Allergy EUROPEAN JOURNAL OF ALLERGY AND CLINICAL IMMUNOLOGY

Allergy

POSITION PAPER

EAACI Food Allergy and Anaphylaxis Guidelines: managing patients with food allergy in the community

A. Muraro[1,*], I. Agache[2,*], A. Clark[3,*], A. Sheikh[4,5,6], G. Roberts[7,8,9], C. A. Akdis[10,11], L. M. Borrego[12], J. Higgs[13], J. O'B. Hourihane[14], P. Jorgensen[15], A. Mazon[16], D. Parmigiani[17,18], M. Said[19], S. Schnadt[20], H. van Os-Medendorp[21], B. J. Vlieg-Boerstra[22] & M. Wickman[23,24,25]

[1]Department of Mother and Child Health, The Referral Centre for Food Allergy Diagnosis and Treatment, Veneto Region, Padua General University Hospital, Padua, Italy; [2]Theramed Medical Center, Brasov, Romania; [3]Allergy Department, Addenbrookes NHS Foundation Trust, Cambridge; [4]Allergy & Respiratory Research Group, Centre for Population Health Sciences, The University of Edinburgh, Edinburgh, UK; [5]Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital; [6]Department of Medicine, Harvard Medical School, Boston, MA, USA; [7]David Hide Asthma and Allergy Research Centre, St Mary's Hospital, Isle of Wight; [8]Human Development in Health and Clinical and Experimental Sciences Academic Units, Faculty of Medicine, University of Southampton; [9]Respiratory Biomedical Research Unit, University Hospital Southampton NHS Foundation Trust, Southampton, UK; [10]Swiss Institute of Allergy and Asthma Research (SIAF), University of Zurich; [11]Christine Kühne–Center for Allergy Research and Education (CK-CARE), Davos, Switzerland; [12]Centro de Alergia, Hospital CUF Descobertas and Departamento de Imunologia, NOVA Medical School, Lisboa, Portugal; [13]Health Education Trust, Greens Norton, Northamptonshire, UK; [14]Paediatrics and Child Health, University College, Cork, Ireland; [15]Allergy, Auckland, New Zealand; [16]Pediatric Allergy and Pneumology Unit, Children's Hospital La Fe, Instituto de Investigacion Sanitaria La Fe, Valencia, Spain; [17]Association for Teacher Education in Europe, Bruxelles, Belgium; [18]Department of Education, University of Genoa, Genoa, Italy; [19]Allergy & Anaphylaxis Australia, Hornsby, NSW, Australia; [20]Deutscher Allergie- und Asthmabund e.V., Mönchengladbach, Germany; [21]Department of Dermatology & Allergology, UMC Utrecht, Utrecht; [22]Department of Respiratory Medicine and Allergy, Emma Children's Hospital, Academic Medical Center, University of Amsterdam, Amsterdam, the Netherlands; [23]Institute of Environmental Medicine, Karolinska Institutet; [24]Department of Pediatrics, Sachs' Children's Hospital; [25]Centre for Allergy Research, Karolinska Institutet, Stockholm, Sweden

To cite this article: Muraro A, Agache I, Clark A, Sheikh A, Roberts G, Akdis CA, Borrego LM, Higgs J, Hourihane JO'B, Jorgensen P, Mazon A, Parmigiani D, Said M, Schnadt S, van Os-Medendorp H, Vlieg-Boerstra BJ, Wickman M. EAACI Food Allergy and Anaphylaxis Guidelines: managing patients with food allergy in the community. *Allergy* 2014; **69**: 1046–1057.

Keywords
adrenaline; anaphylaxis; community; food allergy; guidelines.

Correspondence
Antonella Muraro, Department of Mother and Child Health, The Referral Centre for Food Allergy Diagnosis and Treatment, Veneto Region, University Hospital of Padua, Via Giustiniani 3, 35128 Padua, Italy.
Tel.: 0039-049-821-7789
Fax: 0039-049-821-8091
E-mail: muraro@centroallergiealimentari.eu

*Joint first authorship.

Accepted for publication 2 May 2014

DOI:10.1111/all.12441

Edited by: Thomas Bieber

Abstract

The European Academy of Allergy and Clinical Immunology (EAACI) Food Allergy and Anaphylaxis Guidelines, managing patients with food allergy (FA) in the community, intend to provide guidance to reduce the risk of accidental allergic reactions to foods in the community. This document is intended to meet the needs of early-childhood and school settings as well as providers of non-prepackaged food (e.g., restaurants, bakeries, takeaway, deli counters, and fast-food outlets) and targets the audience of individuals with FA, their families, patient organizations, the general public, policymakers, and allergists. Food allergy is the most common trigger of anaphylaxis in the community. Providing children and caregivers with comprehensive information on food allergen avoidance and prompt recognition and management of allergic reactions are of the utmost importance. Provision of adrenaline auto-injector devices and education on how and when to use these are essential components of a comprehensive management plan. Managing patients at risk of anaphylaxis raises many challenges, which are specific to the community. This includes the need to interact with third parties providing food (e.g., school teachers and restaurant staff) to avoid accidental exposure and to help individuals with FA to make safe and appropriate food choices. Education of individuals at risk and their families, their peers, school nurses and teachers as well as restaurant and other food retail staff can reduce the risk of severe/fatal reactions. Increased awareness among policymakers may improve decision-making on legislation at local and national level.

Food allergy (FA) reactions commonly occur outside the home (1) (Box 1). This section of EAACI Food Allergy and Anaphylaxis Guidelines is intended to provide guidance to all stakeholders in order to reduce the risk of accidental allergic reactions to foods in the community. This guideline is therefore intended to assist those working in school and early-childhood settings (e.g., kindergarten) as well as providers of non-prepackaged food (e.g., restaurants, bakeries, takeaway, deli counters, and fast-food outlets). Furthermore, we hope that it will help children with FA, their families, schools, and their specialist and nonspecialist healthcare providers (Table 1). This guideline has been prepared by EAACI's Taskforce on Community and builds on the previous EAACI Position Paper on Management of the Allergic Child at School (2). Details on the production of these guidelines, the approaches used, and the involvement of experts and stakeholders are summarized in the Data S1 and Table S1.

Why the community is important

Food allergy is a common and increasing problem (3, 4) with the main burden occurring in childhood (5). In Europe, at least 25% of school-age children live with allergic disease and FA affects up to 4–7% of primary school children (6). The estimate will vary depending on point or lifetime prevalence and whether this is self-reported, based on oral food challenge, or based on other methods. The pooled lifetime and point prevalence of self-reported food allergy (FA) were 17.3% (95% CI: 17.0–17.6) and 5.9% (95% CI: 5.7–6.1), respectively. The point prevalence of sensitization to ≥1 food as assessed by specific IgE was 10.1% (95% CI: 9.4–10.8) and skin prick test 2.7% (95% CI: 2.4–3.0), food challenge positivity 0.9% (95% CI: 0.8–1.1).

