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Prevention and management of allergic reactions to food in child care centers and schools: Practice guidelines

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Prevention and management of allergic reactions to food in child care centers and schools: Practice guidelines

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Food allergy management in child care centers and schools is a controversial topic, for which evidence-based guidance is needed. Following the Grading of Recommendations Assessment, Development, and Evaluation approach, we conducted systematic literature reviews of the anticipated health effects of selected interventions for managing food allergy in child care centers and schools; we compiled data about the costs, feasibility, acceptability, and effects on health equity of the selected interventions; and we developed the following conditional recommendations: we suggest that child care centers and schools implement allergy training and action plans; we suggest that they use epinephrine (adrenaline) to treat suspected anaphylaxis; we suggest that they stock unassigned epinephrine autoinjectors, instead of requiring students to supply their own personal autoinjectors to be stored on site for designated at-school use; and we suggest that they do not implement site-wide food prohibitions (eg, "nut-free" schools) or allergen-restricted zones (eg, "milk-free" tables), except in the special circumstances identified in this document. The recommendations are labeled "conditional" due to the low

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Disclosure of potential conflict of interest: Some of the authors have professional affiliations or personal interests outside of the submitted work that are related to the topic of allergy. During the development of these guidelines, an external committee was asked to review each research team and panel member's anonymized disclosure of interests. Panel members who were deemed to have a real, perceived, or potential conflict of interest were asked to abstain from voting on recommendations related to that interest. S. Waserman has received research support from Pfizer; has served as an advisory board member for Aralez, Mylan, Pediapharm, and Pfizer Canada; and has served as an advisory board member for Food Allergy Canada. H. Cruickshank works as a freelance writer for Healthline Media and was previously employed by Food Allergy Canada, which receives financial support from pharmaceutical and food industry partners. K. J. Hildebrand has served as a consultant in the development of patient and child care education materials for Food Allergy Canada; has received an honorarium for reviewing patient education materials for Health Canada; has received a research grant from the Canadian Allergy, Asthma, and Immunology Foundation; and is a member of the board of directors of the Canadian Society of Allergy and Clinical Immunology. D. Mack has served as a consultant in the development of anaphylaxis-related educational programs for Pfizer and Sanofi; has served as a consultant for Kaleo and Pediapharm; has served as an advisory board member for Pfizer, Allerject, and Bausch Health; has provided food allergy–related consultation to the City of Hamilton and Ontario Human Rights Commission; and has provided expert witness testimony on food allergy in schools to the Ontario Human Rights Tribunal. L. Bantock was previously employed by Food Allergy Canada, which receives financial support from pharmaceutical and food industry partners. T. Bingemann is the co-chair of the food allergy and epinephrine in schools workgroup and the psychosocial issues in food allergy workgroup of the American Academy of Asthma, Allergy, and Immunology's Adverse Reactions to Food Committee; the vice chair of the American Academy of Asthma, Allergy, and Immunology's Anaphylaxis Committee; and a member of the American College of Allergy, Asthma and Immunology's Dermatology Committee, the American Academy of Pediatrics' Section of Allergy and Immunology Executive Committee, the Asthma and Allergy Foundation of America's Food Allergy/Anaphylaxis Subcommittee, and the International Food Protein–Induced

quality of available evidence. More research is needed to determine with greater certainty which interventions are likely to be the most beneficial. Policymakers might need to adapt the recommendations to fit local circumstances. (J Allergy Clin Immunol 2021;147:1561-78.)

Key words: *Food allergy, food hypersensitivity, schools, school teachers, child care, child day care centers, health education, epinephrine, secondary prevention, practice guidelines*

Abbreviation used	
GRADE:	Grading of Recommendations Assessment, Development, and Evaluation

EXECUTIVE SUMMARY

Children with food allergy are at risk of allergic reactions that range from mild to potentially life-threatening. The condition can contribute to reduced quality of life and barriers to participation in day-to-day activities. These guidelines provide evidence-informed recommendations to help policymakers determine optimal strategies for managing food allergy in child care centers, primary/elementary schools, middle/junior high schools, and secondary/high schools. The guidelines are intended to be international in scope. However, they are most likely to be applicable in settings where food allergy is a recognized public health concern and local child care, school, and health care systems have the capacity to manage allergic reactions.

