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Abstract

School nurses play a key role in managing students with food allergies. It is becoming more common to encounter students with severe allergies to multiple foods, putting them at risk for anaphylaxis. It is essential that the school nurse have a clear understanding of food allergies and how to effectively manage students in the school setting. Effective communication between families, health care providers, faculty, staff, and students, is of utmost importance when developing a plan of care to ensure the safety of the student with food allergies. Using an interdisciplinary approach to case management, the school nurse can develop comprehensive individualized health care plans for all students with food allergies.

Keywords

food allergies, anaphylaxis, school nurse, school management

Case Study

Five-year-old Alison registered for kindergarten the spring before she began school. Her parents expressed their anxiety about sending their daughter to school with her history of severe allergies to multiple foods and had many questions regarding the management of students with food allergies in the school setting. Alison's food allergies were first presented during infancy. Her mother described an incident where she had given her some uncooked pasta to play with while she prepared dinner. She soon observed that Alison's forearms were covered with hives from where her skin had come into contact with the dried pasta. Alison's pediatrician advised that she be evaluated for other food allergies and Radioallergosorbent testing (RAST) confirmed the diagnosis of allergies to wheat, dairy, eggs, peanuts, tree nuts, beef, blueberries, cranberries, and shellfish. Simply going to the grocery store presents a challenge for Alison; her mother reported that when they walk down the bread aisle, Alison's eyes begin to water. Upon entry into kindergarten, Alison was also diagnosed with asthma, putting her at increased risk for anaphylaxis from contact with or ingestion of the identified foods.

Introduction

A food allergy is an abnormal immune response to specific antigens and is differentiated from food intolerance by its definition as an Immunoglobulin E (IgE)-mediated response to an allergen, usually a food protein. Immunoglobulins or antibody proteins are present in plasma and subsequently classified according to their specific function with regard

to immunity. IgE is one of the five subclasses of immunoglobulins and is responsible for allergic symptoms during a reaction by binding to mast cells in tissues and basophils in the blood. Basophils comprise 1% of circulating white blood cells and are essential to the immune response to inflammation by releasing cell mediators such as histamine, prostaglandins, and leukotrienes into the bloodstream. Mast cells are concentrated in connective tissue beneath the skin and the mucous membranes of the respiratory and digestive tracts and store histamine, prostaglandins, and leukotrienes within densely packed granules within the cytoplasm (Fox, 2010). In people with food allergies, specific antigens trigger the rapid release of cell mediators inducing a range of reactions affecting different areas of the body (Pilette, 2008). The RAST test is used to determine the amount of specific IgE antibodies present in the blood of a person with true food allergies (National Institute of Health, 2010). Conditions such as lactose intolerance and celiac disease differ from true food allergies due to the lack of immune system involvement. It is estimated that approximately 5.2% of children in the United States have food allergies and while a cure for food allergies does not exist, reactions can be prevented by strict avoidance of offending foods (Center for Disease Control and Prevention, 2009). Although any food can cause

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an allergic reaction, eight foods are responsible for 90% of allergic reactions: milk, soy, eggs, wheat, peanuts, tree nuts, fish, and shellfish (Branum & Lukacs, 2008). How long a child may have a food allergy is dependent upon the allergen in question. Children will outgrow milk and wheat allergies in 64% of cases by age 12 while the percentage is lower for egg allergies at 37% by age 10. Individuals with peanut and tree nut allergies have the lowest chance of developing tolerance at 20% and 9%, respectively (Jarvinen, 2005).

The appearance of signs and symptoms related to food-induced anaphylaxis can vary between a few minutes to several hours after exposure to the allergen. Most reactions occur within 1 hr of exposure to the allergen; however, reactions can also occur within 8–72 hrs after initial exposure. The release of histamine from mast cells leads to cardiovascular symptoms such as vasodilation and increased vascular permeability, while bronchoconstriction results from the secretion of leukotrienes and prostaglandin D₂ (Peavy & Metcalfe, 2008). Skin and respiratory symptoms are observed in about 80% of cases; skin presentations include urticaria, angioedema, pruritis, rash, and flushing; while respiratory symptoms include coughing, difficulty in breathing and wheezing. Gastrointestinal symptoms can present as nausea, vomiting, abdominal cramping, and diarrhea, in addition, cardiovascular signs include tachycardia, arrhythmia, syncope, and chest pain with hemodynamic collapse leading to hypotension and shock occurring in as little as 10 min due to increased vascular permeability (Lieberman et al., 2005). Neurological symptoms can present as anxiety, headache, seizure, altered levels of consciousness, or a sense that something bad is going to happen. Other clinical presentations include urinary or fecal incontinence and diaphoresis. Symptoms and severity of allergic reactions vary between individuals and can be dependent upon the amount of exposure or ingestion. Additionally, asthmatics are at increased risk for severe food anaphylaxis (Jarvinen, 2005). Iribarren, Tolstikh, Miller, and Eisner (2010) found the risk of anaphylactic shock to be more than five times greater among those with a diagnosis of asthma. Pumphrey (2004) identified asthma as a major risk factor in food-related anaphylaxis implicating the overuse of rescue inhaler medications as a possible cause of epinephrine resistance. In some children, ingestion of even small amounts of specific foods can cause serious consequences and possibly death (Hadley, 2006).

