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Research Article

Food Allergy Education for School Nurses: A Needs Assessment Survey by the Consortium of Food Allergy Research

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Food allergy is increasing in school-age children. School nurses are a primary health care resource for children with food allergy and must be prepared to manage allergen avoidance and respond in the event of an allergic reaction. An anonymous survey was administered to school nurses attending their association meetings to determine their educational needs regarding children with food allergy. With 199 school nurses responding, their self-reported proficiency for critical areas of food allergy knowledge and management varied, with weaknesses identified particularly for emergency plan development, staff education, delegation, developing guidelines for banning foods and planning school trips. Nurses reported a high interest in obtaining educational materials in these areas and prefer video and Internet resources that could be promoted through professional organizations.

Keywords: school nurses; food allergy; education; emergency plan

INTRODUCTION

Food allergy is an abnormal immunologic response to a food protein. Recent studies indicate that food allergy is increasing and is estimated to affect approximately 5–6% of infants and children and up to 3.7% of the overall population in the United States (Branum and Lukacs, 2008; Grundy, Matthews, Bateman, Dean, & Arshad, 2002; Rona et al., 2007; Sampson, 2003; Sicherer & Sampson, 2006). There is also evidence that fewer children outgrow their food allergies in early childhood and that food allergies persist into their school years and beyond (Grundy et al., 2002; Savage, Matsui, Skripak, & Wood, 2007; Sicherer, Munoz-Furlong, & Sampson, 2003; Skripak, Matsui, Mudd, & Wood, 2007). Currently, the only treatment for food allergy is strictly avoiding the food. However, strict avoidance diets can be complicated and accidental

ingestions are unfortunately common, with one study reporting up to 50% of food allergic

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patients having an allergic reaction over a 2-year period (Sicherer, Burks, & Sampson, 1998). In another cross-sectional study of milk allergic children, accidental allergic reactions were reported in 40% of children and were classified as "severe" in 15% during a 1-year period of study (Boyano-Martinez, Garcia-Ara, Pedrosa, Diaz-Pena, & Quirce, 2009). In some cases, even trace amounts of the food can elicit an allergic response. Allergic reactions can affect the skin, gastrointestinal tract, respiratory system, and cardiovascular system, ranging from mild urticaria to severe and life-threatening anaphylaxis. Currently, there are no diagnostic tests to predict the severity of a reaction (Sampson, 2005). The combination of strict avoidance diets, the high incidence of accidental exposures, and the risk of severe and sometimes fatal reactions imposes a tremendous burden on school children, families, and their caregivers.

"Allergic reactions can affect the skin, gastrointestinal tract, respiratory system, and cardiovascular system, ranging from mild urticaria to severe and life-threatening anaphylaxis."

Management of children with food allergic disorders requires specialized knowledge regarding appropriate dietary intake, allergen avoidance, and medical treatment of adverse reactions. 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 or health care provider, dietitian, and school nurse. Schools are a critical environment in a child's life, second only to the home. Thus, school nurses are a primary resource to promote the health and safety of students and are expected to intervene when health problems occur (American Academy of Pediatrics, 2008; Concepcion, Murphy, & Canham, 2007). As the numbers of school-age children with food allergy rise, school nurses must increasingly meet the medical needs of caring for high-risk children. In addition to providing direct care, they must also collaborate with the family (Concepcion et al., 2007) and medical community in the development of a health care plan and provide leadership in

ensuring that the plan is followed by other school personnel (American Academy of Pediatrics, 2008).