Food allergy, particularly to peanuts, tree nuts, egg, and milk, is the leading cause of anaphylaxis (7–10). Allergen avoidance education is often targeted at avoidance within the home, with less emphasis on how to avoid community exposure. Anaphylaxis often presents at home, and this is an important situation to manage (1). However, there is also significant risk from community exposure (1). The most common location for anaphylaxis to occur in the community is the school or kindergarten, accounting for 16–22% of reactions (11–16). Between 10% and 18% of FA or anaphylaxis reactions occur at school (1, 17). In a UK survey, 61% of schools had at least one child at risk of anaphylaxis

Table 1 Target audience

Children with food allergy and their caregivers
Healthcare providers
Food service staff and managers from settings at risk for allergic reactions to foods
Early childhood staff and managers
School principals, teachers, school staff and volunteers
Patient organizations
Government and policy makers

Box 1: Key terms

Food allergy	An adverse reaction to food triggered by an immunological mechanism, involving specific IgE (IgE-mediated) or cell-mediated mechanisms (non-IgE-mediated) or both IgE-and cell-mediated mechanisms (mixed IgE-and non-IgE-mediated) Food allergy is a subgroup of food hypersensitivity reactions
Anaphylaxis	'Severe, life-threatening generalized or systemic hypersensitivity reaction' (89), which is characterized by being rapid in onset with life-threatening airway, breathing or circulatory problems, usually associated with skin and mucosal changes
Adrenaline (epinephrine)	Drug with combined alpha- and beta-agonist causing peripheral vasoconstriction (reversing hypotension and mucosal edema), increased rate and force of cardiac contractions (reversing hypotension), reversal of bronchoconstriction, and reduction in release of inflammatory mediators in case of anaphylaxis
Adrenaline auto-injectors	Devices that patients, caregivers, or professionals can be trained to use to give a predefined dose of intramuscular adrenaline
Personalized emergency management plan	A written plan tailored to the individual patient's clinical characteristics of reaction, to be implemented when a reaction occurs

Abbreviations

AAI, adrenaline auto-injector; AGREE II, Appraisal of Guidelines for Research and Evaluation; EAACI, European Academy of Allergy and Clinical Immunology; FA, food allergy; NSAID, nonsteroidal anti-inflammatory drugs; PCP, personalized care plan; PEMP, personalized emergency management plan; QoL, quality of life; UK, United Kingdom; US, United States.

(i.e., had a reported history of anaphylaxis or carried an adrenaline auto-injector (AAI)) (18). Reactions also occur in a wide variety of other community locations including restaurants, sports fields, beaches, and gymnasiums (14). Fatalities due to FA are equally likely to occur at home or in community locations such as a restaurant/takeaway (19), friend's home, school/nursery (20–24), camp, and work (25, 26).

The management of food-allergic children should therefore aim also to protect against the risk of allergen exposure outside the home. Avoidance of community reactions depends on complex factors and interaction with third parties providing food (e.g., schools) when parents are not present. Anaphylaxis is more common in adolescents and young adults, at an age when they begin to take over responsibility for making food choices outside the home (27) and carrying emergency medication (28–31). Improved education of individuals at risk and their families, peers, school staff, and restaurant and other food service staff about reducing risk can help to prevent fatalities (11). Increased awareness of policymakers may improve care at local and national levels. A harmonized legislation is urgently required for the availability and administration of adrenaline at school as well as for educational multidisciplinary programs aimed at general practitioners and targeting the family as a whole, the restaurant, canteen, and school staff (32).

Families, caregivers, and the allergist

Families of food-allergic children require guidance on managing this potentially long-lasting condition, balancing safety against social and emotional restrictions. Equal weight should be given to protecting children against community and home reactions. Parents and caregivers have primary responsibility for coordinating care for their children. As children reach adolescence, they begin to make food choices by themselves outside the home and take responsibility for carrying their own emergency medication. This coincides with the time of life where severe reactions and deaths due to anaphylaxis become more common. Education should be focused on providing a comprehensive package of age-appropriate avoidance, advice, provision and training in how and when to use emergency medication.

The first principle is correct diagnosis of the allergy by clinical history, serum-specific IgE and skin prick testing and challenge, if necessary, to identify relevant trigger and tolerated foods (33, 34). The allergist and/or the dietitian should provide comprehensive advice on allergenic foods to be avoided, interpretation of food allergen labeling (including precautionary labeling), and identification of potential sources of cross-contamination. Patients and their families should be advised of the common pitfalls and situations where accidental reactions are particularly frequent or severe, and contingencies for these situations should be discussed. Advice should include guidance for relevant community-specific situations, for example, how to manage FA with reference to school meals, school camps, or social gatherings. Management should also focus on good control of coexisting asthma. Other allergic conditions such as eczema and allergic rhinitis should also be addressed.

The use of comprehensive personalized emergency management plans (PEMPs) is associated with a decreasing frequency of severe reactions following their implementation (26, 35). Regular follow-up is an essential part of any management plan. The ability of parents to assess the risk and manage their child's condition is highly dependent on their own knowledge, attitudes, and beliefs about FA (5). Not surprisingly, misconceptions are held about prevalence and triggers. Also, many families report an adverse effect of the FA on their personal relationships, with some experiencing outright hostility from others when trying to accommodate their child's FA (36).

Provision of AAI devices to those at risk of anaphylaxis is an essential part of the comprehensive PEMP. Indications for provision of AAIs are discussed in detail in the Anaphylaxis guideline (37). Some reports are a warning indication of AAI actual use, in comparison with AAI prescription. According to the Health Council of the Netherlands, 1450–1700 children in the Netherlands are prescribed an AAI device yearly, with 50–75% of children having two devices, one on their person and one stored at day care or school (38). However, an alarming under-prescription of AAI was reported in school-going adolescents: Although the auto-injector was indicated in 3.0%, only 0.09% of the adolescent evaluated owned a device (39). In a study of children from 14 allergy clinics throughout UK, only 16.7% used their prescribed AAI during anaphylaxis (40). These data emphasize the importance of repeated education and assessment of the knowledge on how and when to use of AAI devices (37).

Education is clearly important. Factors associated with greater knowledge are a prior practical demonstration, consultation with an allergy specialist rather than a general physician, and independently seeking additional information from a patient organization (41). Factors correlating with confidence to administer auto-injectors are prior administration, regular training, and empowerment by healthcare professionals to manage a severe allergic reaction (42).

School

Food allergy is a common health issue in the school setting (43, 44). Food-allergic children will be exposed to food ingestion when out of their parents' direct care and require proper management of the adrenaline administration. All schools should therefore have a policy to protect such children. The reality is that many facilities are poorly prepared to protect students. Essential components of policies for the prevention of food allergen exposure are missing (1, 45), teachers have poor knowledge of anaphylaxis triggers, symptoms, and AAIs (16, 46–48), and PEMPs are not currently consistently provided for the majority of students with FA (16).

In one series of food-allergic school children, only 54% had a PEMP, 72% an AAI, and 60% a complete emergency kit (49, 50). Where PEMPs are provided, studies have shown that up to two-thirds of patients and caregivers are unable to administer AAI devices, or even have them available (50).

In a study on a large university campus, only 6.6% of food-allergic students reported always carrying an AAI; in addition, only 39.7% avoided a self-identified food allergen (46).

The goals in school are to create a network of support and a self-sustaining environment of awareness that reduces the likelihood of reactions and enables staff to recognize and treat emergencies. The ideal approach is for schools to develop a formal policy, with the aim of achieving these goals, which is informed by the available expertise.

The school principal should take overall responsibility for provision and delivery of the policy. Early liaison with local expertise such as allergists, pediatricians, allergy nurses, and patient organizations is essential to the implementation of a well-informed, comprehensive policy. There may be significant barriers to be overcome in this regard as 'education' and 'health' are often governed by different municipal governmental bodies. Therefore, fostering a cooperative partnership between doctors, community nurses, dietitians, parents, and the school community is essential (48).

A named person should be responsible for development of management plans for individual children. This should ideally be a school nurse, but if not available, then another appropriately trained individual (e.g., teacher) could be identified. There may be no such person, in which case the principal is encouraged to seek help in training staff using suitable allergy resources (Box 2). All staff are responsible for implementation of the policy.

Teachers and school staff responsible for student supervision should be properly instructed to recognize the onset of an allergic reaction, including anaphylaxis, and know how and when to get help. In many schools, there is a lack of full-time school nurses, and teachers feel overwhelmed when the responsibility is placed upon them to take care of food-allergic children. It is imperative that teachers receive a comprehensive and practical educational program on food allergies whether a school nurse is available or not.