Management and Guidelines for School Nurse Practice

It is imperative that all children with food allergies have an individualized health plan that includes a written emergency plan (Food Allergy and Anaphylaxis Network, 2010). This action is endorsed by the American Academy of Pediatrics which recommends the Food Allergy Action Plan developed

by the Food Allergy and Anaphylaxis Network (Appendix A). It is the responsibility of the school nurse to develop such plans as supported by the National Association of School Nurses (2001) Emergency Care Plan (ECP) Position Statement released in 2004, addressing children with special health care needs, whereas it is the responsibility of the health care provider to prescribe the specific treatment supported by the American College of Allergy, Asthma, and Immunology (Powers, Bergren, & Finnegan, 2007). In Alison's case, her physician was given a copy of the Food Allergy Action Plan and orders for epinephrine only were obtained as this is the first-line drug of choice in the treatment of anaphylaxis. Antihistamines were not ordered as the physician did not want any delay in appropriately treating anaphylaxis. The American Academy of Allergy, Asthma and Immunology's (AAAAI, 2002) Position Statement addressed the use of epinephrine in the treatment of anaphylaxis.

Epinephrine has long been regarded as the treatment of choice for acute anaphylaxis. This is true despite the recognition of its potential hazards. Alternative treatments—such as antihistamines, sublingual isoproterenol, inhaled epinephrine, and corticosteroids without epinephrine have failed to prevent or relieve severe anaphylactic reactions. It is therefore inappropriate to use them for the first-line treatment or prevention of anaphylaxis (AAAAI, 2002).

The dosage of epinephrine is based on the child's weight and typically an autoinjector is prescribed. Children with a weight between 10–25 kg or 22–55 pounds are prescribed 0.15 mg and for those weighing above 25 kg or 55 pounds, the dose is increased to 0.30 mg. Drug therapies such as antihistamines may help alleviate skin symptoms and are usually only given to prevent a later phase reaction, however, research does not support this at present (Jarvinen, 2005).

It is the responsibility of school nurses to be aware of federal laws that apply to K-12 students. The previous restrictive interpretations of Section 504 of the Rehabilitation Act of 1973 and its civil rights statute, the American with Disabilities Act (ADA) were addressed by the U.S. Congress and “in September, 2008, the President signed the ADA Amendment in direct response to the constrictive judicial interpretations” (Zirkel, 2009, p. 259). Section 504 definition of disability addresses three elements: A mental or physical impairment, a substantial limitation of one or more major life activities and activities qualifying as a major life activity. The 2008 expansion of Section 504 now extends the list of major life activities to include various major bodily functions such as “the operation of the immune system, normal cell growth, digestive, bowel, bladder, neurological, brain, respiratory, circulatory, endocrine and reproductive functions” (p. 259). Additionally, the ADA Amendment requires “the measurement of substantial limitations for impairment that are episodic, such as anaphylactic shock” (p. 259.) As school nurses have the ability to review medical

information and to seek clarification when needed, they should be a part of the 504 team. The school nurse can assist other team members in understanding the medical implications of impairment.

In the case with Alison, she has a physical impairment in that her immune system reacts to specific foods in the form of an allergic reaction. The major life activity impaired is breathing. As previously mentioned, Alison's eyes begin to tear when walking down the bread aisle in the grocery store. Eating during the school day is a major life activity. Since Alison's RAST testing indicated very high amounts of IgE antibodies in her blood to multiple foods, her physician strongly recommended Alison not to eat in the cafeteria. The team concluded that the nature and severity of Alison's food allergies put her at high risk for anaphylaxis and therefore qualified for a service agreement.