Use and adaptation

All of the recommendations in these guidelines are labeled "conditional." This implies that based on the limited evidence available, the majority of panel members think but are not certain that in most situations the benefits of following a recommendation would outweigh the harms and burdens of doing so. In some cases, policymakers might need to adapt the recommendations to fit local circumstances. Any adaptations should take into account the available evidence and anticipated effects of implementing an intervention in a specific context.

Methods

These guidelines were developed by an international panel of key stakeholders, including health professionals, school personnel, and parents, with support from a methodology team. The authors followed the Grading of Recommendations Assessment, Development, and Evaluation approach to review the risk of allergic events in child care centers and schools and develop

Enterocolitis Syndrome Association's medical advisory board. D. K. Chu is a Canadian Allergy, Asthma, and Immunology Foundation–Canadian Society of Allergy and Clinical Immunology–AllerGen Emerging Clinician-Scientist Research Fellow, supported by the Canadian Allergy, Asthma, and Immunology Foundation; the Canadian Society of Allergy and Clinical Immunology; and AllerGen Inc, Networks of Centres of Excellence. C. Cuello Garcia has received travel support from the World Allergy Organization and has received an honorarium as an expert consultant for the American College of Rheumatology and the American College of Physicians. M. Ebisawa has served as a scientific advisory board member for DBV Technologies and has received speaker's fees from DBV Technologies, Thermo Fisher, and Pfizer. D. Fahmy has received speaker's fees from Novartis and Aralez. D. M. 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Greenhawt has received research grants from DBV Technologies and the Agency for Healthcare Research and Quality; has served as a consultant for the Canadian Transportation Agency, Aimmune and Intrommune; has received speaker's fees from Aimmune, DBV Technologies, Nutricia, ReachMD, Thermo Fisher, and multiple patient organizations and medical societies; has served as a medical advisory board member for Aimmune, DBV Technologies, Kaleo, Nestle, Nutricia, Monsanto, and the Food Allergy and Anaphylaxis Connection Team; is a member of the medical advisory board of Kids with Food Allergies/Asthma and the Allergy Foundation of America; is a member of the scientific advisory council of the National Peanut Board; is the chair of the Food Allergy Committee and a member of the Adverse Reactions to Foods Committee of the American College of Allergy, Asthma and Immunology; is a member of the Joint Taskforce on Allergy Practice Parameters; is a member of the expert panel on peanut allergy prevention of the National Institute of Allergy and Infectious Diseases; is an associate editor for the *Annals of Allergy, Asthma, and Immunology*; and has provided expert witness testimony on stock epinephrine laws to the Michigan State Legislature. N. Hamilton is a partner in the company Vancouver Food Machinery. J. Hourihane has served as a consultant and received research funding from Aimmune; has received research funding and speaker's fees from DBV Technologies; and is the president of the Irish Association of Allergy and Immunology and the chair of Irish Food Allergy Network, both of which receive unrestricted educational grants from industry sources. R. Loh has received travel and accommodation support from Mylan and is a past-president of the Australasian Society of Clinical Immunology and Allergy, which has received an unrestricted grant from Mylan and Alphapharm. A. Muraro has received speaker's fees from Aimmune, DBV Technologies, Nestle Health Institute, and Nutricia. S. Schoessler is employed by the Allergy and Asthma Network, which receives financial support from pharmaceutical and food industry partners. M. L. K. Tang is the inventor on a patent owned by Murdoch Children's Research Institute for a method of inducing tolerance to peanut; has served as a consultant for the Government of Victoria in the development of legislation, position statements, and publications related to the prevention and management of anaphylaxis in public schools and children's services; is a member of the Anaphylaxis Committee of the Australasian Society of Clinical Immunology and Allergy and has contributed to the organization's development of national food allergy guidelines; is a member of the medical advisory board of Anaphylaxis and Allergy Australia; has received research funding from the National Health Medical Resource Council of Australia, Murdoch Children's Research Institute, Abbott Nutrition, Bayer Pharmaceuticals, and Prota Therapeutics; has acted as a consultant to Bayer Pharmaceuticals; and has received speaker's fees from Abbott Nutrition and Nestle Health Science. J. Wang has participated in an advisory board meeting with DBV Technologies and Genentech; has acted as a site investigator on clinical trials supported by Aimmune, DBV Technologies, Regeneron, and the National Institutes of Health; is a member of the Joint Task Force on Practice Parameters; is the vice chair of the Anaphylaxis, Dermatitis, Drug Allergy Interest Section of the American Academy of Allergy, Asthma and Immunology; and is the chair of the Executive Committee of the Section on Allergy and Immunology of the American Academy of Pediatrics. J. L. Brozek has received research contracts from the World Allergy Organization and the Allergic Rhinitis and its Impact on Asthma initiative. The rest of the authors declare that they have no relevant conflicts of interests. In addition to the interests disclosed, some authors have food allergy or children with food allergy. This information was disclosed to the external committee that reviewed panel members' conflicts of interests, and the committee determined that people or have food allergy or children with food allergy should abstain from voting on the final recommendations. We have not disclosed the names of those panel members here in order to maintain the confidentiality of private medical information.