Ideally, school nurses should play a key role in coordinating management of students with food allergies. It is essential that they themselves have received sufficient training in FA. These school nurses can then train the entire school staff. A train-the-trainer anaphylaxis education program providing school nurses with curriculum, lesson plans, teaching-learning activities, and resources for anaphylaxis education of all school staff has been suggested in Europe (and the US) through patient organizations (51, 52). (http://www.anaphylaxis.org.uk/).

Box 2: Suggested source of expertise for help in developing policy and training staff

- Pediatric allergist.
- Pediatrician.
- Allergy nurse.
- Allergy-trained school nurse.
- National or local allergy patient organization.
- Expert patient/parent.
- Online resources.

The nominated individual should adapt the PEMP for each student. Parents need to be included in discussions on school management (including PEMPs) as they are well practiced in managing their child's FA by the time they reach school age. When school staff and parents cannot agree on an important issue, it can be taken to the specialist.

Another important component of the policy is to have systems in place to identify food-allergic children to school staff, especially catering or new/temporary staff. Any food provided by the school should have clear allergen labeling; menus including allergen information should be available to the families in advance. Appropriate food handling procedures should be put in place to minimize the risk of cross-contamination. A general 'allergen-ban' in isolation is inadequate, falling short of a 'whole school management' approach to instill allergy awareness throughout the school. Measures in line with these approach include: making sure that the child cannot be in contact with other children having allergenic foods, for example by having a teacher sitting in between the child and the other children; cleaning faces, hands, and the floor after meals; making sure that the allergic child has his/her own treats.

Bullying, teasing, and harassment of children with FA together with denial of their condition is also be frequently encountered (53, 54). Policies should be structured around ethical principles of confidentiality (where appropriate), fairness, avoiding stigmatization, and empowerment of those affected (55).

Primary and secondary/tertiary school policies should differ in order to reflect the needs and developmental level of their students. Primary school children tend to be in a more protective environment. In secondary schools, pupils should be supported in becoming more responsible for their allergies. During the teenage years, adolescents should be positively encouraged to self-manage their condition while still in a 'semi-protected' environment, in preparation for adulthood (56, 57). An 'adolescent-centered' approach empowers secondary pupils in a process that is meaningful and relevant to their lives (58).

Secondary schools should educate the peers of students with FA in good practice, risk awareness, and management of emergencies. This may help counteract the ignorance, stigma, and bullying associated with allergies.

Prompt administration of adrenaline is the first-line treatment for anaphylaxis. Scheduled checks for the availability of AAIs are essential, to identify AAI expiry and ensure timely replacement, in liaison with the family (59). Quick and easy access to adrenaline is also an issue since in many cases the device is stored in a remote office causing a delay. School policy should specify a protocol to bring the device to the student promptly during an emergency. Storage in the class or cafeteria or other unlocked and easily accessible locations is recommended for primary school students. As soon as the

student achieves a proper level of maturity, they can be encouraged to self-carry the device.

Adrenaline auto-injectors are not always subsidized by public health insurance, limiting their availability (60). In such cases, government support for reimbursement of AAIs in low-income households is desirable. Some US and Australian, though not European, legislatures are now permitting the patient nonspecific availability of AAIs in schools, which may address this issue of children and adolescents having to always carry their own AAIs. However, students will still need to carry their own AAI to protect them from the effects of food sharing and food accidents on the way to and from school (Box 3).

Providers of non-prepacked foods

Restaurants and other food establishments, such as bakeries, takeaways, deli counters, and fast-food outlets, pose a number of potential dangers for individuals with FA, particularly due to cross-contamination and unexpected ingredients.

A telephone survey of US patients who suffered reactions to peanut and tree nut in restaurants, bakeries, and shops showed that only 45% with previously diagnosed FA notified the establishment of their allergy. In the remainder of cases, reported reactions resulted from ingestion of food not intended for them, ingestion of food selected from buffet/food bars, or skin or inhalational contact (e.g., residual food on tables; peanut shells covering floors; being within a meter of the cooking of the food). For 78% of all reported reactions, someone in the establishment knew that the food contained the allergen as an ingredient. In 50% of these incidents, the food item was 'hidden' (e.g., in sauces and dressings). In 22% cases, exposures were reported from contamination caused primarily by shared cooking or serving supplies (61).

Social considerations such as peer pressure, embarrassment, stigma, alcohol ingestion, choice, and spontaneity may hamper a parent or adolescent's ability to apply appropriate avoidance behavior (62). The individual or family should clearly state the allergy (ies) to the provider on each occasion and if possible should preview the menu online. This should be repeated on every visit to take account of change in recipes or staff. The food providers have a responsibility to provide clear, comprehensive information on potential allergenic ingredients so the individual/family can make an informed decision about food consumption. Where the risk is unknown, this should also be stated, and the restaurant should be avoided.

At present, current food allergen legislation requires any of the 14 EU regulatory allergens, where used as ingredient, to be clearly declared within the ingredients list of prepacked foods (63). From December 2014, the Food Information for Consumers Regulation (EU Regulation No. 1169/2011) will also require businesses selling food sold non-prepacked to provide information about allergenic ingredients deliberately used in the food they serve to consumers. The allergens that have to be declared are mentioned in the Annex II of the Regulation. They include most of the major allergens, but not every food allergen. There are examples of voluntary best practice advice for such businesses (64).

Food preparation and handling techniques in catering establishments can increase the risk of a food-allergic reaction due to the possibility of cross-contamination. The frequency of accidental allergic reactions as a result of cross-contamination in food establishments is unknown, although it is frequently encountered in clinical practice. Ignorance of the ingredients in a recipe by serving staff also poses significant risk (65). Good communication between staff preparing food and front-of-house serving staff is essential to prevent this.

Some food-allergic individuals can react to ingestion of trace levels of the offending food, although highly variable ranges of threshold doses exist. The magnitude of the risk depends, among other factors, on the dose of exposure to cross-contaminated foods and the individual's threshold dose (66). Other cofactors at the time of the reaction such as poor asthma control, increasing age, type of food allergen, exercise, infection, menstruation, food additives, NSAIDs, and alcohol use may contribute to severity (66–69). One study showed that for peanut allergy, threshold levels decreased with increasing age and increasing sIgE (70). However, in most fatal reactions, the allergen was an ingredient in the food and not due to cross-contamination, and in most cases, the adrenaline was not available or not administered (11, 71). Insufficient threshold dose information within the food-allergic population restricts the advice on levels of unintended allergenic foods. In two challenge studies, for example, a low threshold did not correlate with severity of reported accidental reactions (67).

The need for more training for restaurant staff and consumer caution on staff knowledge gaps remains high. Studies from the USA and the UK of an assortment of staff from a wide variety of restaurants and fast-food outlets suggest a high degree of confidence, but a low level of knowledge and a desire for further training (72–74).

Traveling abroad may be perceived as potential risky situation for severe food-allergic reactions. Difficulties with airlines or restaurants are frequently quoted (74). The quality of data from studies reporting reactions on airplanes is poor also due to reluctance in survey response (75); however, the data suggest that a small number of reactions occur in this context, some of which are severe. Airline companies show inconsistency, for example, regarding provision of peanuts on board aircraft and requests for special assistance (76–80). Allergic reactions constituted only 2.2% of medical emergencies during commercial passenger flights in the USA (81).

In the survey performed by Greenhawt et al., although 76% of food-allergic patients reported carrying an AAI on a flight, only 10.6% of these individuals used their device, and overall, only 10% received adrenaline (from the auto-injector or via syringe) as treatment. Despite the reaction, 52.4% reported not making any changes in their behavior. However, some protective behavior was reported by the other half: 25.7% reported that they no longer consume food served on board, 23.8% now clean their personal seating area, and 20% request a peanut- or tree-nut-free flight. Twelve percent reported no longer flying commercially as a result of this reaction (78).

