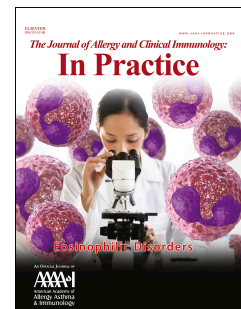


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Camp Leadership Perspectives on Food Allergy Related Anaphylaxis Events and Training for Camp Staff: A National Survey of Summer Camps

Natalie R. Schellpfeffer, MD, Harvey L. Leo, MD, Michael Ambrose, MD, Andrew N. Hashikawa, MD, MS



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**Camp Leadership Perspectives on Food Allergy Related Anaphylaxis Events and
Training for Camp Staff: A National Survey of Summer Camps**

Natalie R. Schellpfeffer, MD¹; Harvey L. Leo, MD²; Michael Ambrose, MD³; Andrew N.
Hashikawa, MD, MS¹

Affiliations: ¹Department of Emergency Medicine, University of Michigan, Ann Arbor,
MI; ²Allergy and Immunology, St. Joseph Mercy Hospital, Ann Arbor, MI; ³Pediatrics, St.
Joseph Mercy Hospital, Ann Arbor, MI

Corresponding Author:

Natalie R. Schellpfeffer
Children's Emergency Services
Department of Emergency Medicine
1540 East Hospital Drive
CW 2-737, SPC 4260
Ann Arbor, MI 48109-4260
Phone: 262-515-2016
Email: nschellpfeffer@gmail.com

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Michael Ambrose is creator, owner, and director of CampDoc.com. The rest of the
authors declare that they have no relevant conflicts of interest.

Abstract:

Background: Training of camp staff to recognize and treat anaphylaxis is recommended because food allergies are prevalent among summer campers. The frequency of food allergy anaphylaxis events and the extent of anaphylaxis training for camp staff are unknown.

Objective: To estimate the frequency of food allergic reactions in camps across the United States and to assess the state of food allergy anaphylaxis training for camp staff.

Methods: We partnered with *CampDoc.com* to send a 20-question survey in February 2016 to camp leadership representing 528 camps. Questions addressed demographics, food allergy policies, training, medication availability, anaphylaxis events and confidence in staff to recognize and treat anaphylaxis.

Results: A total of 559 responses were received, representing 258 camps. The majority surveyed (94.6%, n=529) reported food allergic children attending their camps. Only 47.6% (n=266) respondents reported requiring individualized emergency action plans as required for camper attendance. Anaphylaxis treated with epinephrine was reported by 24% (n=134) of leadership within the previous 2 years at their camp. These respondents were more likely to have a training session for staff (odds ratio=2.46 (95% CI 1.4 - 4.3). A total of 63.3% (n=354) reported training session presence. However, 15.6% (n=87) of leadership were unsatisfied with training materials and one third were not confident in staff to manage anaphylaxis.

48

49 **Conclusion:** Presence of appropriate policies to manage food anaphylaxis events and
50 anaphylaxis management training were missing in a substantial proportion of camps.
51 Camp-tailored food allergy training is needed given the number of camps reporting food
52 allergy reactions requiring epinephrine.

53

54 **Keywords:** summer camp, anaphylaxis, food allergy

55

56 **Abbreviations:**

57 US = United States

58 AAP = American Academy of Pediatrics

59 ACA = American Camp Association

60 EHR = electronic health record

61 EMT = emergency medical technician

62 FARE = Food Allergy Research Education

63

64 **Highlights Box**

65 **1. What is already known about this topic?**

66 Camps are a unique environment for food allergy management in children which require
67 special consideration separate from the school setting. Food allergy is common in the
68 camp population.

69 **2. What does this article add to our knowledge?**

70 This study examines the current state of anaphylaxis education and training in United
71 States summer camps and estimates the frequency of food allergy related anaphylactic
72 events occurring in United States summer camps over a two-year period.

73 **3. How does this study impact current management guidelines?**

74 This study demonstrates the need for food allergy policies and training tailored for
75 summer camp environments and staff.

