
Recognition, evaluation, and treatment of anaphylaxis in the child care setting

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Background: Anaphylaxis can occur anywhere. Many young children with a history of allergic reactions or anaphylaxis spend considerable time in child care centers. However, little is known about the centers' knowledge of, experience with, and capability to manage anaphylaxis.

Objective: To evaluate the ability of child care centers to recognize, evaluate, and treat anaphylactic episodes in children aged 1 to 6 years.

Methods: Eighty-five child care centers in the suburbs of Chicago were randomly selected. They were contacted by telephone and asked to participate in a study by completing an initial questionnaire. Center directors and teachers were then offered an allergy seminar addressing anaphylaxis avoidance, recognition, evaluation, and treatment. Center directors completed a questionnaire after the seminar.

Results: Forty-four of the 85 centers contacted agreed to participate. Forty-two surveys were completed before the seminar and 39 after the seminar. On average, each center has up to 7 children with an identifiable food allergy. Information provided by the parents was the most commonly reported source of education concerning allergies. Before seminar completion, only 24% of child care centers would administer intramuscular epinephrine for a severe allergic reaction. After the seminar, 77% of centers stated that they would administer intramuscular epinephrine ($P < .001$). Also, center staff significantly improved their knowledge of typical allergy symptoms and of the correct method of intramuscular epinephrine administration.

Conclusions: There is a need for greater anaphylaxis education among child care providers. Our intervention significantly increased the ability of child care staff to recognize, evaluate, and treat anaphylaxis.

Ann Allergy Asthma Immunol. 2005;94:55–59.

INTRODUCTION

Anaphylaxis is a collection of symptoms that affects multiple systems in the body.¹ It is estimated that there are 10.5 episodes of anaphylaxis per 100,000 person-years in children. The most frequent cause of anaphylactic episodes is food.² One study³ in Australia estimated that the prevalence of anaphylaxis was 0.6% among children attending preschool. Again, food was the most common culprit.³ Most children who are allergic to food have their first reaction between 14 and 24 months of age, generally at the time of their first exposure.^{4–7}

More than 50% of mothers whose youngest children are younger than 6 years are in the workforce. It is thought that most children spend nearly half of their waking hours with their teacher and school personnel, yet most educators have had little training about the needs of children with medical conditions in the classroom.^{8,9} Data suggest that schools are

not sufficiently well informed about food allergies or anaphylaxis and its treatments. Also, the policies and attitudes regarding food allergy and anaphylaxis are highly variable.^{10,11} The purpose of this study was to evaluate the ability of various child care centers to recognize, evaluate, and treat anaphylactic episodes in children aged 1 to 6 years in the suburbs of Chicago.

METHODS

Independent child care centers caring for infants aged 6 months to 6 years were contacted by telephone. Centers that were interested in participating were mailed or faxed a 36-item questionnaire to be filled out by the center director. The questionnaire evaluated 4 primary areas of concern: allergic reaction avoidance measures, recognition, evaluation, and treatment strategies. Centers caring for children younger than 1 year only and home child care providers were excluded. Questions addressed demographic information about the center, including the training of individuals who treat children with allergies and the number of children known to have asthma or food, medication, or insect venom allergies. Directors were also asked from whom they received their allergic reaction education and where medications were stored. Respondents were asked about action plans for severe allergic reactions, steps for intramuscular epinephrine (EpiPen; Dey Laboratories, Napa, CA) use, and recognition of symptoms of severe allergic reactions in a true/false and fill-in-the-blanks format. When the initial survey response was incomplete or

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Financial support was received from a research grant from the American College of Allergy, Asthma and Immunology.

Received for publication June 21, 2004.

Accepted for publication in revised form August 18, 2004.

unclear, the director of the center was contacted by telephone or in person and the response was clarified.