Development of Individual Health Plan (IHP)

A multidisciplinary meeting was held prior to the start of school to ensure that everyone who may have contact with Alison would be knowledgeable about her plan of care as well as the ECP. "Effective management of food allergy requires a team approach that includes the child and parents/family in cooperation with the child's health care provider and school nurse" (Carlisle et al., 2010, p. 361). The development of an individualized plan is necessary as every child with a food allergy will react differently (Weiss, Munoz-Furlong, Furlong, & Arbit, 2004). Using information provided by Alison's parents and her physician, an IHP was developed to facilitate appropriate management of food allergies in the school setting (Table 1). It is important to note that contact with nonfood items is addressed in the IHP. Anaphylactic reactions can be caused by contact with allergenic components and should be avoided (Behrmann, 2010). Additionally, Alison's parents shall be invited to accompany her on school trips, in addition to the assigned chaperone. In the absence of accompanying parents, staff members trained in the use of epinephrine shall be assigned.

The school nurse is responsible for planning and organizing the multidisciplinary meeting to facilitate classroom management, and with input from Alison's parents, health care provider, school nurse, teachers, and building administrators, the guidelines can be reevaluated prior to the start of every school year. In order to communicate with Alison's health care provider should the need arise, an authorization for release of confidential information is also obtained from Alison's parents during this time. After the final health care plan is drafted, it is the responsibility of the school nurse to disseminate the information to all faculty, staff, and any other individuals who may have contact with Alison during the subsequent school year.

Emergency Training for Faculty and Staff

School nurses frequently have case loads in multiple buildings and must rely on licensed practical nurses, unlicensed assistive personnel, and teachers to assist in providing care to students. Despite the need for delegating care, the school nurse should be recognized as the expert in health information, care planning, and the leader in training all staff, licensed and unlicensed (Cavanaugh & Strickland, 2011). According to Powers, Bergren, and Finnegan (2007), school nurses are responsible for training school staff how to recognize and manage a food allergy emergency. Using the information from the Food Allergy and Anaphylaxis network, faculty and staff should be given training at the beginning of every school year. The objectives of faculty and staff training should focus on the following:

- What you should know about food allergy?
- What you should know about anaphylaxis?
- Treatment of anaphylaxis, preparedness, and prevention

In Alison's case, the school nurse provides in-service training to all school personnel prior to the start of the school year. During this time, faculty and staff members have the opportunity to ask questions pertaining to food allergies and anaphylaxis. It is important for faculty and staff to know that young children will describe allergic symptoms differently compared to an older child, adolescent or adult. Table 2 describes how a child might describe a reaction (The Food Allergy and Anaphylaxis Network, 2011). Additionally, changes in voice such as becoming hoarse or squeaky and the slurring of words could indicate tongue swelling. When faculty and staff fail to recognize the signs of a reaction, time is wasted in treating a child. It is also important for fellow students to have an understanding of food allergies and the importance of following school policies to protect allergic students. In this case, the video *Alexander the Elephant Who Couldn't Eat Peanuts* was used in the classroom to educate Alison's classmates about food allergies (Food Allergy and Anaphylaxis Network, 2008). It also made Alison feel as if she was not the only child to have food allergies. Staff members should also be given the chance to practice administration of epinephrine with a demonstrator device. Faculty and staff need to be informed of where emergency epinephrine will be stored. In Alison's case, one dose of epinephrine (Epi-Pen) was stored in the classroom and another in the health room; neither was locked so that easy access was not hampered. It is necessary to review the procedure for calling 911 emergency services in the event of an anaphylactic reaction including communication to the rescue squad of the need for advanced life support and epinephrine. Staff members should be taught to save the used Epi-Pen to give to the emergency medical staff to take to the hospital. School wide communication can be facilitated by typing the emergency instructions and posting them in the health room as well as the school's main office. Above all, reinforce to faculty and staff the need to follow the