Background:

Summer camp is a formative experience for over 14 million children who attend camp yearly in the United States (US).(1) While prevalence of food allergies in the pediatric population nationally is 4-8%,(2-5) the prevalence of food allergies among summer campers may range from 2.5%-15%.(6,7) While fatal anaphylaxis is not common,(8-13) there have been several well-publicized cases of fatal food anaphylaxis in children.(14-16)

Multiple factors make summer camps a challenging setting to manage food allergies. Children at summer camp are independent from parents and are under less adult supervision. Older adolescents may be more cavalier about their food allergies and may be more likely to take risks that could lead to an accidental food allergen exposure.(17) Campers with food allergy are subject to food sources that are different from those that they are used to at home and school. At overnight camp, there is no opportunity for family to provide food, and the mass production and service of camp food leaves opportunity for cross contamination and food allergen exposure. Some camps have implemented food exclusion policies similar to those instituted by many schools and childcare centers. This strategy may have merit but may also result in a false sense of security, and can be further complicated if trying to eliminate multiple allergenic foods from camp premises.(18, 19) Some camps may designate “nut-free” tables in the cafeteria for food allergic children or restrict food allergic children to stay in “nut-free” bunks and rooms. While these may be the most prevalent food allergies, peanut and tree nut exclusion may not address every food allergic campers’ allergies. Also, summer camps are often located in remote rural or wooded wilderness areas,

usually some distance from emergency medical service providers, emergency departments, and hospitals. Lastly, food allergy management training of camp staff is highly variable. The presence of licensed medical professionals on camp premises is not guaranteed, and camper-to-nurse ratio may be high at many camps. For this reason, the responsibility for managing anaphylaxis may fall on camp staff, who are often young adults (high school or college students) with no medical expertise.

There is currently no standard or mandated food allergy and anaphylaxis training for summer camps. Recent research has shown that many camps are variably or inadequately prepared for medical emergencies including anaphylaxis despite recommendations from the American Academy of Pediatrics (AAP) and the American Camp Association (ACA) to have emergency management strategies in place.(20, 21) Both the AAP and ACA have strongly recommended that all camp staff know the signs and symptoms of anaphylaxis and know how to administer an epinephrine autoinjector.(1, 22-25) Planning and practice is necessary for the mobilization of resources in treating life-threatening medical problems such as anaphylaxis in camp settings.(20) Redmond et al showed that camp staff within their facility were interested in widening educational efforts to increase the comfort level with treating anaphylaxis and that short, focused interventions had a meaningful impact on knowledge retention and comfort level among camp staff participants.(7) However, this study was limited to a single camp for children with complex medical issues, so its generalizability to other camp settings and personnel remains uncertain. It is unclear whether most summer camps follow the AAP or ACA general health guidelines that include recommendations for management of food allergy.(23-25) If training does occur, it is also unclear what

education and training materials and modalities are used for camp staff. A previous letter to the editor evaluated anaphylaxis knowledge amongst camp personnel and found that recent training improved proficiency in management of anaphylaxis.(26)

The primary objectives of this study were to estimate the frequency of allergic reactions requiring epinephrine administration and to assess the state of food allergy education and anaphylaxis management training for camp staff by surveying a national cohort of summer camps' leadership in the United States. Secondary study objectives were to determine the frequency of asthma exacerbations requiring intervention and the availability of stock epinephrine autoinjectors in summer camps nationally.

Methods:

We partnered with *CampDoc.com*, the largest web-based, camp-specific electronic health records (EHR) company that manages health forms, medications, allergies, and illness, and injury tracking for summer camps in the United States and Canada. In February 2016, a 20-question online survey (see Appendix E1 in the Online Repository) was sent to camp leadership via *CampDoc.com*, representing 528 camps who utilize this EHR service. This was a novel survey created by the study authors. Camp leadership were self-selected into one of the following categories: director, doctor, emergency medical technician (EMT), nurse, office staff/registrar, or other. Multiple individuals could respond from the same summer camp. The survey included questions about camp distance from nearest medical center, presence of 24-hour licensed medical professionals (defined as EMT, RN, advanced practice provider, MD, or DO), existence of food exclusion policies, details of enforced food exclusion policies,