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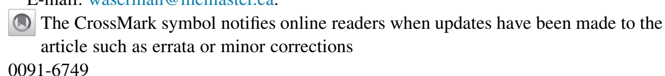

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evidence-informed recommendations related to the following interventions: food allergy training for personnel; allergy action plans and protocols for managing allergic reactions; using epinephrine to treat allergic reactions; stocking unassigned epinephrine (ie, not prescribed to specific students); site-wide food prohibitions (eg, nut-free schools); allergen-restricted zones (eg, milk-free classrooms or tables).

Policymakers might also consider other interventions to manage food allergy. However, those interventions fall outside the scope of these guidelines.

Key findings

Based on current median reported rates of allergic events in child care centers and schools, we found that if the average school had 350 students: 1.3 allergic reactions of any severity would occur on average at each school per year; anaphylaxis would occur in approximately 1 in 15 schools per year; epinephrine would be administered in about 1 in 24 schools per year. On average, researchers report that roughly 1 in 10 allergic reactions and cases of anaphylaxis among children occur at child care centers or schools. Most reactions (90%) occur elsewhere.

We found no studies that estimated the risk of death from anaphylaxis in child care centers or schools. However, based on registries and death certificates, death from food-induced anaphylaxis is rare in any setting.

Very little evidence is available on the effects of selected interventions on the risk of allergic events. Studies suggest that allergy training may help improve knowledge and skills among child care and school personnel. However, more research is needed to learn how long these improvements last, how they affect outcomes in students, and whether allergy action plans provide additional benefits beyond training alone. When anaphylaxis occurs, epinephrine is the first-line recommended treatment. We found no evidence to support the preemptive use of epinephrine when signs or symptoms of anaphylaxis have not yet developed. Stock epinephrine may provide a treatment option when someone experiences anaphylaxis and does not have personal epinephrine available to treat it. However, the cost-effectiveness and feasibility of stocking epinephrine varies depending on the specific jurisdiction and approach taken. Studies have not consistently found that site-wide food prohibitions or allergen-restricted zones reduce the risk of allergic reactions.

Top-level recommendations

1. We suggest that child care centers and schools implement training for teachers and other personnel in the prevention, recognition, and treatment of allergic reactions to food. (Conditional recommendation; very low certainty of evidence.)

2. We suggest that child care centers and schools require all parents of students with diagnosed food allergy to provide an up-to-date allergy action plan. (Conditional recommendation; very low certainty of evidence.)

3. We suggest that child care centers and schools implement site-wide protocols for the management of suspected allergic reactions to food in individuals with no allergy action plans on file. (Conditional recommendation; very low certainty of evidence.)

4. We suggest that child care and school personnel use epinephrine only when they suspect that someone is experiencing anaphylaxis, rather than use epinephrine as the first universal treatment for all suspected allergic reactions. (Conditional recommendation; very low certainty of evidence.) For special circumstances, see the full guidelines.

5. We suggest that child care and school personnel do not preemptively administer epinephrine in cases when no signs or symptoms of an allergic reaction have developed, even if a student has eaten a food to which they have a known allergy or history of anaphylaxis. (Conditional recommendation; very low certainty of evidence.) For special circumstances, see the full guidelines.