Children spend as much as 50% of their waking hours attending school (Gaudreau, 2000). With children spending such a large amount of their time in school, the possibility of an allergen exposure while at school is high. One study reported that it is common for food allergic children to experience accidental allergen exposures and allergic reactions in schools, with as many as 15% requiring treatment with epinephrine (Nowak-Wegrzyn, Conover-Walker, & Wood, 2001). Additionally, a study conducted in 109 school districts in the state of Massachusetts reported that epinephrine was administered in 115 cases over a 2-year period (McIntyre, Sheetz, Carroll, & Young, 2005). It is clear that school nurses are crucial in providing care for children with food allergy and must be prepared to assist with management of allergen avoidance, as well as recognizing and treating potentially life-threatening allergic reactions. To address this concern, the American Academy of Allergy Asthma and Immunology issued a position statement regarding the management of children with allergies and their risk for anaphylaxis in schools (American Academy of Allergy Asthma & Immunology, 1998). The Academy advocated that each student with an allergy diagnosis have a personalized written emergency plan and a prescription for epinephrine. Despite these guidelines, several studies looking at allergies in schools have identified significant deficiencies including lack of staff education on preventive measures and emergency treatment of allergic reactions; lack of written allergy action plans or failure to use them; and lack of epinephrine for administration during life-threatening reactions (Powers, Bergren, & Finnegan, 2007; Sapien & Allen, 2001; Sicherer, Furlong, DeSimone, & Sampson, 2001; Weiss, Munoz-Furlong, Furlong, & Arbit, 2004). Preliminary interviews conducted by our study team with faculty at four nursing schools in Arkansas and New York confirmed that there are currently no formal course or educational materials related to food allergy being offered as part of their nursing curriculum. Education of school nurses would ultimately improve the management of children with life-threatening allergies in the school setting (Sapien & Allen, 2001).

Considering the critical role of school nurses in the treatment and management of food allergic children, the objective of this study was threefold: (a) to determine how proficient school nurses perceived themselves in this area; (b) to pinpoint specific educational needs of school nurses regarding managing students with food allergies; and (c) to identify how educational needs of school nurses could best be met.

METHODS

In 2005, the Consortium of Food Allergy Research (CoFAR) was established by the National Institute of Allergy and Infectious Diseases (NIAID) of the National Institutes of Health (NIH) to conduct multicenter clinical trials, observational studies, mechanistic studies, and basic research to further the understanding of the best possible treatment approaches to food allergies. CoFAR also developed a supplemental Food Allergy Education Program composed of health care providers, nurses, and dietitians with expertise in the area of food allergy, as well as a health psychologist. The goal of the Education Program was to identify the educational needs of health care providers and families of food allergic children and to use this information to develop educational materials to fulfill those needs. The overall project focus is to improve food allergy awareness, knowledge, and adherence to therapy. One component of this project was addressed by assessing the specific educational needs of school nurses.

“The goal of the Education Program was to identify the educational needs of health care providers and families of food allergic children and to use this information to develop educational materials to fulfill those needs.”

A self-administered questionnaire was developed by the CoFAR Education Program Committee, a group of experts in food allergy management. The questionnaire consisted of six sections: (a) demographics and school characteristics; (b) self-reported proficiency of food allergy management

and education; (c) how knowledge and skills were learned; (d) resources used to update knowledge; (e) food allergy educational needs; and (f) preferred methods for dissemination of food allergy education and relevance of a food allergy “tool kit.” Respondents were asked to self-assess their proficiency in 11 food allergy-related knowledge-based areas and skills on a 4-point Likert scale (high, moderate, low, not at all, and not applicable to their practice). Participants were asked to select the educational methods (e.g., coursework, specialized conferences, self-taught, apprentice/mentored work) used to receive food allergy education, what resources (e.g., professional/academic publications, nonacademic articles, conference/lecture, Internet academic Web sites, other Internet web sites) they used to update their knowledge base on food allergy, what topics (listed as the same 11 topics from the proficiency grading) would further benefit them and school faculty/staff, and the best methods (e.g., regional conferences/lectures, video or CD presentation, assessable education via Internet, professional publications) to distribute new educational materials. Finally, participants completing the survey were also asked to grade the relevance of the questions in the survey to their practice as a school nurse and to assess the importance of the availability of an easy-to-use “tool kit” to help them manage food allergy in their school using a 4-point Likert scale (very, moderately, slightly, and not at all relevant). The questionnaire was self-administered by a convenience sample of two separate groups of school nurses attending regional professional meetings in Arkansas and North Carolina. No personal identifiers were collected, and no financial incentive was provided. Consent was implied by voluntary participation. The study was approved by the Institutional Review Boards of Duke University Medical Center, Mount Sinai School of Medicine and the University of Arkansas for Medical Sciences.