requirement of allergy action plans for individual campers, and details about camp food preparation and service. Camp leadership were asked about their camps' anaphylaxis education and epinephrine training for staff. Questions assessed camp leadership satisfaction with current anaphylaxis education and training, their level of confidence in camp staff being able to recognize and treat anaphylaxis, and availability of both stock epinephrine autoinjectors and oral short acting H1 antihistamine (diphenhydramine) at camp. Based on recall, prevalence of food allergy reactions in camp requiring epinephrine administration over the past two years was determined, as was the prevalence of asthma exacerbations requiring intervention and treatment. Anaphylaxis from insect venom was not assessed. No individual camper identifying information was asked for or provided. Survey data were collected by *CampDoc.com* and sent to the authors in de-identified format. Data were analyzed using SAS version 9.3 (SAS Institute Inc., Cary, NC) using descriptive statistics. Logistic regression analyses were performed to identify variables associated with epinephrine autoinjector administration simulation drill presence as a part of training.

Results:

RESPONDENT and CAMP DEMOGRAPHICS

After the electronic survey was distributed via *CampDoc.com* and three subsequent e-mail reminders were sent over a one-month period, we received responses from 559 camp leadership representing 258 available camps nationally, for a response rate of 49%. Camp leadership and general demographics from all survey

respondents are shown in Table I. Among respondents, 83.4% (n=466), reported medical provider presence on-site 24 hours per day.

CHILDREN IN SUMMER CAMPS

Most respondents (94.6%, n=529) identified that there were food allergic children attending their camp, and 95% (n=531) had children with asthma attend. Among respondents, 47.6% (n=266) individualized medical emergency plan (i.e. asthma action plan and/or food allergy action plan) was required for children with known asthma and/or food allergies. Almost all (98.4%, n=550) reported meal times where either the camp served food or the campers brought their own food for consumption on camp premises. Food policy presence that specifically discussed practices around food preparation or food exclusion were highly variable (Table II). Overall, 50% (n=280) of camp leadership said they excluded certain foods from their premises.

EXPERIENCE WITH CHILDREN WITH FOOD ALLERGIES AND ASTHMA

Camp leadership reported food allergic reactions requiring diphenhydramine administration over the past two years: 14.7% (n=82) reported more than 5 events, 54.7% (n=306) reported 1-5 events, and 30.6% (n=171) reported zero events. When asked about food allergic reactions requiring epinephrine autoinjector administration over the past two years, leadership reported the following: 0.8% (n=5) reported more than 5 events, 23.1% (n=129) reported 1-5 events, and 76% (n=76) reported no events. Regarding the number of occurrences of asthma exacerbations requiring in-camp treatment over the past two years, 2.5% (n=14) reported more than 5 events, 40.1% (n=224) reported 1-5 events, and 57.4% (n=321) reported no events. Only one camp

(0.38%) had an asthmatic child require EMS/hospital services more than 5 times in the past 2 years, while 13.6% (n=76) of individual camps had 1-5 occurrences.

ANAPHYLAXIS TRAINING

Among respondent leadership, 63.3% (n=354) did have a training session for camp staff on recognizing anaphylaxis and how to administer epinephrine autoinjectors. Most training sessions were reported to be under 30 minutes and used lecture-based teaching modalities (47.9%; n=268), followed by videos 20.2% (n=113) and paper-based informational handouts at 32% (n=179). Some camps employed more than one teaching method. A variety of resources were used by camps for assisting with education. Reported use of third-party resources for anaphylaxis education and training are shown in Table III. Presence of a hands-on, practice drill for administration of epinephrine was reported as included in training by 37% (n=207) of respondents. Respondents thought in-person training would be most effective for staff training (39.9%), followed by online videos and handouts (18.1% and 17.3%, respectively).

Logistic regression (adjusting for distance from medical center, availability of policies, food exclusion, presence of medical provider, severe asthma reaction requiring EMS or hospital) showed camps where a child had needed epinephrine administration in the past two years were more likely to have had a practice simulation drill compared to camps without any anaphylaxis events requiring epinephrine (adjusted odds ratio of 2.46 (95% CI 1.41 - 4.29).

