

The Allergist's Role in Anaphylaxis and Food Allergy Management in the School and Childcare Setting



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Anaphylaxis and food allergy management in childcare facilities and schools are growing challenges. An increasing number of children experience severe allergic reactions on school grounds as evidenced by reports of epinephrine use. Data also suggest that the prevalence of food allergy may be increasing, with a large percentage of school-aged children at risk for anaphylaxis. Moreover, anaphylaxis may occur for the first time in a previously undiagnosed child at school or childcare setting, suggesting that general preparedness is essential. Management includes strategies for minimizing the risk of reactions and allergen exposures as well as readiness to recognize and treat allergic reactions of any severity. The primary objective of this report is to offer health care providers an overview of relevant evidence, resources, and expert opinion to assist with developing interprofessional collaborative counsel on school food allergy management and anaphylaxis preparedness with families, schools, and childcare settings. We present the current evidence base, suggest resources, and highlight areas of current controversy that warrant further study. © 2017 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2018;6:427-35)

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Over the last several decades, the prevalence of pediatric IgE-mediated food allergy appears to have increased, resulting in up to 1 or 2 children per typical school classroom affected.¹⁻⁸ The primary objective of this report is to offer health care providers an overview of relevant evidence, resources, and expert opinion to assist with developing interprofessional collaborative counsel on school food allergy management and anaphylaxis preparedness with families, schools, and childcare settings. This workgroup report synthesizes materials from recent publications relevant to its objectives to provide guidance to health care providers; it is not based on independent meta-analysis or comprehensive literature reviews. This update is timely given recent publications of Guidelines from the U.S. Centers for Disease Control and Prevention (CDC) regarding school food allergy management, updated Joint Task Force on Practice Parameters (American Academy of Allergy, Asthma and Immunology and American College of Allergy, Asthma and Immunology) for anaphylaxis and for food allergy, clinical reports from the American Academy of Pediatrics regarding first aid use of epinephrine and written emergency plans, and a report from the National Academies of Sciences, Engineering and Medicine on food allergy.⁹⁻¹³ The intent of this workgroup report is not to restate the materials in these documents, but rather to incorporate the contemporary messages to provide guidance to health care providers. The reader is encouraged to review the 2013, "Voluntary Guidelines for Managing Food Allergies in Schools and Early Care and Education Programs" published by the CDC.⁹ The CDC voluntary guidelines provide a framework of evidence-based recommendations that can be tailored to adapt to the wide variations among schools and patients on an individualized basis.^{9,14} A list of selected resources is presented in [Table I](#).

This report assumes that health care professionals understand the nature of IgE-mediated food allergy, anaphylaxis, and other serious food allergies that are not mediated by IgE antibodies, for example, food protein-induced enterocolitis syndrome. The details of diagnosis, daily management (allergen avoidance), determination of risk/severity, and emergency management are beyond the scope of this report and are reviewed in various practice parameters and national guidelines.^{1,10-12,15} Although these topics are not reviewed here, key aspects of diagnosis and management are reviewed here briefly when they are relevant to specific recommendations about school management.

BACKGROUND

Allergic reactions, including anaphylaxis, occur in schools and childcare settings, and the apparent increasing prevalence

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Abbreviations used

ADA- Americans with Disabilities Act
 ADAA- ADA Amendments
 CDC- Centers for Disease Control and Prevention
 EAI- Epinephrine autoinjectors
 EMS- Emergency medical services
 FAAMA- Food Allergy and Anaphylaxis Management Act
 IHP- Individual health plan
 SAEAA- School Access to Emergency Epinephrine Act

of food allergy suggests that many school-aged children are at risk.

- Approximately 8% of children in the United States have food allergy.^{2,5} Studies suggest that food allergies are resolving more slowly than previously believed.¹⁶ This leads to a greater prevalence of school-aged children at risk for allergic reactions.
- Studies of self-reported reactions show that 16% to 18% of children with food allergy have experienced an allergic reaction while at school or daycare.^{17,18}
- Allergic reactions in the school setting occur in students with known food allergy, as well as those who have no prior history of allergy and in nonstudent members of the school community. Up to one quarter of reactions occurring on schools grounds affect individuals who are unaware of their risk.¹⁸⁻²⁰

Students with food allergy are protected by federal civil rights legislation to access education in the least restrictive environment.²¹⁻²³