Statistical Analysis

Results are presented using descriptive statistics. Response frequencies were calculated for each individual question based on the number of respondents answering the question. The data were entered into Access 2000 and the analyses were conducted using SPSS Base 15.0 (SPSS,

TABLE 1. Characteristics of the Study Population

Characteristics	Results (<i>n</i> = 199)
School nurse experience, median (range)	6 years (<1–30)
Number of schools per nurse (mean ± SD)	1.56 (1.63)
Number of students per nurse, median (range)	650 (0–2500)
Students with food allergy diagnosis/nurse (mean ± SD)	2.03 (2.65)
Elementary school	2.33 (2.55)
Middle school	2.05 (2.91)
High school	1.87 (3.66)
Previous training in food allergy management (% yes)	50

Inc., 2006 Chicago, IL). The correlations between proficiency and interest levels were assessed with Spearman's rank correlation. A *P* value of less than .05 was considered statistically significant.

RESULTS

Demographics and School Characteristics

Overall, 246 school nurses attended the two professional meetings and were given the opportunity to complete the survey. A total of 203 questionnaires were returned. Four questionnaires were omitted from analysis because one person declined to participate and three reported that the questions were not applicable to their job responsibilities, thus they did not complete the surveys. A total of 199 surveys were completed, representing an 81% overall response rate. Characteristics of the school nurse population surveyed are shown in Table 1. Those who completed surveys reported a median of 6 years (range <1–30 years) experience as a school nurse. Thirty-eight percent of nurses were responsible for only one school, while 62% percent reported covering multiple schools (range 1–12 schools) and more than one school level (e.g., elementary to high school). Based on raw pooled estimates of nurse-reported student populations for all school levels, the reported student-to-nurse ratio was a median of 650 (range 0–2500) students per school nurse. Sixty-one nurses reported having no students under their care or did not report the number of students, and these nurses were omitted from further analysis. Ninety-two percent

of respondents provided estimates of the number of students in their care who reported having a food allergy. Of the remaining 8%, all but one respondent indicated that they had food allergic students but the number was unknown. Only one nurse that completed the survey reported having no food allergic children among her student population. Of the nurses reporting students with food allergy, prevalence estimates for self-reported food allergy were highest for elementary students followed by middle-school students and then high-school students (2.33, 2.05, and 1.87, respectively). On average, nurses estimated a rate of reported food allergy in the (K-12) school population of only 2.03%.

Self-Reported Proficiency of Food Allergy Management and Education

More than 85% reported a moderate to high proficiency in the understanding of definitions of food allergy and food intolerance, recognizing the signs and symptoms of an allergic reaction, and advising school staff on student hand washing. Fewer rated a moderate to high proficiency on emergency plan development, educating staff on the initiation of an emergency action plan, delegating responsibilities to nonnursing school staff, and advising staff on cross-contact and cleaning of food areas. Approximately half of the respondents (52.5%) indicated proficiency for participating in the planning of school trips and outside activities for food allergic students and less than half (40.1%) for developing guidelines regarding banning specific foods (Table 2).

How Knowledge and Skills Were Learned and Resources Used to Update Knowledge

Fifty percent of respondents reported training in food allergy management, with 35% of those being "self-taught." Thirty-seven percent reported attending professional conferences, while course work and mentoring were reported by 29% and 20%, respectively. When asked what resources were used in continuing education to update their knowledge base on food allergy, 63% of school nurses reported using professional/academic publications and 62% reported attending conferences or lectures. Of the 79% using the Internet, 37%

TABLE 2. Percentage of School Nurses With Moderate-to-High Self-Rated Proficiency and Their Expressed Interest in Receiving Further Training in Key Food Allergy Knowledge-Based Topics and Skills

Topic (missing data)	Proficiency Mod-High (%)	Interest in Further Training (%)	Correlation 1-Tailed
Recognizing signs/symptoms (<i>n</i> = 15)	96.9	89.7	-.223*
Understanding definition of food allergy (<i>n</i> = 23)	92.7	87.5	-.147**
Advising on hand washing (<i>n</i> = 22)	91.2	79.6	-.193**
Understanding definition of food intolerance (<i>n</i> = 19)	85.6	87.8	NS
Emergency plan development (<i>n</i> = 11)	80.6	90.5	NS
Delegation of responsibilities of staff (<i>n</i> = 16)	73.7	89.0	NS
Educating staff on emergency plan (<i>n</i> = 14)	73.4	93.5	NS
Advising on cross-contact (<i>n</i> = 12)	71.8	93.6	NS
Advising on cleaning of food areas (<i>n</i> = 12)	64.2	82.7	-.139**
Planning school trips/activities (<i>n</i> = 14)	52.5	84.9	NS
Developing guidelines for banning of foods (<i>n</i> = 13)	40.1	84.9	NS

* *p* = .001.** *p* < .05.

sought information from only academic Web sites, while 42% used advocacy sites such as the Food Allergy and Anaphylaxis Network (FAAN). Interestingly, 22% of school nurses reported using non-academic articles as a resource for continuing education in food allergy.