CAMP LEADERSHIP PERSPECTIVE ON ANAPHYLAXIS TRAINING

Of respondent leadership, 15.6% (n=87) were either “unsatisfied” or only “somewhat satisfied” with their current training materials. There were 30 respondents

(5.4%) who were “unsure” of satisfaction with current materials, while the remainder of respondents were “mostly satisfied” or “very satisfied.” Figure 1 shows surveyed leaderships’ confidence in staff regarding prevention of food allergy reaction in campers, recognition of anaphylaxis, and administration of epinephrine autoinjectors. One-third of respondents were “not confident” or “somewhat confident” in their staff in all areas. Notably, 8.1% (n=45) respondents were “unsure” of their confidence levels in staff.

MEDICATION AVAILABILITY AND LEADERSHIP OPINION ON LEGISLATION

47.2% (n=264) of respondents reported that stock epinephrine was present, whereas 74.8% (n=418) reported stock diphenhydramine as available at camp. When asked about whether they supported changes in legislation and further law expansion of stock epinephrine autoinjector availability in summer camps across the United States, only 64.4% (n=360) of camp leadership responded “yes.”

Discussion:

Our study of US summer camps demonstrates that camps employ various food allergy policies, and that there are gaps in anaphylaxis training for camp staff. Based on our findings, we present the following recommendations to improve the health and safety of food allergic campers.

EMERGENCY ACTION PLANS:

Only half of camps in our sample required emergency action plans for campers with food allergy or asthma. All summer camps should make individualized emergency action plans mandatory for each food allergic camper. Emergency action plans should

provide clear instruction for recognition of symptoms of an allergic reaction as well as directions for management of an accidental exposure to food or allergic reaction of any severity. Individualized allergy action plans need to highlight straightforward instructions for administration of injectable epinephrine and provide correct dosages for antihistamine and epinephrine for every camper. Additionally, we recommend camps not create their own action plans, but rather use currently available and free emergency action plans from AAP or Food Allergy Research Education (FARE), which were developed based on expert opinion and are already in wide use.(27, 28)

ANAPHYLAXIS TRAINING FOR ALL CAMPS:

Our analysis suggests that camps with recent anaphylaxis events were more likely to have training in place. Given the majority of camps lacked anaphylaxis events in the previous two years requiring treatment, relying on recent experience is not optimal. In addition, anaphylaxis is not a frequent event, camp staff may change on a yearly basis, and only a few individuals would likely be involved in managing any particular anaphylactic event. Therefore, summer camps must instead have a proactive approach to provide anaphylaxis training that includes recognition, management and treatment for all staff. Additionally, staff may be relying on treating with antihistamines as their primary treatment choice. Antihistamine administration is a commonly cited reason for delayed epinephrine administration.(42-44) Uncertainty regarding when to administer epinephrine can be addressed with repeated anaphylaxis training.

IMPROVING ANAPHYLAXIS TRAINING

Literature has shown that simulations are an effective means to facilitate procedural skills and enhance knowledge retention.(29, 30) Prior studies have also shown that simulation helps with confidence with use of epinephrine autoinjectors to treat anaphylaxis.(31, 32)

More than one half of respondent camp leadership in our sample did not employ anaphylaxis management simulations for staff to practice use of epinephrine autoinjectors. Camp leadership were most interested in in-person training experiences for their staff members, which may present an opportunity for community engagement with pediatric medical practices or emergency medical services. While online videos were thought of as “less effective” by our sample of respondent leadership, such resources are available for free use online and are produced and endorsed by reputable food allergy organizations.(33)

INCREASING AVAILABILITY OF STOCK EPINEPHRINE AUTOINJECTORS:

Another barrier to universal training may be the lack of stock epinephrine available on site for use in the event of an unanticipated reaction. A 2018 study by Shaker and Greenhawt showed that a theoretical model of stock, undesignated epinephrine autoinjectors in schools may be more cost effective overall than individual student autoinjector prescription presence.(34) This may have implications for cost savings related to emergency preparedness in camp settings as well.

Prior data have shown widely variable rates of epinephrine availability,(35-39) and a recent study of 170 summer camps across the United States and Canada found that only about 40% of food allergic campers brought their own epinephrine

autoinjectors to camp.(6) Currently, it is legal in half of states for camps to stock epinephrine autoinjectors.(40, 41) Approximately half of camps in our sample had stock epinephrine available for use. Legislation expansion in all states to include summer camps would increase their preparedness to treat anaphylaxis events, by making it likely that epinephrine is always readily available on camp premises.