Box 3: Families, caregivers and the allergist, nurse and dietitian: recommendations

Recommendation	Evidence level	Grade	Key references
The individual/family			
Implement allergen prevention strategies recommended by the allergist, nurse and dietitian both within the home and the wider community	V	D	Expert consensus
For children, inform the school/early-years settings of the allergy and provide them with a food allergy (FA) management plan from the allergist	V	D	Expert consensus
Keep regular follow-up with the allergist and school nurse and dietitian and forward new copies of treatment plans to the school as they are updated	V	D	Expert consensus
Monitor medication expiry dates and replace adrenaline auto-injectors (AAIs) as required	V	D	Expert consensus
The allergist (allergy specialist or other healthcare professional with the appropriate training and competency)			
Provide a comprehensive FA management plan incorporating the following features: diagnosis, risk assessment, allergen avoidance advice, provision and training in emergency medication, including AAIs	V	D	Expert consensus
Provide a written management plan incorporating relevant allergen avoidance advice and use of emergency medication. This should be passed to the school to form a basis for the personalized care plan (PCP)	V	D	Expert consensus
Liaise with educational services (for children) to develop/maintain a comprehensive school allergy policy and individual PCPs	V	D	Expert consensus
Schools: recommendations			
The school principal should develop a comprehensive school policy for allergy aware management and a staff member should be identified to coordinate allergy care and liaise with local allergy services	IV	D	Expert opinion
The school should identify all children with FA in its care, and each should have a PCP. The care plan should clearly state which foods are to be avoided and what action is to be taken in the event of an accidental reaction	IV	D	Expert opinion
The school should engage with local allergy specialists to provide input into PCPs, training staff on food allergen avoidance, and how to treat reactions	IV	D	Expert opinion
The school should store emergency medication for each child as recommended by the allergist. Medication should be readily available	IV	D	Expert opinion
Allergy awareness should be applied to cooking and handling of food anywhere in the school	IV	D	Expert opinion
The scope of the comprehensive school policy should extend to school trips, exchanges and excursions	IV	D	Expert opinion
Suppliers and providers of nonpackaged foods			
Seek training and obtain competency in serving customers who have FA	IV	D	Expert opinion
Implement policy and procedures to reduce cross-contamination	IV	D	Expert opinion
Provide information to customers about food allergen content or possible cross-contamination	IV	D	Expert opinion

The approach to eating on an aircraft should be the same as that for any restaurant, ensuring the cabin staff are aware of the allergy (preferably inform the airline before the flight and the cabin staff on the day), and the contents of any meal served during the flight should be carefully checked. Emergency medication should be carried in the aircraft cabin and not packed into the luggage hold.

At the destination, individuals can use a variety of strategies to remain safe including visiting familiar environments, carrying allergy information cards in the host language, and possibly preparing their own food (82). They should also carry a sufficient supply of emergency medication, bearing in mind it may be difficult to replace, and be prepared to use it.

General public

The general public plays a significant role in the well-being of individuals with FA. The emergence of FA as a significant

Box 4: Families, caregivers and the allergist, nurse and dietitian: recommendations

Recommendation	Evidence level	Grade	Barriers to implementation	Facilitators to implementation	Audit criteria
The individual/family					
Implement allergen prevention strategies recommended by the allergist, nurse, and dietitian both within the home and in the wider community	V	D	Lack of trained personnel to explain the indications	Education of the family as a whole, including caregivers through specific educational courses	% of families receiving proper advice
For children, inform the school/ early-years settings of the allergy and provide them with a food allergy (FA) management plan from the allergist	V	D	Lack of allergists Lack of time and adequate knowledge among primary care physicians Fear of stigma Lack of proper legislation implementing guidelines for school	Education and training of nurses and medical students Education on psychological issues and proper communication Implementation of specific legislation	% of patients with FA management plans at school
Keep regular follow-up with the allergist and school nurse and dietitian and forward new copies of treatment plans to the school as they are updated	V	D	Lack of communication among stakeholders Lack of trained personnel Long waiting lists	Implementation of proper communication flow, for example, Web-based intranet	% of school receiving updates directly
Monitor medication expiry dates and replace adrenaline auto-injectors (AAIs) as required	V	D	Lack of knowledge that AAIs expire, availability and cost of auto-injectors	Alert systems as reminder, check at each physician's visit	% of patient with AAI not expired
The allergist (allergy specialist or other healthcare professional with the appropriate training and competency)					
Provide a comprehensive FA management plan incorporating the following features: diagnosis, risk assessment, allergen avoidance advice, provision and training in emergency medication, including AAIs	V	D	Lack of knowledge among healthcare professionals, lack of training	Education to primary care physicians, nurses, dietitians, and medical students	% of patients receiving an adequate comprehensive consultation
Provide a written management plan incorporating relevant allergen avoidance advice and use of emergency medication. This should be passed to the school to form a basis for the personalized care plan (PCP)	V	D	Lack of trained personnel, lack of adequate communication with the school	Education to primary care physicians, nurses, dietitians, and medical students	% of patients receiving management plans
Liaise with educational services (for children) to develop/maintain a comprehensive school allergy policy and individual PCPs	V	D	Lack of time and resources	Compensation for time spent for educational activity	% of consultations to school
Schools: recommendations					
The principal should develop a comprehensive school policy for allergy aware management and a staff member should be identified to coordinate allergy care and liaise with local allergy services	IV	D	Lack of specific national guidelines for school Liability issues for school staff to be addressed	Implementing national guidelines for school	% of national countries with guidelines for school % of schools with management plans

Box 4: (Continued)

Recommendation	Evidence level	Grade	Barriers to implementation	Facilitators to implementation	Audit criteria
The school should identify all children with FA in its care, and each should have a PCP. The care plan should clearly state which foods are to be avoided and what action is to be taken in the event of an accidental reaction	IV	D	Lack of specific national guidelines for school	Implementing national guidelines for school	% of national countries with guidelines for school % of children correctly identified
The school should engage with local allergy specialists to provide input into PCPs, training staff on food allergen avoidance, and how to treat reactions	IV	D	Lack of specific national guidelines for school	Implementing national guidelines for school	% of national countries with guidelines for school % of school staff trained
The school should store emergency medication for each child as recommended by the allergist. Medication should be readily available	IV	D	Lack of specific national guidelines for school	Implementing national guidelines for school	% of staff aware of the medication storage and expiry date
Allergy awareness should be applied to cooking and handling of food anywhere in the school	IV	D	Lack of specific national guidelines for school Liability issues for school staff to be addressed	Implementing national guidelines Implementing procedures	% of school with proper procedures
The scope of the comprehensive school policy should extend to school trips, exchanges and excursions	IV	D	Lack of specific national guidelines for school Liability issues for school staff to be addressed	Implementing national guidelines Implementing procedures	% of school with proper procedures
Suppliers and providers of nonpackaged foods					
Seek training and obtain competency in serving customers who have FA	IV	D	Lack of awareness, knowledge, and training, lack of legislation	Educational courses	% of staff with adequate knowledge
Implement policy and procedures to reduce cross-contamination	IV	D	Lack of awareness, knowledge, and training, lack of legislation, lack of funding for educational activities	Educational courses on national basis funded by the Government or charities Implementation of policies and procedures	% of policies and procedures developed and implemented
Provide information to customers about food allergen content or possible cross-contamination	IV	D	Lack of awareness, knowledge, and training, lack of legislation	Educational courses on national basis funded by the Government or charities Implementation of policies and procedures	% of customers receiving proper management

public health problem has been relatively recent and is accompanied by increasing interest from the mass media and the commercial sector, as policymakers respond to the demands of affected individuals (82). Food allergy has become an important issue on the regulatory agenda, particularly in the UK, Canada, the USA, New Zealand, and Australia (83). In order to respond appropriately to the growing prevalence of food allergies, decision-makers must balance protecting the affected population, while accommodating the general public's needs.