Food Allergy Educational Needs

School nurses completing the survey were asked which topics they would be interested in having included in an educational program if training were offered on food allergies. The same 11 specific knowledge-based topics and skills used for proficiency self-assessment were listed (Table 2). Cross-contact of food allergens, emergency plan development, and educating other school staff on how to carry out the emergency plan ranked highest among the areas that school nurses wanted more information. Advising on hand washing and cleaning of food surfaces were least important. As expected, there were negative correlations between proficiency and interest in additional training (Table 2). However, only four topics had significant correlations and all were of low magnitude: Recognizing signs/symptoms (-0.223), Advising on hand washing (-0.193), Understanding definition of food allergy (-0.147), and Advising on cleaning of food areas (-0.139). It is worth noticing that the majority of the school nurses expressed interest in receiving further training in all topics, even for those topic areas in which they rated themselves as "proficient." Additionally, 9 of 11 self-assessment

questions were used to determine the topics that should be included to help the school nurse train/educate school personnel, students, and families regarding food allergy and food allergy management (Table 3), with the most important areas being the recognition of signs and symptoms of an allergic reaction and emergency management of food allergic reactions.

Preferred Methods for Dissemination of Food Allergy Education and Relevance of a Food Allergy "Tool Kit"

Respondents were asked to rank educational formats for the distribution of new materials regarding food allergy from 1 being the most useful and accessible and 5 the least. Responses indicated that 66% preferred a video format with a 1 or 2 ranking and 54% assigned 1 or 2 rankings to Internet resources. Fewer indicated that professional publications (14%) or conferences/lectures (27%) would be a preferred method of education. When asked to rate the importance of the availability of an easy-to-use "tool kit" to help manage food allergy in schools, 96% of school nurse respondents rated a food allergy tool kit as "very important" or "moderately important," while only 4% rated a tool kit as "not at all" or "slightly" important.

DISCUSSION

The objective of this study was to assess self-reported proficiency and educational needs of school nurses in regard to providing instruction

TABLE 3. Topics of Importance for Food Allergy Training of School Personnel, Students, and Families

Topic	"Yes" Responses (%) from total of 182 respondents
Recognizing signs/symptoms	95
Emergency management of food allergic reactions	95
Adverse reactions to foods	91
Food allergy action plans	89
Definition and prevalence of food allergy	86
Cross-contact	86
Cleaning of food areas	76
Food preparation	74
Hand washing for students	72

and treatment for children with food allergies. The project originated out of the increasing need for school nurses to be prepared to care and supervise children with food allergies (American Academy of Allergy Asthma & Immunology, 1998; American Academy of Pediatrics, 2008; McIntyre et al., 2005; Nowak-Wegrzyn et al., 2001; Weiss et al., 2004). The Education Committee of the NIH-sponsored CoFAR thus conducted surveys in two school nurse associations. Our study found that 99% of the school nurses who responded reported being responsible for children with food allergies in their schools. Clearly, these school nurses require knowledge and skills in the management and treatment of food allergic children to fulfill their roles as health care professionals in the school setting.

Our project identified several areas of educational deficiencies that hinder the school nurses' ability to provide adequate management of food allergies within schools, in addition to possible inadequate personnel and staffing issues that further complicate management. More than half of the school nurses completing the survey reported being responsible for multiple schools. In addition, they reported being responsible for an average of 650 students. The estimated rate of food allergy in the surveyed school population was 3.1%, a value less than expected among the general population of children (Sicherer & Sampson, 2006). These results may indicate a high rate of undiagnosed food allergy or underreporting of food allergy to the school nurse. These issues are potentially more significant in middle-school and high-school students, with communication between students/parents and the school nurse

less frequent as the age increases. Because the majority of schools represented in our study do not have a nurse onsite full time and the student-to-nurse ratio is high, it is important for these schools to carry out preventive strategies by educating other staff members, particularly teachers, administrators, food service workers, coaches, and anyone who regularly interacts with the students. Faculty and staff should be trained on allergen avoidance, recognition of the signs and symptoms of an allergic reaction, and how to provide emergency treatment in the absence of a nurse.