Table 1. Individualized Health Plan for Alison

Assessment Data	Nursing Diagnosis	Goal	Nursing Intervention	Expected Outcome
Alison has severe food allergies	Risk for ineffective breathing related to bronchospasm and inflammation of airway	Alison will have an IHP and ECP in place to include student, staff, transportation, and parental roles in preventing and managing an anaphylactic reaction	Educate staff on early signs of potential anaphylactic reaction and appropriate steps for treatment. Prevention measures include: Label classroom "Food Allergy Aware: Hand washing to all students upon entering classroom and immediately after eating. Discourage eating in the classroom"	School staff is informed of potential for an anaphylactic reaction, the signs of a reaction and what to do if a reaction occurs. Alison will wear a medical alert bracelet at all times
Physician order for epinephrine (Epi-Pen) at school	Risk of impaired gas exchange related to bronchospasm and inflammation of airway. Risk of impaired circulation related to vascular collapse and shock	One Epi-Pen in classroom and one in unlocked storage in health room	Train willing staff members on Epi-Pen administration	Students and staff will identify allergic reactions and treat immediately
Alison is able to recognize allergic foods but unable to comprehend food labels due to her age. Alison is unable to recognize allergens in other nonfood materials	Knowledge deficit re: foods that contains allergens. Knowledge deficit re: non-food materials that could potentially cause a reaction	Alison will increase knowledge about allergic foods and non-food materials. Parent will provide all food to consumed by the student. Material Safety Data Sheets will be used to list ingredients in all non-food materials	Training for staff regarding anaphylaxis prevention and treatment. Request classroom teacher to alert room parents about food allergy and need for alternative party treats	Alison will increase knowledge of foods that contain allergic ingredients and will avoid these foods. Staff will check with school nurse and parents about ingredients in foods and non-food materials. Alison will describe symptoms of an allergic reaction
Alison fearful of reaction at school	Risk for altered health maintenance and feelings of powerlessness regarding uncertainty of allergic reaction at school	Alison will have an IHP and ECP and will participate in school activities with minimal disruptions	Monitor and continue to educate regarding foods containing allergens and need for alternative food choices. Assist Alison to identify school personnel that can assist her if an anaphylactic episode occurs	Alison will identify school personnel responsible for helping carry out IHP and ECP. Alison will participate in all school activities with modifications as needed

Note. ECP = emergency care plan; IHP = individual health plan.

emergency plan of action exactly as written. Reinforce statistical evidence that "among children with a known food allergy, 16-18 percent developed a reaction at school" (Jarvinen, 2005, p. 257). Share case studies described by the Food and Allergy Anaphylaxis Network to learn how to avoid errors in judgment and the treatment of allergic reactions. Cases have been cited where although epinephrine was prescribed and readily available, it was not administered in a timely fashion, thereby putting a child at increased risk (Food Allergy and Anaphylaxis Network, 2010). Educate all parents about the dangers of innocently coercing a child into accepting food which could easily occur in the classroom or on a field trip. Despite the best planning, mistakes can be made and all need to be prepared for an

emergency situation (Food Allergy and Anaphylaxis Network, 2011).

Conclusion

Students with food allergies come into the school setting with different backgrounds and needs. As food allergies are becoming a common occurrence, school nurses are faced with the challenge of providing a safe educational setting for children. Many nurses have had experience in managing a student with allergies to only one or two foods but may not have dealt with a child with multiple allergies. The student with multiple, severe food allergies can attend school

Table 2. How a Child Might Describe an Allergic Reaction?

- "This food is too spicy"
- My tongue is hot (or burning)
- "It feels like something's poking my tongue"
- "My tongue (or mouth) is tingling (or burning)"
- "My tongue (or mouth) itches"
- "It (my tongue) feels like there is hair on it"
- "My mouth feels funny"
- "There's something stuck in my throat"
- "My tongue feels full (or heavy)"
- "My lips feel tight"
- "It feels like there are bugs in there (to describe itchy ears)"
- "It (my throat) feels thick"
- "It feels like a bump is on the back of my tongue (throat)"

Source. Adapted from Food Allergy and Anaphylaxis Network, 2011.

safely with proper planning beginning with effective communication with parents and health care providers. Using best practice guidelines, school nurses can effectively educate faculty, staff, and students about food allergies with the ultimate goal of preventing accidental exposure to or ingestion of allergic foods. In Alison's case, a multidisciplinary meeting is conducted at the beginning of every year to ensure that her individualized health plan is followed. Emergency protocols and procedures are also reviewed with all faculty and staff at this time. Alison's physician continues to monitor the severity of the allergies utilizing periodic RAST testing with the hope of allowing her to eat lunch in the cafeteria with her peers. When that time comes, her plan will be reevaluated so that the school can safely accommodate her needs. Alison has been able to participate in all school activities, other than eating lunch, due to careful planning and cooperation from all parties involved. As she matures, she will be able to accept more responsibility for managing her food allergies and will most likely not require a 504 service agreement. Alison's parents have expressed their gratitude to the school district for ensuring her safety as she is now entering third grade.