- The Americans with Disabilities Act of 1990 (ADA) and ADA Amendments of 2008 (ADAA) prevent discrimination based on disability. Children with food allergy gain legislative security in school and childcare settings receiving federal funding as the law protects their access to a free and appropriate education.^{21,22,24,25} Private schools that are not religiously affiliated must comply with the ADA and ADAA, but private schools that are religiously affiliated are exempt.^{22,25}
- Under ADAA, students with food allergy are considered to have a disability restricting their diet and therefore are eligible for free case-specific dietary substitutions in school meal and snack programs when their physician, or other state-allowed health care provider, gives written documentation of substitution needs with suggested alternatives, unless exempted by the U.S. Food and Nutrition Service.^{25,26}
- Section 504 of the U.S. Rehabilitation Act of 1973 disallows discrimination against qualified individuals with disabilities in activities and programs receiving federal funding.²³
- The Food Allergy and Anaphylaxis Management Act (FAAMA) became law in 2011, as part of the Food Safety Modernization Act, and mandated that the U.S. Secretary of Health and Human Services, in collaboration with the U.S. Secretary of the Department of Education, developed voluntary school food allergy and anaphylaxis management guidelines. FAAMA included recommended elements to be addressed in the procedures, and established incentive grants to support implementation of such guidelines in public schools.^{27,28}
- The School Access to Emergency Epinephrine Act (SAEAA) of 2013 is federal legislation providing financial incentive for states to create laws requiring schools to stock undesignated

epinephrine autoinjectors (EAI) for the treatment of anaphylaxis by trained personnel.²⁹

- Most states have passed laws regarding the availability of nonstudent-specific stock EAI.³⁰ However, legal distinctions may exist with factors such as whether only a school nurse or other trained school personnel may administer the medication during an anaphylactic emergency, whether staff education is only to be directed by registered nurses or if other personnel may do so, and parameter requirements for reporting reactions and any use of epinephrine.²⁴

Summary

Allergists and other health care providers should be familiar with the scope of food allergy affecting school-aged children and the role of legislation in protecting the rights and safety of these children.

COMMUNICATION BETWEEN PATIENTS/FAMILIES AND SCHOOLS

The allergist or health care provider plays a key role in communicating the diagnosis and allergic risks faced by the child with food allergy. Opportunities include discussion with the family of food allergy care and provision of a written allergy and anaphylaxis emergency plan, prescriptions for EAI, assistance with creating school plans for effective avoidance, and additional communication with the school team if needed.

- The CDC recommends a team approach to managing food allergy in schools. Clear communication and partnership are necessary for this to be successful. This partnership includes the food-allergic child, parents, school staff, school nurse, and the child's health care providers.⁹
- Parental anxiety is a natural outcome of the knowledge that the child is at risk for anaphylaxis and that despite best efforts, unintentional allergen exposures do occur. The health care provider's discussion of anaphylaxis should be evidence based, including the low risk of anaphylaxis from casual contact (skin, air) compared with ingestion, the lack of correlation of allergy tests with clinical reaction severity, and the low incidence of fatal food anaphylaxis.^{1,31}

Individualized written emergency plans should be developed with the student and family and provided to the school. Emergency plans are documents written in simple lay terms that provide medical information about the child (demographics and allergy history), describe signs and symptoms that can develop during an allergic reaction, instructions for initiating treatment, and medication dosages appropriate for the child. School personnel, parents, and health care providers should recognize that the written plan provides individualized guidance and treatment authorization, but is not a sole means of imparting the full scope of anaphylaxis recognition and management. Additional education about food allergy and anaphylaxis is required to provide context.

- The CDC recommends that students have individualized emergency care plans that are prepared by the child's health care provider.⁹
- A written emergency plan serves to inform the school of a child's risk for allergic reactions and anaphylaxis. It also provides guidance for managing reactions given a student's specific circumstances or needs. Ideally, the emergency plan is simple to execute, and allows trained, unlicensed school personnel to implement the plan in the absence of the school

TABLE 1. Resources for food allergy anaphylaxis management in schools

Organization	Web site
• U.S. Centers for Disease Control and Prevention	• www.cdc.gov/healthyschools/foodallergies/index.htm
• American Academy of Allergy, Asthma, and Immunology	• www.aaaai.org/conditions-and-treatments/school-tools
• Food Allergy Research and Education	• www.foodallergy.org/managing-food-allergies/at-school
• AllergyHome	• www.allergyhome.org

nurse. Studies have shown that many students do not provide schools with written emergency plans.^{19,32,33}