DEVELOPMENT OF INCLUSIVE FOOD ALLERGY POLICIES:

Finally, we echo the ACA and AAP recommendation to create food allergy policies in conjunction with physicians specializing in pediatric allergy, as well as the national camp community and food allergy advocacy organizations.

LIMITATIONS:

This study was limited by the retrospective nature of the data collected and respondent recall for event rates, policies, and procedures. We attempted to reduce recall bias by limiting the period of time for survey events reported to 2 years, however, this may have been ineffective or introduced additional selection bias unintentionally. However, our sample of 559 responses representing 258 camps is the largest sampling of summer camps for a summer camp anaphylaxis study to date. Response bias may also exist and responses may not be representative of other summer camps that did not respond to the survey within *CampDoc.com*'s system. While every effort was made by the study team to use appropriate survey creation theory in its design, this was a novel survey that was not validated prior to use. Additionally, food allergy events where diphenhydramine was given may be overestimated if respondents unintentionally reported diphenhydramine administration for indications other than for food allergic

reactions, despite question phrasing. It is less likely that respondents overestimated the number of food allergy anaphylaxis events where epinephrine injection was administered, as the medical indications for epinephrine administration are much less broad compared to diphenhydramine.

There are a few questions which, retrospectively, would have been helpful for further analyzing this cohort. Specifically, demographic data about the respondents' camps, breakdown of camp emergency action plan by category of "asthma action plan" or "food allergy action plan," and whether camp leadership instituted education and training on food allergy and anaphylaxis in response to a prior incident or poorly managed camper case.

Finally, another limitation was the lack of specificity regarding certain allergen categories, specifically surrounding "peanut," "tree nut," "seafood," and "legume." The authors acknowledge that peanuts and tree nuts are different categories of allergens. Similarly, "seafood" comprised both fish and shellfish allergens, which are considered separate allergen categories classically. Also, given that peanuts are a part of the legume family, the additional category in our results of "legume" is confusing. The categorization of allergies was made in concert with those listed on the *CampDoc.com* original EHR allergen listing, which was initially based on parent-reported data and has since been modified to more accurately document specific camper allergy.

Despite these limitations, this data provides an estimation of food allergy- and asthma-related emergency event burden among a large number of summer camps that has not previously been available. Additional studies will be needed to further elucidate

the incidence of anaphylaxis in camps based on a patient review of the medical summer camp-specific electronic health record database.

Future directions of this research include development of a multimodality educational packet or online module created by key pediatric allergy stakeholders to be used by camp leadership for staff education on anaphylaxis and epinephrine administration training. Given this study's findings, uniformity in a resource that is widely available and specifically tailored could be immensely beneficial for the camp community either as a replacement or supplement to current education and training materials. A future study of camps with available stock epinephrine autoinjectors is needed to further explore it is obtained and paid for by camp leadership. Finally, there is a need for cost analysis study of stocking epinephrine autoinjectors in summer camps.

Conclusions:

While most summer camps in our sample had food allergic children attend, one-third of camps did not have anaphylaxis training for staff and half of camps did not require individual food allergy and anaphylaxis action plans for campers. Camp leadership's satisfaction with training materials and confidence in staff ability to diagnose and treat anaphylaxis could be improved by more unified food allergy policies and more widespread practical training tailored for summer camp environments and staff.

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Tables

Table I: Survey Respondent and Camp Demographics

	% (n) of Respondents (Total = 559)
Respondent Role	
Owner	1.8 (10)
Director	38.3 (214)
Office Staff/Registrar	11.6 (65)
Doctor	2.1 (12)
Nurse	29.3 (164)
EMT	1.8 (10)
Other	15.0 (84)
Distance from Nearest Medical Center	
Less than 5 Miles	28.1 (157)
5-20 Miles	55.3 (309)
20-50 Miles	12.3 (69)
Greater than 50 Miles	0.9 (5)
Not Sure	3.4 (19)
Medical Provider (MD/DO, RN, EMT) on Camp Premises at All Times	
Yes	83.4 (466)
No	14.8 (83)
Not Sure	1.8 (10)