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Bios

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Appendix A

Food Allergy Action Plan

Name: _____ D.O.B.: ____ / ____ / ____

Allergy to: _____

Weight: _____ lbs. Asthma: ☐ Yes (higher risk for a severe reaction) ☐ NoPlace
Student's
Picture
Here

Extremely reactive to the following foods: _____

THEREFORE:

- ☐ If checked, give epinephrine immediately for ANY symptoms if the allergen was *likely* eaten.
- ☐ If checked, give epinephrine immediately if the allergen was *definitely* eaten, even if no symptoms are noted.

Any SEVERE SYMPTOMS after suspected or known ingestion:**One or more** of the following:

LUNG: Short of breath, wheeze, repetitive cough

HEART: Pale, blue, faint, weak pulse, dizzy, confused

THROAT: Tight, hoarse, trouble breathing/swallowing

MOUTH: Obstructive swelling (tongue and/or lips)

SKIN: Many hives over body

Or combination of symptoms from different body areas:

SKIN: Hives, itchy rashes, swelling (e.g., eyes, lips)

GUT: Vomiting, crampy pain

**1. INJECT EPINEPHRINE IMMEDIATELY**

2. Call 911
3. Begin monitoring (see box below)
4. Give additional medications:*
-Antihistamine
-Inhaler (bronchodilator) if asthma

*Antihistamines & inhalers/bronchodilators are not to be depended upon to treat a severe reaction (anaphylaxis). USE EPINEPHRINE.

MILD SYMPTOMS ONLY:

MOUTH: Itchy mouth

SKIN: A few hives around mouth/face, mild itch

GUT: Mild nausea/discomfort

**1. GIVE ANTIHISTAMINE**

2. Stay with student; alert healthcare professionals and parent
3. If symptoms progress (see above), USE EPINEPHRINE
4. Begin monitoring (see box below)

Medications/Doses

Epinephrine (brand and dose): _____

Antihistamine (brand and dose): _____

Other (e.g., inhaler-bronchodilator if asthmatic): _____

Monitoring

Stay with student; alert healthcare professionals and parent. Tell rescue squad epinephrine was given; request an ambulance with epinephrine. Note time when epinephrine was administered. A second dose of epinephrine can be given 5 minutes or more after the first if symptoms persist or recur. For a severe reaction, consider keeping student lying on back with legs raised. Treat student even if parents cannot be reached. See back/attached for auto-injection technique.

Parent/Guardian Signature _____

Date _____

Physician/Healthcare Provider Signature _____

Date _____

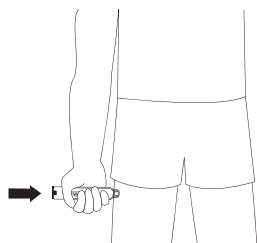
TURN FORM OVERForm provided courtesy of FAAN (www.foodallergy.org) 7/2010

EPIPEN Auto-Injector and EPIPEN Jr Auto-Injector Directions

- First, remove the EPIPEN Auto-Injector from the plastic carrying case
- Pull off the blue safety release cap



- Hold orange tip near outer thigh (always apply to thigh)



- Swing and firmly push orange tip against outer thigh. Hold on thigh for approximately 10 seconds. Remove the EPIPEN Auto-Injector and massage the area for 10 more seconds



DEY™ and the Dey logo, EpiPen®, EpiPen 2-Pak®, and EpiPen Jr 2-Pak™ are registered trademarks of Dey Pharma, L.P.

Twinject® 0.3 mg and Twinject® 0.15 mg Directions



Remove caps labeled "1" and "2."

Place rounded tip against outer thigh, press down hard until needle penetrates. Hold for 10 seconds, then remove.



SECOND DOSE ADMINISTRATION:
If symptoms don't improve after 10 minutes, administer second dose:

Unscrew rounded tip. Pull syringe from barrel by holding blue collar at needle base.



Slide yellow collar off plunger.

Put needle into thigh through skin, push plunger down all the way, and remove.



Adrenaclick™ 0.3 mg and Adrenaclick™ 0.15 mg Directions



Remove **GREY** caps labeled "1" and "2."



Place **RED** rounded tip against outer thigh, press down hard until needle penetrates. Hold for 10 seconds, then remove.

A food allergy response kit should contain at least two doses of epinephrine, other medications as noted by the student's physician, and a copy of this Food Allergy Action Plan.

A kit must accompany the student if he/she is off school grounds (i.e., field trip).

Contacts

Call 911 (Rescue squad: () -) Doctor: _____

Parent/Guardian: _____

Phone: () - _____

Phone: () - _____

Other Emergency Contacts

Name/Relationship: _____

Name/Relationship: _____

Phone: () - _____

Phone: () - _____

Form provided courtesy of FAAN (www.foodallergy.org) 7/2010