- Different emergency plans exist, which vary in treatment recommendations and amount of information included. These written plans authorizing treatment are offered by professional and lay organizations and are often modified by schools or districts, as no universal written plan has been adopted. The American Academy of Pediatrics recently published an Allergy and Anaphylaxis Emergency Plan (www.aap.org/aaep) that is accompanied by a clinical report that provides guidance to clinicians on how to complete the plan.¹² The emergency plan emphasizes the importance of epinephrine as the first line of treatment of anaphylaxis, but also allows for the use of other medications (if desired) for the initial management of mild allergic reactions that are not anaphylaxis. The ability to individualize the plan is included with an option to indicate early use of epinephrine at the first sign of any symptom (even mild symptoms such as facial or oral itching, a few hives, or mild stomach discomfort or nausea); this may be considered for those with a history of near fatal anaphylaxis or other risk factors for severe anaphylaxis (such as respiratory distress, hypoxia, hypotension, or neurologic compromise). The circumstances to consider such options are discussed in the accompanying clinical report. Emergency plans are also available from the American Academy of Allergy, Asthma and Immunology (<http://www.aaaai.org/Aaaai/media/MediaLibrary/PDF%20Documents/Libraries/Anaphylaxis-Emergency-Action-Plan.pdf>) and Food Allergy Research and Education (www.foodallergy.org/file/emergency-care-plan.pdf).
- Emergency plans also serve as an educational tool to assist patients, families, and school staff in understanding the spectrum of allergic reactions. Coexisting asthma and prior anaphylaxis can be indicated on the form to alert families and school staff of these risk factors for more severe reactions.³⁴ Emergency plans indicate that epinephrine should be immediately administered if any severe symptoms develop or anaphylaxis is highly likely. After epinephrine administration, emergency medical services (EMS) should be called (911) for transport to the nearest emergency facility. Pending arrival of EMS, the child should be monitored, and additional medications may be considered such as antihistamines and/or bronchodilators for children with asthma or who have respiratory symptoms. If only mild symptoms occur, then an oral antihistamine may be used first. However, if additional symptoms develop, then epinephrine is needed.
- Emergency action plans should be updated at the beginning of every school year as well as when changes in allergic triggers, comorbid conditions, or other new medical information are noted.

Individual health plans (IHPs) proactively focus on prevention of allergic reactions.

- With information from the health care provider, family, school nurse, and other school personnel, an IHP may be developed.

It should include developmentally appropriate food allergen avoidance measures, education for the school community, as well as the emergency plan. The IHP should take into consideration the resources of the school and the school environment, such as the size of the school, access to emergency medications, where students eat, as well as school transportation and off-campus activities (ie, sports and field trips).²¹

- There may be circumstances where there is difficulty with implementation of the child's IHP, such as inadequate supervision or nursing coverage, previous experience with sub-optimal implementation of IHPs with inadequate provision of case-specific accommodations, and/or other factors preventing the student from safely obtaining education in the specific school setting. Section 504 of the Rehabilitation Act of 1973 provides legal recourse for the student when there is difficulty with the school and family coming to terms through normal channels. 504 plans offer an option providing much more detailed documentation of agreements regarding school accommodation planning when IHPs are found to be insufficient in certain circumstances. However, for many students, IHPs are all that is needed and the decision as to which option to pursue may change per academic year.^{14,23,24}

Summary

The allergist or health care provider should establish a diagnosis and participate in communication regarding a risk reduction and management plan. Written emergency plans communicate important medical information to schools and provide a plan for the treatment of allergic reactions, including indications for epinephrine. These plans assist the school in preparing a safe learning environment for students at risk for allergic reactions. Health care providers should develop these individualized plans with the family and school and counsel families regarding the importance of providing these documents to schools. Ongoing communications between the student, family, health care provider, school nurse, and school staff addressing prevention and treatment of allergic reactions allow the development of the most effective care plan for students in their particular school environment.