Improved FA knowledge among the general public is desirable. A Web-based survey of the general US population showed that familiarity and prior training in FA management were associated with higher knowledge scores.

However, respondents tended to minimize the stigma associated with FA and oppose FA policies in schools, such as nut bans or special FA tables (84).

The introduction of public health policies to protect food-allergic individuals should be based on the best available data and expert consensus. Currently, many policies and regulations are being implemented in public spaces (schools, restaurants) despite the lack of scientific consensus (85) (Box 3). Consequently, these policies are often perceived as extreme in the literature, in the media, and by the nonallergic population (86). The inflated perception of risk of severe food allergies in the general population (85, 87) has resulted in several debates related to protection *vs* rights, particularly around the policies developed in response to the disproportionate burden of food allergies in children (88).

In addition, social exclusion (such as parents reluctant to invite a child with allergies, prohibited trips and activities or reduced career options in the longer term) is a growing problem that needs to be addressed at the societal level. In the meantime, careful planning such as training the staff who will be accompanying the allergic child in the trip in allergen avoidance on symptoms recognition and emergency medication should overcome some situations of social exclusion.

Concluding remarks

Food allergy reactions commonly occur outside hospitals and the home environment. Food allergies are now seen as a health risk and there is a growing interest from the general public, mass media, and the commercial sector. Community exposure, traveling abroad, and lack of information from healthcare providers are factors that place food-allergic patients at greater risk of severe or fatal anaphylaxis. In the community, many stakeholders need to work together to reduce the risk of allergic reactions to foods and to manage any that occur.

The ability of the parents of children with food allergies to assess the risk and manage their child's condition is highly dependent on the parental knowledge, attitudes, support of family/friends/others including support organizations and beliefs of FA. School nurses and teachers play a key role in managing young students with food allergies. For older students, self-management should be encouraged. Policies regarding FA management in schools range widely and are often inadequate if not made in conjunction with an informed clinician.

Many retail catering facilities are poorly prepared to handle the advent of anaphylaxis, and the staffs often have poor or truncated knowledge on acute or preventive management of FA. Businesses such as restaurants and takeaways have no legal obligation to warn customers about potential allergen content. The need for more training for restaurant/cafeteria/fast-food/takeaway staff and consumer caution on food allergen content and staff knowledge gaps remains high.

Communication patterns of food-allergic patient within the general community may be hampered by legitimate everyday social considerations such as embarrassment, choice, spontaneity, and discrimination. Increased FA knowledge among the general public is required; nevertheless, the needs and rights of the nonallergic population should be taken into consideration as well. Instead of being blatantly discriminatory, policies should be structured around ethical principles of confidentiality and anonymity, fairness, avoiding stigmatization, and empowerment of the patients.

However, implementing proper risk management strategies should be evidence based. The paucity of randomized–controlled studies on evaluation of effectiveness and cost-effectiveness of such interventions has so far restricted the grade of recommendations, mainly at the level of expert consensus. As a consequence, the adoption of procedures has been limited to very few countries. The time has come to undertake efforts to address properly these issues in order to fulfill adequate safety measures in the community at-large worldwide (Box 4).

Expert panel

We are grateful to the expert panel for providing expert feedback on the final draft of the paper: Magnus Borres (Uppsala University, Uppsala), Anna Bręborowicz (Poznan University of Medical Sciences, Poznan, Poland), Chun-Han Chan (Food Standards Agency, London), M. Hazel Gowland (Anaphylaxis Campaign, Farnborough), Matt Greenhawt (The University of Michigan Medical School, and the University of Michigan Health System, Ann Arbor), Ruchi Gupta (Northwestern University Feinberg School of Medicine, Chicago; Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago), Marcia Podestà (Food Allergy Italia).

Acknowledgments

We would like to acknowledge the support of EAACI and the EAACI Food Allergy and Anaphylaxis Guidelines Group in developing these guidelines. We would like to thank Dr. Cristina Ranzato for her insights and advice on public health issues and Ms Catherine Crowley for her administrative help in preparing the guidelines. We would also like to thank our EAACI taskforce members and the EAACI Executive Committee for their helpful comments and suggestions.

Author contributions

Antonella Muraro, Chair of the EAACI Food Allergy and Anaphylaxis Guidelines Initiative, has steered and coordinated the publication. Ioana Agache and Andy Clark wrote the first draft of the manuscript. All authors participated in the revision of the manuscript including the discussion of the recommendations and gaps.

Conflicts of interest

Antonella Muraro has provided scientific advice for Meda. Graham Roberts has provided scientific advice for Danone and ALK-Abelló; Thermo Fisher and ALK-Abelló have pro-

vided consumables for their research activities. Jonathan O'B. Hourihane has received speaker fees from Mead Johnson, Nutricia, MSD, Pfizer, ALK-Abelló, and Stallergenes; Thermo Fisher has provided consumables for their research activities. Luis Miguel Borrego has received honoraria for lectures from MSD. Sabine Schnadt has support for travel to EAACI congress from Peanut Council and Novartis. Ioana Agache, Jennette Higgs, Angel Mazon, Magnus Wickman, Maria Said, Davide Parmigiani, Andrew Clark, Cezmi Akdis, Berber Vlieg-Boerstra, Penny Jorgensen, Harmieke van Os-Medendorp and Aziz Sheikh have no conflict of interests in relation to this manuscript.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Data S1. Methods.

Table S1. Assigning levels of evidence and recommendations.

Table S2. Suggested elements of food allergy policy for schools.

Table S3. Gaps and research families, caregivers and the allergist.