Table II: Summary of Respondent Camps' Food Policies

	% (n) of Respondents (Total=559)
Emergency Action Plans Required	
Yes	47.6 (266)
No	34.3 (192)
Unsure	18.1 (101)
Policy Types Employed for the Food Allergic Child	
No special arrangements	9.1 (51)
Full exclusion of food group	39.0 (218)
Label foods	43.1 (241)
Separate tables/facilities	28.3 (158)
Ask parents to sign a waiver	10.0 (56)
Other	39.7 (222)
Food Types Excluded from Entire Camp	
None	49.9 (279)
Peanut	36.7 (205)
Tree nut	24.5 (137)
Seafood	10.0 (56)
Egg	1.3 (7)
Fruit/Vegetable	1.3 (7)
Seeds	2.7 (15)
Dairy	1.6 (9)
Soy	1.1 (6)
Legumes	0.7 (4)
Wheat	1.1 (6)
Meat	2.0 (11)
Other	16.6 (93)

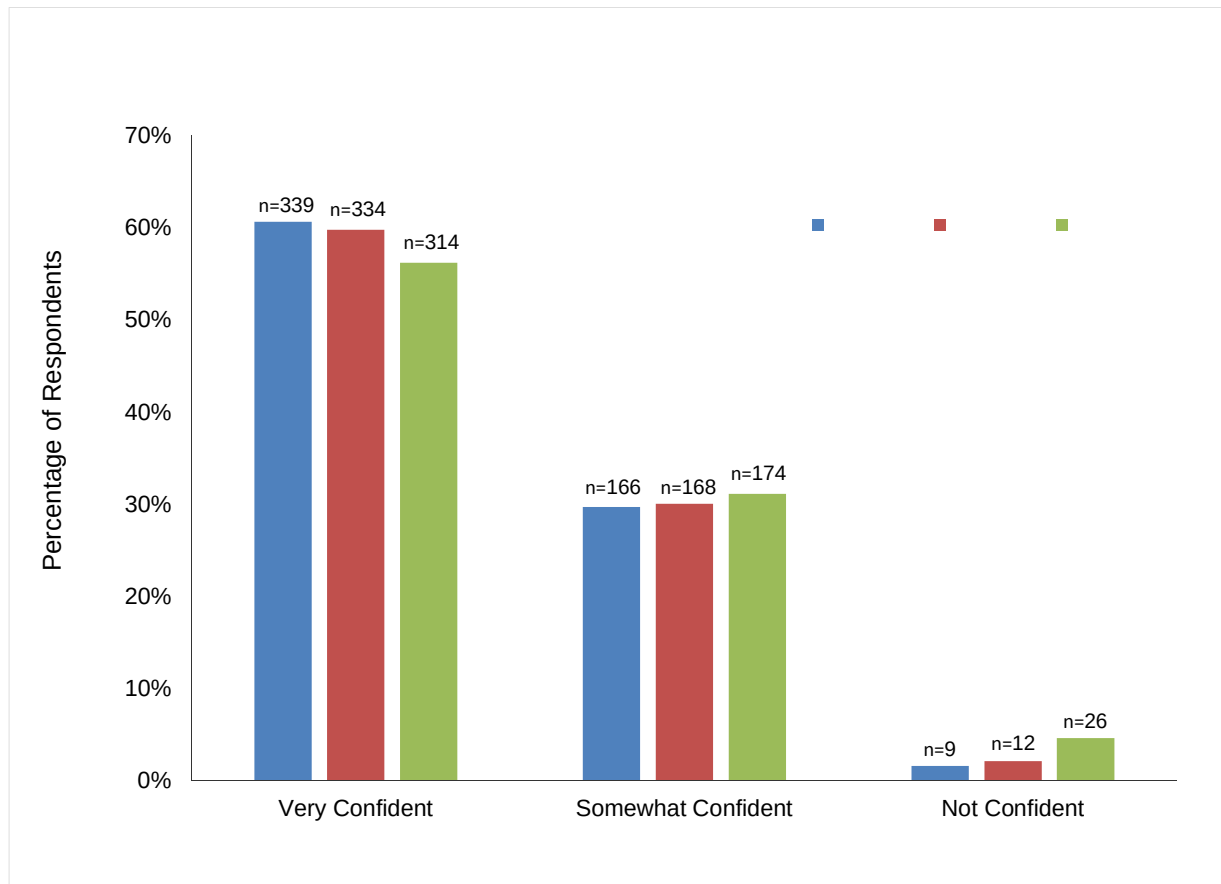
Table III: Respondent Utilization of Third Party Resources for Anaphylaxis Education and Training

