sudden itching, hives, reddish patches of skin or swelling (eyelids, lips, tongue, throat). However, 80 percent of food-induced anaphylaxis fatalities do not start with skin symptoms [11]. Respiratory symptoms occur in 70 percent of episodes and include sudden sneezing, difficulty breathing, wheezing or repetitive coughing. *School personnel should have a high index of suspicion for a systemic allergic reaction if a child suddenly complains of spontaneous itchy rashes and difficulty breathing.*

IV. Treatment

Epinephrine is the first line treatment for anaphylaxis and is the only treatment capable of stopping and reversing an anaphylactic reaction. Administering epinephrine immediately at the onset of symptoms assures the best possible outcome for the student. A delay or failure of epinephrine administration may result in more severe symptoms and a decreased chance of survival. Anaphylaxis is a very rapidly progressive process; therefore, every minute matters and effort should be made to minimize the time between symptoms onset and epinephrine administration. **It is much safer to administer epinephrine at the first sign of anaphylaxis than to wait until the student is in severe distress.** (In other words, if you are concerned that the student may be experiencing anaphylaxis, it is much safer to administer when it is not needed than to withhold when it is needed.)

a. How Epinephrine Works. During anaphylaxis, blood vessels throughout the body spontaneously widen causing tissue swelling and a drop in blood pressure—potentially resulting in throat closure and shock. Epinephrine counteracts these life-threatening problems by constricting the blood vessels, reducing swelling and raising the blood pressure. Epinephrine begins working within a few minutes of injection although its duration only lasts 5-15 minutes. Therefore an additional dose may be required if symptoms persist or are worsening.

b. Common Side Effects: What to expect. Epinephrine is adrenaline and therefore side effects will mimic the typical “flight or fight” response to danger. Injectable epinephrine commonly causes mild and transient tremor, rapid heartbeat and nervousness.



c. **Administration and Dosing.** Epinephrine is commercially available in auto-injectable devices and in ampules/vials. Auto-injectable devices are designed for use by the lay public and can be easily administered by nonmedical personnel or self-administered. A notable advantage of auto-injectors is that they afford the most rapid administration of epinephrine at a premeasured dose. Also, they can be administered through a layer of clothing if needed. Epinephrine auto-injectors are available in a 0.15mg dose and a 0.3 mg dose. Dosing is based upon the individual’s body weight (Table 3). All epinephrine auto-injectors should be given *intramuscularly* (in the muscle) in the outer thigh.

Epinephrine ampules/vials may be appropriate for some schools; however, they require precise measurement when being drawn into a syringe and *should only be administered by licensed, medically trained personnel*. They may be administered intramuscularly in the outer thigh or in the deltoid muscle.

Table 3. WEIGHT-BASED EPINEPHRINE DOSING GRID (See Appendix for alternative dosing schedule)		
33-66 pounds	0.15mg	e.g. Adrenallick 0.15 [®] , Auvi-Q Jr [™] , EpiPen Jr. [®] , generic, etc.
Over 66 pounds	0.3mg	e.g. Adrenallick 0.30 [®] , Auvi-Q [™] , EpiPen [®] , generic , etc.

There may be occasions where the student’s precise weight is unknown and the acquisition of an accurate weight measurement would delay emergent treatment. In these cases, it may be necessary to estimate the student’s weight by visual inspection of body habitus or by age. According to children’s growth data from the CDC, 50% of 9 year old children and 75% of 10 year old children weigh greater than 66 pounds [12].

d. **Storage of Epinephrine.** Epinephrine should be stored room temperatures of 68-77 degrees Fahrenheit. It should never be frozen or exposed to high temperatures. Prolonged exposure to light can prematurely degrade epinephrine and render it ineffective. Epinephrine is colorless and translucent (like water). The expiration dates and contents should be monitored on a periodic basis. Auto-injectors have a window through which the contents may be seen. If cloudiness, discoloration or particle formation is observed then it should be replaced. While every attempt should be made to have an epinephrine auto-injector that has not expired, it is much better to use an expired dose (which maintains partial activity) than to withhold administering the epinephrine. If there is a feasible non-expired epinephrine auto-injector which could be “borrowed” temporarily, this might also be an alternative.