After completion of the questionnaire, individual anaphylaxis seminars were given to each of the center directors and teachers by the principal investigator (P.J.B.) based on the position statement of the American Academy of Allergy, Asthma, and Immunology regarding anaphylaxis in child care settings⁵ and the Food Allergy and Anaphylaxis Network's Child Care and Preschool Guide to Managing Food Allergy. The seminar consisted of a presentation on anaphylaxis, an EpiPen trainer demonstration using trainer devices, and a question and answer session. Handouts from the Food Allergy and Anaphylaxis Network on how to read a food label and forms for centers to give to parents who fail to identify action plans for their child with moderate or severe allergies were provided. After the seminar, center directors were given a posttest that included some of the questions from the original questionnaire to compare changes in their knowledge and management skills.

Eighty-five child care centers in the suburbs of Chicago were randomly selected from the Yahoo! yellow pages and then contacted by telephone. Forty-four of these centers scheduled a seminar. Three of these centers had scheduling difficulties and did not complete the questionnaire or schedule a seminar. One center completed the questionnaire but did not schedule a seminar and, therefore, did not complete a posttest. A total of 42 initial surveys were completed (49% of centers called), and 39 posttests were collected (95% of centers given seminars). Two child care centers did not provide posttest responses. The posttest responses were collected within 4 weeks of the seminar. All statistics were calculated using the Fisher exact test and a statistical software program (InStat; GraphPad Software Inc, San Diego, CA).

RESULTS

According to the 42 surveys collected, the mean number of children enrolled per child care center was 108 (N = 4,552). The mean number of children present at each center on an average day was 83. The children at these centers ranged from 6 weeks to 12 years of age; the centers operated an average of 48 hours per week. Centers update their allergy information for children an average of every 10.3 months. However, 24% of center directors (n = 10) reported that they only update information when the parents inform them of changes.

Fourteen of the 4,552 children enrolled at the child care centers were reported by the center directors to have a severe allergy to insects. Approximately 5 children per center had asthma (range, 0–25 children per center), 3 children per center had drug allergies (range, 0–17 children per center), and 7 children per center were known to have food allergies (range, 0–25 children per center). Figure 1 shows the most common parentally reported food allergens in the 295 children with food allergies. Twenty-eight centers reported children with other allergies, mainly to various fruits. The per-

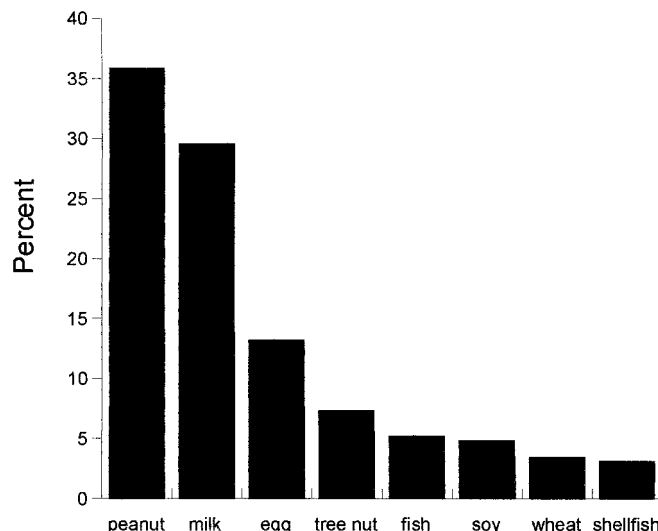


Figure 1. Most common parentally reported food allergens in the 295 children with food allergies at the 42 participating child care centers. Twenty-eight centers listed children with other allergies, mainly to fruits.

centages sum to more than 100% because some children had multiple parentally reported food allergies.

Education for the child care centers comes from various resources. Centers reported that they have received information from discussions with the parents (83%; n = 35), written instructions from the parents (55%; n = 23), self-reading (33%; n = 14), videos (17%; n = 7), lectures (14%; n = 6), and previous allergy seminars (10%; n = 4). Seven percent of center staff (n = 3) have discussed allergic reaction treatment with a physician, and 7% (n = 3) have received information from the Internet. Two percent of center staff (n = 1) have read information in the newspaper about treating allergic reactions. Seventy-four percent of center directors (n = 31) reported that someone in their center has had cardiopulmonary resuscitation (CPR) training.