	% (n) of Respondents (Total=559)
Training Materials Used by Surveyed Camps	
Red Cross	32.9 (184)
Food Allergy, Research, and Education (FARE)	6.2 (35)
Centers for Disease Control (CDC)	7.3 (41)
American Academy of Pediatrics (AAP)	7.5 (42)
Association of Camp Nurses (ACN)	7.9 (44)
Other	17.4 (97)

Figures

Figure 1: Percent respondents' confidence in camp staff ability surrounding food allergy management.

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Appendix E1:**Survey Questions**

1. What is your main role at camp? (Owner, Director, Office Staff/Registrar, Doctor, Nurse, EMT, Other)
2. Does your camp have meals or snack times (regardless of whether the food is brought by the camper or provided by the camp)? (Yes, No, Not Sure)
3. If your camp accepts food allergic children, does your camp employ any of the following policies? Select all that apply. (No special arrangement, Full avoidance, label foods, Separate tables/facilities, Ask parents to sign a waiver, Other)
4. Does your camp exclude any of the following food products? Please select all that apply. (None, Peanuts, Tree nuts, Seafood, Egg, Fruits/Vegetables, Seeds, Dairy, Soy, Legumes, Wheat, Meat, Other)
5. If you do not exclude certain food products, are there any special accommodations made at camp for food allergic children?
6. Is there a medical provider (doctor, nurse, or EMT) present at your camp at all times? (Yes, No, Not sure)
7. How far is your camp from the nearest medical center? (Less than 5 miles, 5-20 miles, 20-50 miles, Greater than 50 miles, Not sure)
8. Does your summer camp have participants with any of the following conditions? (Asthma, Food Allergies)
9. For campers with asthma or food allergies, are individualized emergency action plans (i.e. asthma action plans or allergy action plans) required? (Yes, No, Not sure)
10. How many times has your summer camp experienced an episode of the following in the past two years? (Severe asthma attack requiring treatment at camp by medical provider; Severe asthma attack requiring EMS/hospital visit; Allergic reaction requiring cream or pill medicine (such as Benadryl) administration; Allergy reaction requiring epinephrine autoinjector). (Options of 0 times, 1-5 times, more than 5 times)
11. Does your camp hold a training session for staff on management of allergic reactions to foods? (Yes, online education only; Yes, live, in-class training by instructor; Yes, both online and in-class training; No)
12. What is the average length of time of your camp's training session on food allergies and anaphylaxis? (Less than 10 minutes; 0-30 minutes; Longer than 30 minutes; Does not apply)
13. Does your training session on food allergies and anaphylaxis include any of the following? (In-class lectures; Videos; Handouts; Practice drill for administration of epinephrine)
14. Are your training materials based on information from any particular organizations? Select all that apply. (Red Cross; Food Allergy, Research and Education (FARE); Centers for Disease Control; American Academy of Pediatrics; Association of Camp Nurses; Other)

- 45 15. Please rate how satisfied you are with your current materials for food allergy
46 training. (Very satisfied; Mostly satisfied; Somewhat satisfied; Unsatisfied;
47 Unsure)
- 48 16. Which training format(s) would you find most effective for your staff training? (In
49 class lectures; Online videos; Handouts)
- 50 17. How confident are you in with the ability of your staff to prevent reactions from
51 food allergies, recognize anaphylaxis, and administer epinephrine? must rate
52 each separately. (Very confident; Somewhat confident; Not confident; Unsure)
- 53 18. Does your camp stock either of these medications, without prescriptions needed?
54 (Benadryl; Epinephrine auto-injectors)
- 55 19. There is a federal law called the School Access to Emergency Epinephrine Act,
56 signed by President Obama in 2013, which encourages states to adopt laws
57 requiring schools to have on hand "stock" epinephrine auto-injectors. Each state
58 writes its own legislation, which does not necessarily include camps. Would you
59 be in favor of expansion of this policy to camp settings? (Yes; No; Unsure)
60

61