GENERAL ADVICE FOR REDUCING THE RISK OF ALLERGEN EXPOSURE FOR STUDENTS WITH FOOD ALLERGY

The allergist or health care provider is often called upon to provide advice regarding the best means of allergen avoidance. The following information provides background for providing this advice:

- Allergen avoidance is key to decreasing the risk of food-allergic reactions.¹ This entails reading ingredient labels as well as ensuring that no cross-contact of allergens occur. Strict avoidance is necessary because it is possible for small exposures

to trigger severe reactions. Peanut allergic patients have been shown to react to levels of peanut as low as 100 micrograms by ingestion during double-blinded placebo-controlled food challenges.^{35,36}

- The most effective strategies for minimizing allergen exposures in the school setting have not been systematically studied in large, randomized trials. Data from small studies provide insight regarding which approaches may or may not be helpful. Measures for reducing the risk for accidental food allergen exposure for food-allergic students will differ depending on factors specific to the students with food allergy (ie, age, developmental maturity, nature of the allergy) as well as circumstances particular to the school (ie, available staff and resources).
- Very stringent approaches to preventing food allergen exposure in school (ie, school-wide bans) are sometimes advocated. However, there are no data indicating that restricting allergens in this manner is effective for reducing allergic reactions occurring in the school setting. In addition, such approaches have been criticized for posing significant burdens on students and families who are not affected by food allergy and may be taxing on limited school resources to enforce such policies. In addition, some argue that school-wide allergen restriction policies will provide a false sense of security, potentially leading to less vigilance on the part of students, families, and school staff for preventing exposures and addressing allergic reactions. In some cases, allergen bans or other forms of food allergen restrictions may also become increasingly impractical when multiple foods are targeted.
- It is important to understand the data that are currently available and identify circumstances where more stringent strategies of allergen avoidance may be beneficial, as described below.

Severe reactions generally occur as a result of oral allergen exposure, whereas cutaneous and inhalation exposures are unlikely to trigger severe allergic reactions.

- Severity of allergic reactions is variable and cannot be anticipated based on allergy test results or historical reactions. Serum-specific IgE levels and prick skin test results reflect the likelihood of clinical reactivity to a food, but do not reliably predict the severity of allergic reactions.^{1,31} Furthermore, severity of prior reactions does not prognosticate severity of future reactions.^{1,37}
- Ingestion of the food allergen is the primary route of exposure causing severe allergic reactions and should be the emphasized concern regarding allergen avoidance. Usually this occurs through direct ingestion of the allergen or cross-contaminated food. Use of shared cups/utensils that are contaminated with allergen can trigger reactions. A study detected allergenic protein in saliva hours after ingestion of a peanut butter sandwich.³⁸ Ingestion exposures can occur with products known to contain the food allergen as well as to products that carry allergen advisory labels (eg, “may contain” or “made in a facility that processes”). One study found that some products with advisory labeling had up to 5 mg of peanut per serving.³⁹
- Allergen exposure through skin contact or inhalation is unlikely to trigger severe allergic reactions. In a study of 30 children with peanut allergy, exposure to peanut butter by skin contact and inhalation did not cause any systemic or

respiratory symptoms.⁴⁰ The amount placed on the skin approximated exposure from contact with a poorly cleaned table, and 10 minutes of inhalation exposure was used to simulate the scenario of sitting next to a person eating a peanut butter sandwich. One-third experienced mild cutaneous symptoms at the site of peanut butter contact. None of the subjects had respiratory or systemic reactions during the contact or inhalation challenge. In another study, no systemic reactions occurred in 281 peanut allergic children with a longer and more concentrated skin exposure, with the application of 1 g of peanut butter with occlusive patch for 15 minutes.⁴¹ Air sampling studies have been performed measuring the presence of peanut allergen in various scenarios simulating environmental peanut exposures. Perry et al⁴² measured no airborne peanut allergen in scenarios where participants ate peanut butter sandwiches, shelled and consumed roasted peanuts, and walked on the discarded shells on the floor. Johnson and Barnes⁴³ performed air sampling studies in additional scenarios with shelling raw and roasted peanuts, pouring peanut flour, opening peanut butter jars, opening peanut snack packages, and measured no Ara h 1 or Ara h 2. Another study showed no peanut protein in air samples taken above an open jar of peanut butter, bag of peanut, during peanut consumption, and in homes with high peanut protein levels in house dust; there was detectable peanut protein 330.9 mcg/m³, transiently with deshelling peanuts.⁴⁴ Thus, nonoral exposures are unlikely to trigger severe allergic reactions.

- Johnson and Barnes⁴³ also sampled the air during boiling of raw shelled peanuts and detected no Ara h 1 or Ara h 2. The water samples from soaked raw shelled peanut and boiling peanuts did contain measurable peanut protein. In the specific situation of inhaling actively aerosolized food allergens such as boiling milk or steaming fish, allergic reactions can be triggered.⁴⁵ Therefore, food-allergic students should use caution when participating in cooking or heating known food allergens in class or school activities.
- Hidden allergens may be found in art or science project supplies that can trigger allergic reactions.¹⁸ Examples of craft supplies commonly used by young students that may contain potential food allergens include paste, shaving cream, finger paint, and play dough. Animal feeds can also contain allergens such as nuts and seeds. The mostly highly sensitive food-allergic child may have to refrain from participating in these types of activities or use of materials containing food allergens.
- It is possible for hand-to-mouth contact to introduce food allergen to the oral mucosa. There are no data on the scope of this risk, but this concern has led to suggestions for hand washing and additional supervision of young children.