Most child care centers (98%; n = 41) do not have medications to treat an allergic reaction unless provided by a parent. Many centers (67%; n = 28) reported that parents provide medication for administration by the child care center for allergies to food, medications, or insects. Of the centers that have medications, 48% (n = 23) have the EpiPen, 35% (n = 17) have an antihistamine, and 17% (n = 8) have albuterol inhalers. The centers reported an average of 8 providers per center who were able to administer medication in case of an allergic reaction (range, 0–50 providers per center), and 95% of the centers (n = 40) have someone always available to administer the medication. Sixty-eight percent of child care centers (n = 28) keep their medications in a locked cabinet, whereas 32% (n = 13; 1 did not answer) keep the medications in an unlocked cabinet. Fifty-six percent of centers (n = 23) keep their medicines in the room where the child is, whereas 44% (n = 18; 1 did not answer)

reported that they keep the medication away from where the child is located.

Regarding the cooking staff or caterer, 64% of center directors ($n = 27$) reported that they have a protocol for children with food allergies. (Twenty-one percent of center directors [$n = 9$] reported that this question does not apply.) Many centers (69%; $n = 29$) reported that the cooking staff or caterer knows the specific foods to which each child is allergic. (Twenty-nine percent of centers [$n = 12$] reported that this question is not applicable.) According to 64% of center directors ($n = 27$), children are allowed to bring food from home. Most directors (90%; $n = 38$) reported that children are not allowed to share food. All center directors who provided transportation for children reported that children could not eat or share food while being transported. Almost all of the respondents knew in the initial questionnaire and the questionnaire after the seminar that various allergic reactions can have different symptoms, that mild reactions do not always precede a severe allergic reaction, and that allergic reactions can be fatal.

Various signs and symptoms were ranked as typical or nontypical allergic symptoms before and after the allergy in-service. The Food Allergy and Anaphylaxis Network's Child Care and Preschool Guide to Managing Food Allergy lists all the physical signs and symptoms given in Table 1 as typical allergy symptoms except for those indicated otherwise: irritability, change in color (cyanosis), dizziness, and headache have been reported in the allergy literature.^{12,13} Burning with urination, change in vision, numbness, and blood in stool were designed to serve as controls. On the initial questionnaire, only 55% of center directors ($n = 23$) reported that teachers are trained to identify the signs and symptoms of an allergic reaction. Also, only 48% of teachers ($n = 20$) at the child care centers are trained to treat these signs and symptoms.

Most child care centers reported that they would treat a severe allergic reaction by calling 911, administering medication (nonspecific), starting CPR, and calling the parents. On the initial questionnaire, only 24% of centers ($n = 10$) stated that they would administer the EpiPen. After the allergy seminar, 77% of centers ($n = 30$) replied that they would use the EpiPen for a severe reaction ($P < .001$). Approximately half (55%; $n = 23$) of the center directors reported that their caregivers are trained to use an EpiPen for allergic emergencies. Center directors were asked for the basic steps in EpiPen use in both questionnaires (Figure 2). The steps we looked for were (1) remove the gray cap from the EpiPen, (2) inject the EpiPen into the thigh, and (3) hold the EpiPen at the site for 10 seconds.¹⁴

DISCUSSION

Schools face a variety of challenges in incorporating children with different illnesses into the classroom.¹⁵ A previous study⁵ showed that a disproportionate fraction of reactions occur in the preschool or day care center, and the school reaction represents the first reaction for 25% of the children

Table 1. Questionnaire Responses Regarding Typical Allergy Symptoms before and after Attending an Allergy Seminar