It is preferable that the epinephrine devices not be in a locked drawer, as searching for the key may delay the child receiving this emergency medication. If it must be kept in a locked drawer, then it is recommended that multiple school personnel carry working keys to quickly access the epinephrine when needed. The stock supply should not be accessible to children.



V. Managing an Anaphylactic Reaction

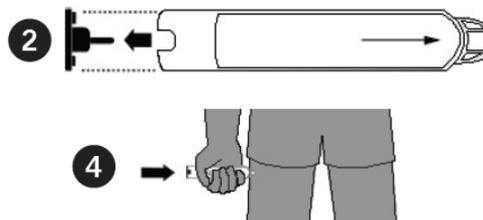
1. Once the determination of anaphylaxis is made, it is crucial to immediately obtain and administer epinephrine as soon as possible. Anaphylaxis progresses very quickly, every minute counts.
2. Place the student in a reclined position on the floor, flat on the back with legs elevated if possible.
 - If others are present, have someone remain with the student as you emergently obtain epinephrine. Be sure to notify others to call 911.
 - If you are alone, yell for help and alert others to call 911 as you hurry to get the epinephrine. Do not waste time looking for others or a phone until the epinephrine is given.
3. The dose of autoinjectable epinephrine is based on the student's weight: 0.15mg for children 33-66 pounds and 0.3mg for individuals over 66 pounds (see Appendix for an alternative dosing schedule). It should be administered in the outer thigh and may be administered through one layer of clothing if necessary. Auvi-Q™ and EpiPen® epinephrine autoinjectors have instructions on the device to guide proper injection technique (Table 4). Product demonstration videos may also be found on the following manufacturers' websites for training purposes:
 - www.adrenaclick.com (Adrenaclick®)
 - www.auvi-q.com (Auvi-Q™)
 - www.epinephrineautoinject.com (generic, epinephrine injection, USP autoinjector)
 - www.epipen.com (EpiPen®)
4. Once epinephrine has been administered and 911 has been called, remain with the student until emergency medical service (EMS) personnel arrive. A second dose of epinephrine may be given 5-10 minutes after the first injection if the student's condition continues to worsen before EMS personnel arrives.

TABLE 4. DEVICE SPECIFIC DIRECTIONS FOR AUTO-INJECTABLE EPINEPHRINE

Source: Food Allergy Research and Education (FARE) ♦ www.foodallergy.org

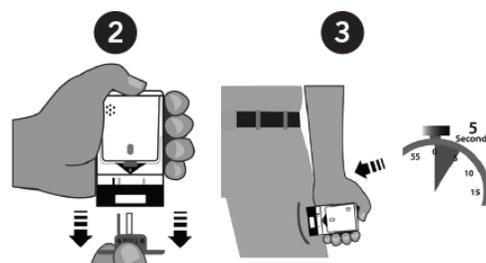
EPIPEN® (EPINEPHRINE) AUTO-INJECTOR DIRECTIONS

1. Remove the EpiPen Auto-Injector from the plastic carrying case.
2. Pull off the blue safety release cap.
3. Swing and firmly push orange tip against mid-outer thigh.
4. Hold for approximately 10 seconds.
5. Remove and massage the area for 10 seconds.



AUVI-Q™ (EPINEPHRINE INJECTION, USP) DIRECTIONS

1. Remove the outer case of Auvi-Q. This will automatically activate the voice instructions.
2. Pull off red safety guard.
3. Place black end against mid-outer thigh.
4. Press firmly and hold for 5 seconds.
5. Remove from thigh.



ADRENACLICK®/ADRENACLICK® GENERIC DIRECTIONS

1. Remove the outer case.
2. Remove grey caps labeled "1" and "2".
3. Place red rounded tip against mid-outer thigh.
4. Press down hard until needle penetrates.
5. Hold for 10 seconds. Remove from thigh.





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Appendix

Alternative Epinephrine Dosing Schedule

Some physicians may prefer to use the published medically advised dose for the emergency treatment of anaphylaxis, which is 0.01 mg/kg up to 0.3 mg in children. The rationale is that it is safer to administer a dose that is a little larger than ideal than to administer a dose that is too low. This would mean that any child weighing over 32 lb would be given the 0.30 dose of epinephrine. Thus a specific child's emergency plan (developed by their physician or prescribing practitioner) may differ from the dosing guidelines listed in Table 3.