Food allergens can be effectively removed using conventional cleaning methods.

- Several studies demonstrate the effectiveness of standard cleaning methods in the removal of peanut allergen. Perry et al⁴² found no detectable Ara h 1 from table surfaces cleaned with common household cleaners. In another study, common household cleaners and hospital cleaning wipes completely removed Ara h 1 from laminate table surfaces, plastic toys, and book covers contaminated with 5 mL of peanut butter.⁴⁶ These same investigators found persistence of Ara h 1 on

table surfaces contaminated with 5 mL of peanut butter after 110 days, with 1,951 to 29,089 ng/mL, but cleaning with cleaning wipes was completely effective in removal of Ara h 1.⁴⁷ Brough et al⁴⁴ did find residual peanut protein from peanut butter contaminated wood (1.75 mcg) and laminate (0.47 mcg) table surfaces after cleaning with commercial cleaner, but no peanut protein after cleaning of granite surfaces. Of note, these levels are unlikely to elicit an allergic reaction, as some studies found that oral doses in the range of 1000 mcg are needed to elicit subjective symptoms, whereas doses in the range of 2 to 50 mg are required to trigger objective symptoms.³⁵

- Hand washing using soap and water or commercial wipes effectively removes peanut butter from hands.⁴² After applying peanut butter directly to study participants' hands, washing with water and soap or commercial wipes completely removed Ara h 1. However, cleaning with water alone or antibacterial hand sanitizer left residual amounts of Ara h 1 at relatively high concentration. Therefore, students should be encouraged to use soap and water or commercial wipes to clean food-contaminated hands.

Although the effectiveness of allergen restrictions on reducing rates of allergic reactions in schools is uncertain, restrictions may be considered in specific situations to decrease the likelihood of accidental exposures.

- There are no controlled studies examining whether rates of allergen exposures or allergic reactions are lower in schools that have enacted school-wide allergen restriction policies.
- There is limited evidence suggesting that restrictions do not result in complete elimination of allergen exposures. In a prospective study of 1411 children with peanut allergy (mean age 7.1 years), 17 incidences of peanut exposure (6.4%) occurred in the school setting. The majority of these (n = 12) occurred in schools that prohibited peanuts, whereas 5 exposures occurred in schools that did not restrict peanuts.⁴⁸ In a follow-up study with a larger cohort of children (n = 1,941), this study team found that accidental peanut exposures occurred more often in schools with peanut restrictions than schools allowing peanut (4.9% in schools with peanut restrictions vs 3.0% in schools with no restriction).⁴⁹
- Imposing school-wide peanut restrictions does not eliminate the chance of peanuts being brought into schools. One study randomly inspected student lunches brought from home for food visibly containing peanut or labeled as containing peanut (foods with advisory labels were deemed acceptable).⁵⁰ The purpose of the study was disclosed to families and participating families signed a written consent approximately 3 months before the inspection. Although it is not surprising that 10% of lunches from classes without peanut-free guidelines were found to contain peanut, 5 of 861 (0.6%) lunches from students in classes with peanut-free guidelines were found to contain peanut, indicating that mistakes will happen and enforcing such policies may be difficult.
- Although rates of epinephrine administration are not lower in schools with allergen restriction policies compared with schools allowing peanut, schools with designated peanut-free tables reported fewer epinephrine administrations compared with schools without peanut-free tables.⁵¹ In a survey of schools nurses, 1.5% of schools reported epinephrine administration for peanut or tree nut exposure during 2006-2011.