Symptoms	Pretest, %	Posttest, %	P value*
Hives	100	100	NA
Cramps	31	87	<.001
Sneezing	90	95	>.99
Shock	50	74	.06
Irritability†	67	85	.12
Rash	100	100	NA
Cough	55	95	.03
Increased heart rate	81	97	.57
Repetitive throat clearing	76	84	.06
Change in color†	57	67	.50
Burning with urination‡	19	36	.21
Reduced blood pressure	40	82	<.001
Chest tightness	76	90	.23
Difficulty swallowing	90	92	>.99
Gas	24	77	<.001
Nausea	64	92	.01
Shortness of breath	86	100	.03
Itchy eyes	100	100	NA
Stuffy nose	90	92	>.99
Eczema flare	81	95	.09
Change in voice	64	92	.003
Change in vision‡	52	64	.49
Vomiting	69	100	<.001
Swelling	98	100	>.99
Runny nose	93	100	.24
Weakness	62	79	.14
Headache†	86	79	.56
Numbness‡	52	72	.11
Dizziness†	76	90	.23
Blood in stool‡	19	31	.31
Wheezing	95	100	.49

Abbreviation: NA, not applicable.

* $P \leq .05$ is considered statistically significant.

† Not listed in the Food Allergy and Anaphylaxis Network's Child Care and Preschool Guide to Managing Food Allergy but reported in the allergy literature.

‡ Designed to serve as a control.

(primarily <4 years of age). Our study is the first to target anaphylaxis in child care centers for the younger age population, to provide an intervention to these centers, and to demonstrate significant improvement in the recognition, evaluation, and treatment of the disease.

In this study, a mean of 5 children per center had asthma, 7 per center had food allergies, 3 per center had medication allergies, and less than 1 per center had insect allergies. Given the marked prevalence of asthma, it is interesting that there were higher reports of children with food allergy. We believe that this phenomenon could be because the food allergies noted were parentally reported and thus could be elevated. Another reason could be that food is routinely provided in the child care centers and, therefore, that food allergies are directly screened by many of the centers. Along the same lines, asthma is placed with other medical conditions, and all parents may not keep a rescue inhaler at the child care center.

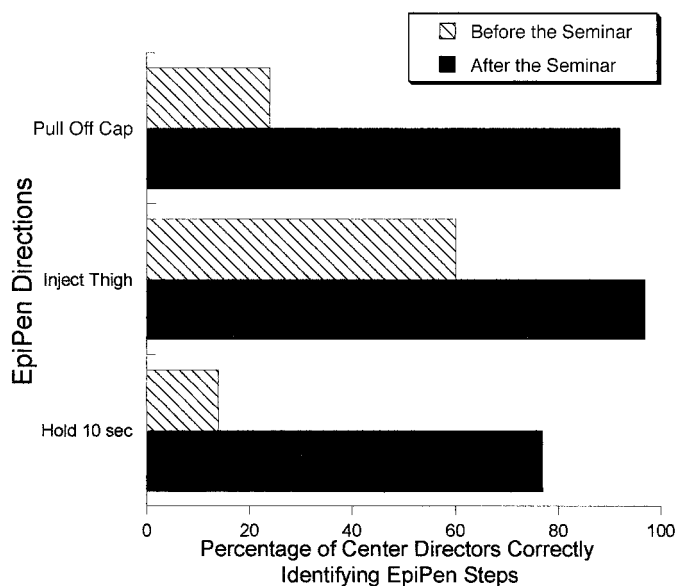


Figure 2. Percentage of child care center directors who correctly identified 3 crucial steps in EpiPen use before and after attending an allergy seminar. The *P* value for each step was significant at less than .001.

Thus, asthma in these child care centers may have been underreported.

Nevertheless, it is known that food allergy is the most common identifiable cause of outpatient anaphylaxis, has a significant impact on quality of life, and can be fatal.^{16,17} Because child care centers have a mean of 7 children per center with food allergy, it is important for them to receive education about anaphylaxis and to be given treatment parameters.