"Faculty and staff should be trained on allergen avoidance, recognition of the signs and symptoms of an allergic reaction, and how to provide emergency treatment in the absence of a nurse."

As the health care professional within the school setting, the school nurse is often responsible for communicating important aspects of care for food allergic children to other school personnel (American Academy of Pediatrics, 2008; Powers et al., 2007; Weiss et al., 2004). In addition to emergency preparations, school nurses are often responsible for creating a plan to address ways to provide a safe environment for the food allergic child. They should communicate policies regarding food sharing, supervision during meals, use of foods in crafts and projects, and hand washing and safety on school buses, field trips and parties (American Academy of Allergy Asthma & Immunology, 1998). In our study, school nurses completing the questionnaire reported only moderate proficiency in the areas that required training and delegating responsibilities to nonnursing school faculty and staff including emergency plan development, cross-contact, and cleaning food areas. More than half the nurses who responded noted that they also lacked proficiency in developing guidelines regarding the banning of specific foods and participating in the planning of school trips and outside activities for food allergic students. This may also indicate a school health service system issue related to the authority given to school nurses in managing food allergies. The

availability of standardized educational tools, as well as clear school system directives, would clearly be beneficial in facilitating school nurses in their role as patient advocates.

Of the nurses who completed the survey, emergency plan development and educating school staff on how to carry out that plan ranked highest among the topics they wanted more information about. One specific implication for school nurses would include the responsibility to work with each food allergic student's family and health care providers to develop an individualized emergency treatment plan. The emergency plan should include a list of the child's allergies, symptoms of an allergic reaction, how to treat it, who to contact, and how to activate emergency services. Staff should be instructed where medications are kept and who will give them when needed. Responsible staff members should be instructed in the appropriate use and administration of injectable epinephrine (American Academy of Allergy Asthma & Immunology, 1998; Powers et al., 2007; Weiss et al., 2004).

"One specific implication for school nurses would include the responsibility to work with each food allergic student's family and health care providers to develop an individualized emergency treatment plan."

Only half of the school nurses surveyed reported any training in food allergy management, with 35% of those being "self-taught." The majority reported currently relying on professional meetings, conferences, and the Internet to update their knowledge on food allergy. It is interesting to note that despite their reported reliance on professional meetings as a source of self-education, only 27% indicated that professional conferences would be an acceptable method for obtaining new information regarding food allergy. Of those nurses who reported using the Internet, approximately 40% used academic Web sites or advocacy sites such as FAAN. More than half responded that the Internet would be a preferred method for distributing new educational materials. The

majority also favored video as an acceptable educational tool.

One limitation of our study is that the needs assessment is based on the nurses' perceptions of their proficiency in the area of food allergy rather than direct measurement of their proficiency. The survey did not test the accuracy of their knowledge or skills related to the topics that the program identified as relevant. A more in-depth study would need to be conducted to more precisely assess the true proficiency levels of these school nurses. It should also be noted that the use of a convenience sample may limit the ability to generalize the findings of the study, as those surveyed may not necessarily be representative of all school nurses. Participation from a more diverse demographic population of nurses may also change the results of the survey.

CONCLUSIONS

School nurses play a key role in the development of programs aimed at preventing and managing food allergic reactions in schools, including creating individualized care plans, planning an appropriate emergency response, and training staff to carry out the plans. Self-reported proficiency among school nurses for critical areas of food allergy knowledge and management varied with weaknesses identified particularly for staff education, delegation, developing guidelines for banning specific foods, and planning school trips. Despite potential obstacles, the school environment can provide an opportunity to increase awareness, prevention, and treatment of food allergic children outside the home. Nurses reported a high interest in educational materials in these areas and prefer video and Internet resources that could be promoted through professional organizations.

The CoFAR educational program was organized primarily in response to the public's recognition of a need for education in a variety of venues. This study confirms that one area missing key resources related to food allergy is in health education, specifically for school nurses. The data from this survey, along with data from similar projects completed by the Food Allergy Education Program with dietitians and parents, identifies a need for educational materials to be

used by school nurses. The National School Nurses Association hosts a Web site that could potentially be used to link to food allergy educational resources. Excellent information is currently available from the Food Allergy & Anaphylaxis Network (www.foodallergy.org) to help schools manage food allergies.

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