References

1. Eigenmann PA, Zamora SA. An internet-based survey on the circumstances of food-induced reactions following the diagnosis of IgE-mediated food allergy. *Allergy* 2002;**57**:449–453.
2. Muraro A, Clark A, Beyer K, Borrego LM, Borres M, LødrupCarlsen KC et al. The management of the allergic child at school: EAACI/GA2LEN Task Force on the allergic child at school. *Allergy* 2010;**65**:681–689.
3. Gupta R, Sheikh A, Strachan D, Anderson HR. Increasing hospital admissions for systemic allergic disorders in England: analysis of national admissions data. *BMJ* 2003;**327**:1142–1143.
4. Nowak-Wegrzyn A, Sampson HA. Adverse reactions to foods. *Med Clin North Am* 2006;**90**:97–127.
5. Bidat E. Food allergy in children. *Arch Pediatr* 2006;**13**:1349–1353.
6. Nwaru BI, Hickstein L, Panesar SS, Muraro A, Werfel T, Cardona V et al. The epidemiology of food allergy in Europe: a systematic review and meta-analysis. *Allergy* 2014;**69**:62–75.
7. Mehl A, Wahn U, Niggemann B. Anaphylactic reactions in children-a questionnaire-based survey in Germany. *Allergy* 2005;**60**:1440–1445.
8. Vetander M, Helander D, Flodström C, Ostblom E, Alfvén T, Ly DH et al. Anaphylaxis and reactions to foods in children – a population-based case study of emergency department visits. *Clin Exp Allergy* 2012;**42**:568–577.
9. Beyer K, Eckermann O, Hompes S, Grabenhenrich L, Worm M. Anaphylaxis in an emergency setting – elicitors, therapy and incidence of severe allergic reactions. *Allergy* 2012;**67**:1451–1456.
10. Cox HE. Food allergy as seen by an allergist. *J Pediatr Gastroenterol Nutr* 2008;**47** (Suppl 2):S45–S48.
11. Novembre E, Cianferoni A, Bernardini R et al. Anaphylaxis in children: clinical and allergologic features. *Pediatrics* 1998;**101**:E8.
12. Moneret-Vautrin DA, Kanny G, Morisset M, Flabbee J, Guénard L, Beaudouin E et al. Food anaphylaxis in schools: evaluation of the management plan and the efficiency of the emergency kit. *Allergy* 2001;**56**:1071–1076.
13. Rankin KE, Sheikh A. Serious shortcomings in the management of children with anaphylaxis in Scottish schools. *PLoS Med* 2006;**3**:e326.
14. McIntyre CL, Sheetz AH, Carroll CR, Young MC. Administration of epinephrine for life-threatening allergic reactions in school settings. *Pediatrics* 2005;**116**:1134–1140.
15. Bock SA, Muñoz-Furlong A, Sampson HA. Further fatalities caused by anaphylactic reactions to food, 2001–2006. *J Allergy Clin Immunol* 2007;**119**:1016–1018.
16. Young MC, Muñoz-Furlong A, Sicherer SH. Management of food allergies in schools: a perspective for allergists. *J Allergy Clin Immunol* 2009;**124**:175–182.
17. Burks W, Ballmer-Weber BK. Food allergy. *Mol Nutr Food Res* 2006;**50**:595–603.
18. Allen KJ, Hill DJ, Heine RG. Food allergy in childhood. *Med J Aust* 2006;**185**:394–400.
19. Uguz A, Lack G, Pumphrey R, Ewan P, Warner J, Dick J et al. Allergic reactions in the community: a questionnaire survey of members of the anaphylaxis campaign. *Clin Exp Allergy* 2005;**35**:746–750.
20. AAAAI Board of Directors, American Academy of Allergy, Asthma and Immunology. Anaphylaxis in schools and other child-care settings. *J Allergy Clin Immunol* 1998;**102**:173–176.
21. School guidelines for managing students with food allergies. *School Nurse News* 2002;**19**:10.
22. School guidelines for managing students with food allergies. *School Nurse News* 2006;**23**:13–14.
23. School guidelines for managing students with food allergies. *School Nurse News* 2007;**24**:8, 11.
24. Robinson JM, Ficca M. Managing the student with severe food allergies. *J Sch Nurs* 2012;**28**:187–194.
25. Pumphrey RS, Gowland MH. Further fatal allergic reactions to food in the United Kingdom, 1999–2006. *J Allergy Clin Immunol* 2007;**119**:1018–1019.
26. Kapoor S, Roberts G, Bynoe Y, Gaughan M, Habibi P, Lack G. Influence of a multidisciplinary paediatric allergy clinic on parental knowledge and rate of subsequent allergic reactions. *Allergy* 2004;**59**:185–191.
27. Muñoz-Furlong A, Weiss CC. Characteristics of food-allergic patients placing them at risk for a fatal anaphylactic episode. *Curr Allergy Asthma Rep* 2009;**9**:57–63.
28. Imamura T, Kanagawa Y, Ebisawa M. A survey of patients with self-reported severe food allergies in Japan. *Pediatr Allergy Immunol* 2008;**19**:270–274.
29. Sampson MA, Muñoz-Furlong A, Sicherer SH. Risk-taking and coping strategies of adolescents and young adults with food allergy. *J Allergy Clin Immunol* 2006;**117**:1440–1445.
30. Gallagher M, Worth A, Cunningham-Burley S, Sheikh A. Epinephrine auto-injector use in adolescents at risk of anaphylaxis: a qualitative study in Scotland, UK. *Clin Exp Allergy* 2011;**41**:869–877.
31. Gallagher M, Worth A, Cunningham-Burley S, Sheikh A. Strategies for living with the risk of anaphylaxis in adolescence: qualitative study of young people and their parents. *Prim Care Respir J* 2012;**21**:392–397.
32. Centers for Disease Control and Prevention. *Voluntary Guidelines for Managing Food Allergies in Schools and Early Care and Education Programs*. Washington, DC: US Department of Health and Human Services, 2013. Available at: http://www.cdc.gov/healthyyouth/foodallergies/pdf/13_243135_A_Food_Allergy_Web_508.pdf.
33. Soares-Weiser K, Takwoingi Y, Panesar SS, Muraro A, Werfel T, Hoffmann-Sommergruber K et al. The diagnosis of food allergy:

a systematic review and meta-analysis. *Allergy* 2014;**69**:76–86.
34. de Silva D, Geromi M, Panesar SS, Muraro A, Werfel T, Hoffmann-Sommergruber K et al. Acute and long-term management of food allergy: systematic review. *Allergy* 2014;**69**:159–167.
35. Clark AT, Ewan PW. Good prognosis, clinical features, and circumstances of peanut and tree nut reactions in children treated by a specialist allergy center. *J Allergy Clin Immunol* 2008;**122**:286–289.
36. Knibb RC, Semper H. Impact of suspected food allergy on emotional distress and family life of parents prior to allergy diagnosis. *Pediatr Allergy Immunol* 2013;**24**:798–803.
37. Dhami S, Panesar SS, Roberts G, Muraro A, Worm M, Bilò MB et al. Management of anaphylaxis: a systematic review. *Allergy* 2014;**69**:168–175.
38. Health Council of the Netherlands. *Food Allergy*. The Hague: Health Council of the Netherlands, 2007: publication no. 2007/07.
39. Flokstra-de Blok BM, Doriene van Ginkel C, Roerdink EM, Kroeze MA, Stel AA, van der Meulen GN et al. Extremely low prevalence of epinephrine autoinjectors in high-risk food-allergic adolescents in Dutch high schools. *Pediatr Allergy Immunol* 2011;**22**:374.
40. Noimark L, Wales J, Du Toit G, Pastacaldi C, Haddad D, Gardner J et al. The use of adrenaline autoinjectors by children and teenagers. *Clin Exp Allergy* 2012;**42**:284–292.
41. Arkwright PD, Farragher AJ. Factors determining the ability of parents to effectively administer intramuscular adrenaline to food allergic children. *Pediatr Allergy Immunol* 2006;**17**:227–229.
42. Kim JS, Sinacore JM, Pongracic JA. Parental use of EpiPen for children with food allergies. *J Allergy Clin Immunol* 2005;**116**:164–168.
43. Gupta RS, Springston EE, Smith B, Kim JS, Pongracic JA, Wang X et al. Food allergy knowledge, attitudes, and beliefs of parents with food-allergic children in the United States. *Pediatr Allergy Immunol* 2010;**21**:927–934.
44. Weiss C, Muñoz-Furlong A, Furlong TJ, Arbit J. Impact of food allergies on school nursing practice. *J Sch Nurs* 2004;**20**:268–278.
45. Polloni L, Lazzarotto F, Toniolo A, Ducolin G, Muraro A. What do school personnel know, think and feel about food allergies? *Clin Transl Allergy* 2013;**3**:39.
46. Greenhawt MJ, Singer AM, Baptist AP. Food allergy and food allergy attitudes among college students. *J Allergy Clin Immunol* 2009;**124**:323–327.
47. Ercan H, Ozen A, Karatepe H, Berber M, Cengizlier R. Primary school teachers' knowledge about and attitudes toward anaphylaxis. *Pediatr Allergy Immunol* 2012;**23**:428–432.
48. Behrmann J. Ethical principles as a guide in implementing policies for the management of food allergies in schools. *J Sch Nurs* 2010;**26**:183–193.
49. Pouessel G, Deschildre A, Castelain C, Sardet A, Sagot-Bevenot S, de Sauve-Boeuf A et al. Parental knowledge and use of epinephrine auto-injector for children with food allergy. *Pediatr Allergy Immunol* 2006;**17**:221–226.
50. Clark S, Camargo CA Jr. Emergency management of food allergy: systems perspective. *Curr Opin Allergy Clin Immunol* 2005;**5**:293–298.
51. Cavanaugh R, Strickland CJ. Research to practice: developing an integrated anaphylaxis education curriculum for school nurses. *J Sch Nurs* 2011;**27**:197–208.
52. Clarke S. AllergyWise online training and resources for healthcare professionals. Available at: http://www.anaphylaxis.org.uk/healthcare/allergywise-training/allergywise-online-training-and-resources-for-healthcare-professionals.
53. Pulcini JM, Sease KK, Marshall GD. Disparity between the presence and absence of food allergy action plans in one school district. *Allergy Asthma Proc* 2010;**31**:141–146.
54. Shemesh E, Annunziato RA, Ambrose MA, Ravid NL, Mullarkey C, Rubes M et al. Child and parental reports of bullying in a consecutive sample of children with food allergy. *Pediatrics* 2013;**131**:e10–e17.
55. Lieberman JA, Weiss C, Furlong TJ, Sicherer M, Sicherer SH. Bullying among pediatric patients with food allergy. *Ann Allergy Asthma Immunol* 2010;**105**:282–286.
56. Gådin KG, Weiner G, Ahlgren C. Young students as participants in school health promotion: an intervention study in a Swedish elementary school. *Int J Circumpolar Health* 2009;**68**:498–507.
57. Standage M, Cumming SP, Gillison FB. A cluster randomized controlled trial of the be the best you can be intervention: effects on the psychological and physical well-being of school children. *BMC Public Health* 2013;**13**:666.
58. Fenton NE, Elliott SJ, Cicutto L, Clarke AE, Harada L, McPhee E. Illustrating risk: anaphylaxis through the eyes of the food-allergic child. *Risk Anal* 2011;**31**:171–183.
59. Spina JL, McIntyre CL, Pulcini JA. An intervention to increase high school students' compliance with carrying auto-injectable epinephrine: a MASNRN study. *J Sch Nurs* 2012;**28**:230–237.
60. Frost DW, Chalin CG. The effect of income on anaphylaxis preparation and management plans in Toronto primary schools. *Can J Public Health* 2005;**96**:250–253.
61. Furlong TJ, DeSimone J, Sicherer SH. Peanut and tree nut allergic reactions in restaurants and other food establishments. *J Allergy Clin Immunol* 2001;**108**:867–870.
62. Leftwich J, Barnett J, Muncer K, Shepherd R, Raats MM, Hazel Gowland M et al. The challenges for nut-allergic consumers of eating out. *Clin Exp Allergy* 2011;**41**:243–249.
63. Anandan C, Sheikh A. European developments in labelling allergenic foods. *BMJ* 2005;**331**:1155–1156.
64. The provision of allergen information for non pre-packed foods. Food Standards Agency, 2008. Available at: http://food.gov.uk/business-industry/guidancenotes/labelregsguidance/nonprepacked#.U38p8S_3PLk.
65. Zurzolo GA, Mathai ML, Koplin JJ, Allen KJ. Hidden allergens in foods and implications for labelling and clinical care of food allergic patients. *Curr Allergy Asthma Rep* 2012;**12**:292–296.
66. Taylor SL, Baumert JL. Cross-contamination of foods and implications for food allergic patients. *Curr Allergy Asthma Rep* 2010;**10**:265–270.
67. Eller E, Hansen TK, Bindslev-Jensen C. Clinical thresholds to egg, hazelnut, milk and peanut: results from a single-center study using standardized challenges. *Ann Allergy Asthma Immunol* 2012;**108**:332–336.
68. Hompes S, Dölle S, Grünhagen J, Grabenhenrich L, Worm M. Elicitors and co-factors in food-induced anaphylaxis in adults. *Clin Transl Allergy* 2013;**3**:38.
69. Cardona V, Luengo O, Garriga T, Labrador-Horrillo M, Sala-Cunill A, Izquierdo A et al. Co-factor-enhanced food allergy. *Allergy* 2012;**67**:1316–1318.
70. van der Veen MJ, van Ree R, Aalberse RC, Akkerdaas J, Koppelman SJ, Jansen HM et al. Poor biologic activity of cross-reactive IgE directed to carbohydrate determinants of glycoproteins. *J Allergy Clin Immunol* 1997;**100**:327–334.
71. Ferreira CT, Seidman E. Food allergy: a practical update from the gastroenterological viewpoint. *J Pediatr (Rio J)* 2007;**83**:7–20.
72. Ahuja R, Sicherer SH. Food-allergy management from the perspective of restaurant and food establishment personnel. *Ann Allergy Asthma Immunol* 2007;**98**:344–348.
73. Bailey S, Albardiaz R, Frew AJ, Smith H. Restaurant staff's knowledge of anaphylaxis and dietary care of people with allergies. *Clin Exp Allergy* 2011;**41**:713–717.
74. Leitch IS, Walker MJ, Davey R. Food allergy: gambling your life on a take-away meal. *Int J Environ Health Res* 2005;**15**:79–87.

75. Shehata Y, Sheikh A. Flight anaphylaxis emergencies: lessons gained from attempting a questionnaire pilot study. *Prim Care Respir J* 2007;**16**:321.
76. Comstock SS, DeMera R, Vega LC, Boren EJ, Deane S, Haapanen LA et al. Allergic reactions to peanuts, tree nuts, and seeds aboard commercial airliners. *Ann Allergy Asthma Immunol* 2008;**101**:51–56.
77. Moore BR, Ping JM, Claypool DW. Pediatric emergencies on a US-based commercial airline. *Pediatr Emerg Care* 2005;**21**:725–729.
78. Greenhawt MJ, McMorris MS, Furlong TJ. Self-reported allergic reactions to peanut and tree nuts occurring on commercial airlines. *J Allergy Clin Immunol* 2009;**124**:599–600.
79. Sicherer SH, Furlong TJ, DeSimone J, Sampson HA. Self-reported allergic reactions to peanut on commercial airliners. *J Allergy Clin Immunol* 1999;**104**:186–189.
80. Barnett J, Botting N, Gowland MH, Lucas JS. The strategies that peanut and nut-allergic consumers employ to remain safe when travelling abroad. *Clin Transl Allergy* 2012;**2**:12.
81. Peterson DC, Martin-Gill C, Guyette FX, Tobias AZ, McCarthy CE, Harrington ST et al. Outcomes of medical emergencies on commercial airline flights. *N Engl J Med* 2013;**368**:2075–2083.
82. Nettleton S, Woods B, Burrows R, Kerr A. Food allergy and food intolerance: towards a sociological agenda. *Health* 2009;**13**:647–664.
83. Chafen JJ, Newberry SJ, Riedl MA, Bravata DM, Maglione M, Suttorp MJ et al. Diagnosing and managing common food allergies. *JAMA* 2010;**303**:1848–1856.
84. Gupta RS, Kim JS, Springston EE, Smith B, Pongracic JA, Wang X et al. Food allergy knowledge, attitudes, and beliefs in the United States. *Ann Allergy Asthma Immunol* 2009;**103**:43–50.
85. Harrington DW, Elliott SJ, Clarke AE, Ben-Shoshan M, Godefroy S. Exploring the determinants of the perceived risk of food allergies in Canada. *Hum Ecol Risk Assess* 2012;**18**:1338–1358.
86. Harrington DW, Elliott SJ, Clarke AE. Frames, claims and audiences: construction of food allergies in the Canadian media. *Public Underst Sci* 2012;**21**:724–739.
87. Rona RJ, Keil T, Summers C, Gislason D, Zuidmeer L, Sodergren E et al. The prevalence of food allergy: a meta-analysis. *J Allergy Clin Immunol* 2007;**120**: 638–646.
88. Madsen C, Crevel R, Chan C, Dubois AE, DunnGalvin A, Flokstra-de Blok BM et al. Food allergy: stakeholder perspectives on acceptable risk. *Regul Toxicol Pharmacol* 2010;**57**:256–265.
89. Johansson SGO, Bieber T, Dahl R, Friedmann PS, Lanier BQ, Lockey RF et al. Revised nomenclature for allergy for global use: report of the Nomenclature Review Committee of the World Allergy Organization, October 2003. *J Allergy Clin Immunol* 2004;**113**:832–836.