Schools with school-wide restriction of peanut reported higher rates of epinephrine administration compared with schools without peanut restrictions (incidence rate of epinephrine for peanut or tree nut was 1.1/10,000 students vs 0.2/10,000 students, $P < .05$). However, the rate of epinephrine use was lower in schools with peanut-free tables (0.2/10,000 vs 0.8/10,000, $P < .001$). These results suggest that focused attention may be more effective than widespread bans. Alternatives to banning allergens include designating specific areas as "allergen-safe zones" such as specific tables in a classroom or lunchroom or "food-free zones" such as library or classrooms.⁹

- Young children are at greatest risk for having allergic reactions in the school setting. Among allergic reactions occurring in school, the majority (64%) occurred in young children attending daycare or preschool.¹⁸ Food allergy management is more difficult in young children as they are unable to identify potential allergens, are more likely to have oral exposures (ie, thumb sucking, mouthing toy), and are less capable of verbalizing symptoms of an allergic reaction.⁵² Therefore, young children and students who are intellectually or developmentally challenged/impaired typically require more oversight by school staff and more precautions may be needed to keep these children safe.
- Although concern is often focused on the lunchroom setting, allergen exposures and reactions can occur anywhere during school. Data from a peanut and tree nut registry revealed that the majority of allergic reactions at school occur in the classroom (79%) and the remainder occurred in lunchrooms, during field trips, and on the school playground.¹⁸ Nearly a quarter of reactions happened during activities for a special occasion when a break from routine classroom procedures occurred, such as a birthday celebration. Schools may consider celebrating special events in ways that do not include food to limit the possibility of accidental exposures.
- In situations where there may be limited adult oversight of students or difficulties in rapid adult response (ie, school bus where the only adult is the driver), it may be prudent to have policies restricting eating/allergens to reduce the likelihood of allergen exposures and reactions.
- The CDC recommends that schools develop and implement a comprehensive plan for managing food allergy.⁹ This includes training on food allergy for all school staff that covers strategies for reducing and preventing exposures to allergens. In addition, focused training is advised for staff who have frequent contact with food-allergic students. This training may include reading ingredient labels to identify food allergens and effective strategies for allergen removal. Education of school staff, in combination with thoughtful approaches for food allergen containment, is an important part of promoting a safe learning environment for students with food allergy.

Summary

The allergist or health care provider can provide education regarding allergen avoidance for children in schools, which may be tailored to age, developmental level, and other factors. Allergic reactions are unpredictable, and severe reactions primarily occur with ingestion exposure. Therefore, health care providers and schools should focus on strategies for minimizing the chance of oral allergen exposures. Food allergens are effectively removed from school surfaces with common household cleaners. Students should be encouraged to use soap and water or commercial wipes

to clean allergen-contaminated hands. There are insufficient data supporting the efficacy of school-wide allergen restrictions on reducing the risk of allergic reactions. However, allergen-safe areas with increased supervision within schools may be beneficial in certain situations to decrease the likelihood of allergic reactions.

ADDRESSING EMERGENCY MANAGEMENT IN THE SCHOOL SETTING

The allergist or health care provider is a source of information regarding appropriate recognition and management of allergic reactions and anaphylaxis, and should ensure that medications are prescribed for use in the school setting.

- Severe reactions, including fatalities, are possible in the school setting.⁵³⁻⁵⁵ The main factor associated with these unfortunate outcomes has been the delayed use of epinephrine. Comorbid asthma is also an important risk factor associated with poor outcomes.

School staff should be trained and prepared to quickly respond in case of an allergic reaction.

- Allergic reactions can occur anywhere during school, including the classroom, lunchroom, playground area as well as during field trips and while traveling to and from school.¹⁷⁻¹⁹ Often, the first adult to become aware of a reaction is the teacher.¹⁸ Epinephrine is underutilized in cases of anaphylaxis as a survey of schools participating in the EpiPen4Schools program found that 24% of anaphylactic reactions in schools were not treated with epinephrine.²⁰ Therefore, to ensure optimal outcomes, it is important to always have personnel trained to recognize signs and symptoms of allergic reactions, including anaphylaxis, so that appropriate treatment can be quickly initiated. Many states allow school nurses to train designated surrogates in the treatment of anaphylaxis and epinephrine administration techniques.
- A National Association of School Nurses position statement recommends a nurse to student ratio of 1:750 in the healthy student population.⁵⁶ However, less than half of the schools in the United States have a full-time registered nurse. There is significant variability in access to school nurses across the country; most states do not have mandates for school nurses or for the number of nurses per students.⁵⁷
- The CDC recommends that the school nurse train all staff to recognize anaphylaxis and initiate the emergency protocol. However, there is significant variability in numbers and types of trained staff across the country.⁵⁸ States and school districts often develop their own training processes tailored to the specific policies and guidelines to which they must adhere. There are educational resources that have been developed by national/lay organizations that are available to schools.
- School staff training can lead to improvements in confidence and attitudes^{20,59} as well as positive outcomes in reducing the number of reactions occurring in school and increased number of students providing EAIs to schools.⁶⁰
- Training should be conducted annually and should be reviewed after an allergic reaction to evaluate the response to identify areas for improvement.⁹

Emergency medications should be readily accessible to allow prompt treatment of anaphylaxis.