Through the questionnaire, it is apparent that most centers receive their education from discussions with the parents. It is good that clear communication with the parents and the child care center is established. However, previous studies¹⁸ have shown that of families that were given an EpiPen, only 60% received a demonstration on how to use it, and only 50% of the patients could identify all the critical steps in its use. Therefore, health care providers need to become involved in educating not only parents but also child care centers, where some of these children spend most of their time.

Child care centers are not permitted to keep an emergency kit that contains epinephrine and antihistamines on site, although in this study approximately 8 people per center could administer epinephrine. Also, when epinephrine is kept on site, 68% of centers (*n* = 28) keep it locked and 44% (*n* = 18) keep it in a room away from the child. Because epinephrine is used for the first-aid treatment of anaphylaxis, it is important for it to be readily available and accessible for the child with a new-onset allergic emergency. It is also important for the cooking staff or caterer to be educated about these children and to have a protocol to follow for children with 1 or multiple allergies.

At the site visit and per the survey, only approximately 50% of center directors (*n* = 23) believe that they are trained to identify and treat an allergic reaction. This supports previous data that state that although parents readily inform caregivers that their child has a history of anaphylaxis, provisions are not in place to ensure the administration of epinephrine in these situations.¹⁴ However, with interventions such as our training seminar, their knowledge of typical allergy symptoms improves. In the seminar, they learned the various ways that these symptoms could present, such as ingestion, contact, and inhalation, and how to treat these symptoms. After the seminar, most centers responded that they would use an EpiPen to treat a severe allergic reaction, and they correctly identified the steps to do so. This shows that the centers are willing and can successfully be trained, but proper policies and training programs need to be put in place.

This study has some limitations. Our survey was an estimate of all child care centers' practices based on the center directors' answers. We believed that the director would provide a good reference point for the employees of the center and thus did not survey each of the employees as well. We also relied on the child care center's report of allergies from parental information. Our study was not geared to determine which of these reactions were IgE mediated but rather to find out what guidelines and practices the child care centers follow assuming they will encounter a child now or in the future with IgE-mediated disease. Various articles^{1,11,14} have been written that identify when to use epinephrine and what signs and symptoms to look for in a mild or severe allergic reaction. The lack of a set identification protocol for child care centers makes it difficult for them to recognize and treat an allergic reaction, especially in light of their absence of medical training. The centers in this study were educated with the same material that the Food Allergy and Anaphylaxis Network provides to parents and other child care centers. However, because there is no uniform position statement about signs and symptoms of a mild vs a severe allergic reaction, it becomes difficult to identify what to use to educate child care centers in the future.

Our study population was randomly selected, but the center directors who participated may have had an interest in anaphylaxis and allergy in the school system when they agreed to participate. This study also is a suburban Chicago study. Different results may be obtained using a different setting for the study. In our study, the posttest responses were collected immediately to 4 weeks after the seminar. A long-term recall study needs to be performed to evaluate how frequently an intervention must be taken in the child care setting.

Considering the growing number of children younger than 3 years with food allergy¹⁹ and the increasing number of parents in the workforce, child care centers need to be equipped with the knowledge to recognize, evaluate, and treat a severe allergic reaction. Ideally, these centers should also be equipped with an on-site emergency kit that contains epinephrine. Treatment plans should be readily available at the

center and should be provided to parents of children with allergies who do not have plans, to be completed by the physician. Also, just as CPR training is a requirement at many of these centers, training about the EpiPen should be incorporated as a requirement as well. Future studies need to be completed to examine long-term recall of intervention information, different forms of intervention, and practices at other caregiver sites, such as home child care.

CONCLUSION

This study identifies a knowledge deficit in anaphylaxis education at child care centers for children aged 1 to 6 years, when children are the most prone to have their first allergic reaction. By attending individual educational seminars, these center staff dramatically improved their ability to recognize, evaluate, and treat an anaphylactic reaction. The results of this study confirm that, with education, child care centers can be made much more knowledgeable and safe for our children.

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