Data S1

METHODS

This Guideline was produced using the Appraisal of Guidelines for Research & Evaluation (AGREE II) approach (1,2). This is a structured approach to guideline production that is designed to ensure appropriate representation of the wide range of stakeholders, a careful search for and critical appraisal of the relevant literature, a systematic approach to the formulation and presentation of recommendations, and steps to ensure that the risk of bias is minimized at each step of the process. We provide below an overview of the approach used.

Clarifying the scope and purpose of the Guideline

The process began in January 2012 with a meeting to discuss the overall approach to guideline development. This included detailed discussions on the main aims of the guidelines, the target conditions, agreeing the intended end-user for the recommendations, agreeing the intended end-user group, and ensuring adequate professional and lay representation in the guidelines development process.

Ensuring appropriate stakeholder involvement

Participants represented 20 European countries, from different disciplinary and clinical backgrounds, including medical tertiary, secondary and primary care, dietitians, nursing and teachers and patient groups. Primary Care: Aziz Sheikh; Nurse: van Os-Medendorp; Dietitians: Berber Vlieg-Boestra, Jeanette Higgs; Association of Teacher for Education in Europe – ATEE: Davide Parmigiani, Patient's Organizations representatives: Sabine Schnadt (Germany), Penny Jorgensen (New Zealand) Maria Said (Anaphylaxis Australia)

Formulating recommendations

The following recommendations are the result of expert opinion consensus following previous systematic reviews of literature on epidemiology, diagnosis and management of food allergy and anaphylaxis (3-6) and extensive narrative review of

Confidential Draft

the relevant literature. They result also from consultations with all the stakeholders involved in management of food allergy and anaphylaxis, such as primary care physicians, nurses, dietitians, patient organizations and teachers associations.

Experts identified the resource implications of implementing the recommendations, barriers and facilitators to the implementation of each recommendation, advised on approaches to implementing the recommendations and suggested audit criteria that can help with assessing organizational compliance with each recommendation. (Table S1)

Peer review

A draft of this Guideline was externally peer-reviewed by experts from a range of organizations, countries and professional backgrounds. All feedback was considered by the Community Task Force and, where appropriate, final revisions were made in the light of the feedback received. We will be pleased to continue to receive feedback on this Guideline, which should be addressed to the corresponding author.

Identification of evidence gaps

The process of developing this Guideline identified a number of evidence gaps and we plan in future to prioritize the questions that the Community Task Force believes should be urgently addressed through formal consensus building techniques. We plan furthermore to draft outline research briefs that funders can use to commission research on these questions.

Editorial independence and managing conflict of interests

The production of this Guideline was funded and supported by EAACI. The funders did not have any influence on the guideline production process, its contents or on the decision to publish. All members of the Community Task Force completed conflicts of interest statements and these were taken into account by the Community Task Force chair as recommendations were formulated.

Confidential Draft

Updating the Guideline

We plan to update this Guideline in 2017 unless there are important advances before then.

Table S1. Assigning levels of evidence and recommendations (7)

Level of evidence	
Level I	Systematic reviews, meta-analysis, randomized controlled trials
Level II	Two groups, non-randomized studies (e.g. cohort, case-control)
Level III	One-group non-randomized (e.g. before and after, pre test and post test)
Level IV	Descriptive studies that include analysis of outcomes (single-subject design, case-series)
Level V	Case reports and expert opinion that include narrative literature, reviews and consensus statements
Grades of recommendation	
Grade A	Consistent level I studies
Grade B	Consistent level II or III studies or extrapolations from Level I studies
Grade C	Level IV studies or extrapolations from level II or III studies
Grade D	Level V evidence or troublingly inconsistent or inconclusive studies at any level

Table S2. Suggested elements of food allergy policy for schools (8-10)

- Formal school policy
- Led by principal
- All staff (including non-teaching) responsible for implementation
- Specify named personnel for coordination of management plans and training staff in emergency medication use
- Engage with local expertise (allergist, nurse, paediatrician)
- Process to identify FA children at school entry
- System to identify food-allergic children to school staff, especially catering or new/temporary staff
- Clear communication line to parents
- Protocol to provide PEMP
- Approach to allergen avoidance in school
- Include extra-curricular activities (e.g. school trips)
- Integrate food allergy into bullying/child protection policy
- Periodic checks of AAI availability and expiry
- Protocol to deliver AAI from storage to site of emergency treatment

Confidential Draft

Confidential Draft

Table S3: Gaps and Research Families, caregivers and the allergist

Gaps in the evidence	Plan to address	Priority
Epidemiology of food-induced anaphylactic reactions in the community (incidence and risk assessment)	Disease registries and large epidemiological trials with a common methodology	High
Population thresholds for common food allergens and interaction with co-factors	Studies to estimate population thresholds and actions levels for common food allergens, including estimating the effect of co-factors (e.g. exercise) on the action levels	High
Objective measurement of interventions aimed to reduce food allergic reactions in the community	Pragmatic Interventional Randomized Control Trials (RCTs) to prevent food allergic reactions in the community including quality of life / anxiety score as outcome measure.	High
Comparison between various intervention methods for efficacy and cost-effectiveness	RCTs of various media (smartphone apps and websites) to implement/reinforce training packages for prevention and acute management of reactions. Especially useful for evaluation of specific target groups, such as teenagers/young adults and teachers.	High
	Trials of efficacy and cost-effectiveness of different models of school training implementation, e.g. web based school nurse training versus face-face.	High

Confidential Draft

	Trials of efficacy and cost-effectiveness of different models to improve knowledge base of community food providers.	High

Confidential Draft

References

1. Agree Collaboration. Development and validation of an international appraisal instrument for assessing the quality of clinical practice guidelines: the AGREE project. . Quality and Safety in Health Care 2003;12(1):18-23.

2. Brouwers MC, Kho ME, Browman GP, Burgers JS, Cluzeau F, Feder G, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. Canadian Medical Association Journal 2010;182(18):E839-E842.

3. Nwaru BI, Hickstein L, Panesar SS, Muraro A, Werfel T, Cardona V, et al. EAACI Food Allergy and Anaphylaxis Guidelines Group. The epidemiology of food allergy in Europe: a systematic review and meta-analysis. Allergy. 2014 Jan;69(1):62-75.

4. Soares-Weiser K, Takwoingi Y, Panesar SS, Muraro A, Werfel T, Hoffmann-Sommergruber K, et al. The diagnosis of food allergy: a systematic review and meta-analysis. *Allergy*. 2014 Jan;69(1):76-86

5. de Silva D, Geromi M, Panesar SS, Muraro A, Werfel T, Hoffmann-Sommergruber K, et al. Acute and long-term management of food allergy: systematic review. *Allergy.* 2014 Feb;69(2):159-67.

6. Dhami S, Panesar SS, Roberts G, Muraro A, Worm M, Bilò MB, et al. Management of anaphylaxis: a systematic review. *Allergy.* 2014 Feb;69(2):168-75.

7. Oxford Centre for Evidence-based Medicine. Levels of Evidence and Grades of Recommendation. http://www cebm net/index aspx?o=1025 (accessed 25th March 2013)

8. Cavanaugh R, Strickland CJ. Research to practice: developing an integrated anaphylaxis education curriculum for school nurses. J SchNurs. 2011;27(3):197-208.

9. http://www.anaphylaxis.org.uk/healthcare/allergywise-training/allergywise-online-training-and-resources-for-healthcare-professionals

10. Gådin KG, Weiner G, Ahlgren C. Young students as participants in school health promotion: an intervention study in a Swedish elementary school. Int J Circumpolar Health. 2009 Dec;68(5):498-507.

Confidential Draft

Confidential Draft