- Epinephrine is the treatment of choice for anaphylaxis.³⁴ Physicians should provide prescriptions for EAIs for use at school as well as outside of school and ensure that students and their families understand the importance of providing the school with accurate, up to date medical information.
- Up to 25% of students experiencing anaphylaxis while at school were unaware of their risk as this was their first allergic reaction.^{18-20,61,62} Therefore, schools need to have unassigned emergency medications available in case students such as these have severe first allergic reactions while at school. This is supported by the 2013 SAEAA that provides incentives to states that mandate stocking of nonstudent-specific epinephrine in schools.
- In some cases, parents of students known to be at risk for anaphylaxis do not provide the school with emergency medications.³³ Health care providers should ensure that families have prescriptions for EAI and counsel parents that providing student-specific EAI to school is advisable as not all schools have unassigned epinephrine available.
- Prompt treatment with epinephrine improves anaphylaxis outcomes, including decreasing the likelihood of requiring multiple doses of epinephrine or hospitalization.^{63,64} Therefore, EAIs should be stored in secure locations that are easily accessible within minutes.³⁴ Large campuses may need EAIs stored in multiple locations as reactions can happen anywhere on school grounds.¹⁸
- EAIs are available in 2 dosing options; 0.15 mg is indicated for those 25 kg (55 lbs) or under and 0.3 mg should be used for those over 25 kg to ensure that those approaching 30 kg (66 lbs) are not underdosed.¹¹ Schools should identify staff responsible for reviewing expiration dates and have a process in place for replacing outdated medications.⁹
- After epinephrine administration, EMS should be activated and the student should be transported to the nearest emergency department by ambulance for further evaluation.^{1,11,34} The school should also contact the parents to inform them of the allergy emergency, but staff must not wait to speak to the parents or their arrival before initiating treatment and activating EMS.⁹
- In some cases, more than one dose of epinephrine may be needed to adequately treat severe symptoms.²⁰ Biphasic reactions are also possible and can develop before arrival of EMS. Therefore, having multiple EAIs available is advisable. A second dose of epinephrine may be used in 5 to 15 minutes if no significant improvement in symptoms is seen.³⁴
- Transferring of responsibility for self-carrying of emergency medication and self-treatment should be discussed with students as they mature and become adolescents and teenagers. This generally coincides with their increased self-awareness and growing independence. Most pediatric allergists expect students to be able to recognize symptoms of anaphylaxis and demonstrate the steps for using the EAI, practicing with a trainer by 9 to 11 years of age, and take responsibility to self-carry and self-inject by 12 to 14 years of age.⁶⁵ The decision to self-carry and self-treat should be discussed in conjunction with the student and family as well as the school and may depend on student-specific factors (ie, readiness, competence) and school-specific factors (ie, size of the school, availability of trained staff). This decision should be re-assessed periodically and self-management skills should be reinforced.⁹ Trained school staff should still be ultimately responsible for treatment

TABLE II. How allergists and health care providers can help regarding social and emotional support

- Open the discussion with patients⁶⁶
- Ask about bullying at all visits⁶⁷
- Encourage parents to ask questions about bullying
- Encourage the student to inform the parent or school if there is a problem
- Encourage parents to approach the school if a problem exists
- Provide educational resources to the school focusing on the challenges faced by food-allergic students, the serious nature of allergies, and bullying frequency⁶⁸
- Raise awareness in school and the community⁶⁹
- Encourage students to take responsibility for self-care (allergen avoidance, carrying medications, etc.) according to age, physical and emotional readiness, and developmental stage. Encourage timely, respectful communication and realistic requests for the school environment
- Discuss that severe reactions generally occur as a result of oral allergen exposure whereas casual exposures by touch or smell are unlikely to trigger severe allergic reactions
- Perform food challenges when appropriate to avoid unnecessary food restrictions
- Refer to a mental health professional if distress or anxiety seems excessive

and have EAI's available because in acute reaction situations, the student may not be able to or may be unwilling to self-administer medication or may not have medication available.⁹

- Access to emergency medications is also advisable in the event that allergic reactions occur off school grounds, including on school buses and school-sponsored off-campus activities such as field trips and sports events.