6. When laws permit, we suggest that child care centers and schools stock unassigned epinephrine autoinjectors on site, instead of requiring students with allergy to submit personal autoinjectors to be stored on site for designated at-school use. (Conditional recommendation; very low certainty of evidence.) For special circumstances, see the full guidelines.

7. We suggest that child care centers and schools do not prohibit specific foods site-wide. (Conditional recommendation; very low certainty of evidence.)

8. We suggest that child care centers and schools do not establish allergen-restricted zones, except in the special circumstances identified in the full guidelines. (Conditional recommendation; very low certainty of evidence.)

For additional recommendations and implementation considerations, see the full guidelines.

When weighing the data and additional considerations, we placed high value on the health, quality of life, and self-management capacity of students with food allergy. We also considered the quality of life of other stakeholders, such as students without food allergy, parents, and personnel. We assumed any intervention would be implemented in contexts with finite resources, where the anticipated costs must be justified by the anticipated benefits.

INTRODUCTION

The management of food allergy in child care centers and schools is a sensitive and often controversial topic. Across jurisdictions, there is considerable variability in the policies and procedures used to manage the risk of allergic reactions. In part, this might reflect the variable guidance provided by allergy organizations and public health agencies around the world. In many cases, current policies and practices may not be supported by the best available evidence.

To inform rational decision making, evidence-based guidance is needed. To our knowledge, this is the first international attempt to synthesize the available data and provide evidence-informed recommendations to help policymakers manage the risk of allergic reactions to food in child care centers and schools. In some cases, the research literature provides little direct evidence to support or reject particular policies and practices. However, identifying the limits of the available evidence is important, in and of itself, for guiding informed discussions and future research.

Based on data from oral food challenges, a 2013 survey of allergy organizations found that the prevalence of food allergy ranged from 1% to 10% among infants and preschool-age children and 1% to 2.5% in children over the age of 5 years.[1] More recent research suggests the prevalence may now be higher in some populations of older children.[2] Most allergic reactions to food are mild to moderate, but some are severe. The most serious type of allergic reaction is anaphylaxis. Most people who develop

anaphylaxis survive—but fatal reactions can occur, particularly if the reaction is not treated. Food allergy can also contribute to reduced quality of life[3,4] and increased costs of living.[5-7] Anxiety and fear about the risk of accidental exposure to food allergens, and the burden of managing that risk, may limit children's participation in day-to-day activities. Children with food allergy are also at risk of allergy-related bullying.[8]

Given that children spend much of their time in child care centers and schools, it is not surprising that food allergy management has become a topic of concern in these settings. These guidelines provide evidence-informed recommendations to help child care and school policymakers determine optimal strategies for managing food allergy in their jurisdictions. Managing the risk of allergic reactions must not be confused with totally removing the risk: it is not possible to totally remove the risk of allergic reactions in any setting.

INSTRUCTIONS FOR USE AND ADAPTATION

All of the recommendations in these guidelines have been labeled conditional. That means that the majority of panel members think, but are not certain, that in most situations the benefits of following a recommendation would outweigh the harms and burdens of doing so. The lack of certainty reflects the lack of high-quality evidence available on the interventions addressed in these guidelines. For policymakers, the implication of a conditional recommendation is that decisions about whether to implement, continue, or discontinue an intervention will require discussion among stakeholders. This discussion should take into account the evidence and additional considerations presented in these guidelines and accompanying appendices.

Decision makers should not treat the recommendations in these guidelines as binding mandates. No recommendation can take into account all of the variable circumstances that might affect the potential benefits, harms, and burdens of an intervention in a given jurisdiction. Thus, no one charged with overseeing or evaluating the actions of child care and school policymakers or personnel should apply the recommendations by rote or in blanket fashion. In some cases, policymakers might need to adapt the recommendations to fit local circumstances. Any adaptations should take into account the available evidence and the anticipated consequences of implementing an intervention in a specific context.

When quoting or translating recommendations from these guidelines, any qualifying remarks that accompany each recommendation—including statements regarding special circumstances and assumed values and preferences—should not be omitted. These statements are integral to the recommendations.

For more guidance, see Appendix A: Instructions for Use and Adaptation in this article's Online Repository (available at www.jacionline.org).