Summary

The allergist may participate, through advocacy, education, or consultation, in ensuring that the school and student are appropriately prepared to recognize and treat anaphylaxis. School staff should obtain training to ensure rapid responses and initiation of treatment for allergic reactions. Rapid response with administration of epinephrine for anaphylaxis emergencies can be life-saving. Therefore, prompt availability of epinephrine is critical. Older students who have the competence and maturity to take responsibility for self-managing and self-treating should be supported, but it is still advisable for trained staff to be equipped to intervene if needed.

ADVICE ON SOCIAL AND EMOTIONAL ASPECTS AT SCHOOL

It may be beneficial for allergists and health care providers to discuss the social and emotional aspects of managing food allergy with their patients and families and provide support as needed to school personnel in managing this aspect of care (Table II).

- In a study of caregivers of children with food allergy, 10% of caregivers did not send their children to school because of their food allergy.⁷⁰
- Peanut-allergic children have been found to have lower quality of life in school than their same gender siblings.⁷¹
- In a survey study, food-related bullying was reported by 31.5% of children with food allergy and by 24.7% of their

TABLE III. Selected resources on bullying

- www.cdc.gov/Features/prevent-bullying/index.html
- www.stopbullying.gov
- www.healthychildren.org/English/safety-prevention/at-play/Pages/Bullying-Its-Not-Ok.aspx
- www.upstand.org
- www.foodallergy.org/its-not-a-joke

parents. The bullying occurred in school for 60%. The more frequent the bullying, the greater the anxiety and the worse quality of life experienced by the child. When parents were aware of the bullying, the children reported better quality of life, but the parents experienced more distress.⁷²

- Lieberman et al⁷³ reported 80% experienced bullying by classmates and 21% from teachers or staff. Teasing was the most common verbal act (64.7%) and having the allergen placed in front of their face was the most common physical act (43.5%). The majority (78.8%) felt that the maltreatment was solely due to the food allergy.
- A study of Italian students with food allergy found that the rate of bullying experienced was double that of their nonallergic peers.⁷⁴ Teachers underestimate the psychosocial challenges of children with food allergy.⁷⁵ Only 50% of the teachers were aware that students with food allergy were at a greater risk of bullying.⁷⁶ Interventions suggested by survey respondents included food allergy education and training focused on the risks and burdens that food-allergic students face (43%), food allergy awareness campaigns promoting cooperation and acceptance (20%), and actions targeting those doing the bullying (8%).
- A longitudinal study of children with food allergy found that bullying was an ongoing issue for many. Parental intervention was associated with remission and improved quality of life.⁶⁷
- Educational programs on peer victimization, frequent assessments regarding bullying, modeling appropriate behavior, and encouraging activities that enhance self-esteem can be helpful in reducing bullying. Children should be encouraged to report bullying and taught how to protect themselves from bullying through communication and removing themselves from the environment (Table III).

Summary

Social and emotional aspects of food allergy should be assessed periodically. Efforts to maximize health-related quality of life and safety of food-allergic patients should be a priority and included in discussions between health care providers, families, and school staff. Allergists can help in many ways, including opening the discussion with patients and their families, providing education, and raising awareness of this issue. Allergists can encourage schools to use food allergy educational programs that focus on bullying that are age appropriate. The CDC recommends having policies that address the social and emotional aspects of dealing with food allergy in school and have bullying prevention policies.⁹

SUMMARY AND CONCLUSIONS

The management of children with food allergy in schools is based on the successful implementation of proactive plans for food allergen avoidance, preparedness with emergency plans, and

ready access to epinephrine. The role of the allergist/health care provider is to assist families and schools with formulating these individualized school plans based on knowledge of the child's medical history and annually updated evaluations. The allergist/health care provider ensures that these recommendations are scientific and based on current evidence, with emphasis on the preponderance of evidence that anaphylaxis results from ingestion and not skin or inhalation exposures, and that routine cleaning of hands and surfaces is highly effective in allergen removal. The ongoing care by the allergist/health care provider includes regularly reviewing the clinical history including any quality of life issues such as bullying, updating diagnostic testing, prescribing and training on epinephrine autoinjectors, reviewing emergency plans, and addressing family education with current scientific information. The allergist/health care provider can also be an important resource through advocacy, and by assisting schools and communities in the formulation of policies that are scientific and evidence based. Successful fulfillment of these key roles by the allergist/health care provider will give the food-allergic student the best opportunity for a healthy and fulfilling educational experience.

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