TARGET AUDIENCE AND SCOPE

The primary target audience of these guidelines includes policymakers, public health professionals, and child care and school personnel that play a role in developing and implementing policies for managing food allergy in child care centers, primary/elementary schools, middle/junior high schools, and secondary/high schools. These guidelines may also help other community members understand the magnitude of risk of allergic reactions to food in child care centers and schools, as well as the potential benefits, harms, and costs of different approaches to managing that risk. By identifying gaps in the research literature, these guidelines may help researchers direct attention to topics on which more studies are needed.

These guidelines are intended to be international in scope. However, they are most likely to be applicable in settings where food allergy is prevalent enough to be a recognized public health concern and the local child care, school, and health care systems are developed enough to manage allergic reactions. Most of the studies cited in these guidelines took place in high-income countries. Their findings may not reflect on-the-ground realities in poorly resourced communities. There may be settings in which the management of food allergy is not considered a priority or the recommendations are not feasible to implement, due, for instance, to gaps in resources. For example, epinephrine (adrenaline) autoinjectors are difficult to access in many regions of the world.[1,9]

These guidelines provide evidence-informed recommendations related to the following interventions: allergy training; allergy action plans and site-wide protocols for managing suspected allergic reactions; using epinephrine to treat allergic reactions; stocking unassigned epinephrine; and site-wide food prohibitions and allergen-restricted zones. (See Table I.) Policymakers or personnel might also consider using other interventions to manage food allergy in child care centers or schools (eg, individualized accommodation plans, allergy training for students, antibullying initiatives). However, those interventions fall outside the scope of these particular guidelines.

All of the recommendations in these guidelines relate to the management of IgE-mediated food allergy. Recommendations on the stocking and use of epinephrine are also relevant to the management of other types of IgE-mediated allergy, such as insect sting allergy. For simplicity, we use "students" to refer to all children and adolescents who attend child care centers and schools. We use "parents" to refer to their legal guardians.

METHODS

These guidelines were developed by: (1) an international panel of key stakeholders consisting of 22 members, including allergy specialists, primary care and nursing professionals, school administrators and personnel, and parents of children with and without food allergy; and (2) a methodology team consisting of 6 researchers with experience in evidence synthesis and guideline development.

Questions and outcomes of interest

Members of the guideline panel and methodology team collaboratively brainstormed potential questions to be addressed in these guidelines. Using group discussion and online polling software (www.surveymonkey.com), we ranked the questions in terms of priority. The selected interventions and questions represent the top-prioritized issues identified by the group. We used the same process to identify outcomes of interest for each question. A recent high-school graduate with food allergy also participated in this process. For most questions, we deemed the following outcomes to be critically important: allergic reactions to food, including severe and fatal reactions; emergency department visits and emergency medical service interventions; and quality of life and other psychosocial outcomes among students with food allergy. We also deemed the following outcomes to be important but less critically so: adverse reactions to epinephrine and quality of life and other psychosocial outcomes among students without food allergy, parents, and personnel.

TABLE I. Summary of recommendations

Food allergy training, allergy action plans, and site-wide protocols

1. We suggest that child care centers and schools implement training for teachers and other personnel in the prevention, recognition, and treatment of allergic reactions to food. (Conditional recommendation; very low certainty of evidence.)*

2. We suggest that child care centers and schools require all parents of students with diagnosed food allergy to submit an up-to-date allergy action plan. (Conditional recommendation; very low certainty of evidence.)*

3. We suggest that child care centers and schools implement site-wide protocols for the management of suspected allergic reactions to food in individuals with no allergy action plans on file. (Conditional recommendation; very low certainty of evidence.)*

Epinephrine (adrenaline) vs other treatments for allergic reactions

4. We suggest that child care and school personnel use epinephrine only when they suspect that someone is experiencing anaphylaxis, rather than use epinephrine as the first universal treatment for all suspected allergic reactions. (Conditional recommendation; very low certainty of evidence.)*

5. We suggest that child care and school personnel do not preemptively administer epinephrine in cases when no signs or symptoms of an allergic reaction have developed, even if a student has eaten a food to which they have a known allergy or history of anaphylaxis. (Conditional recommendation; very low certainty of evidence.)*

Special circumstances

a. If child care or school personnel think that someone might be experiencing anaphylaxis but they are not certain, we suggest that they give epinephrine immediately (ie, when in doubt, give epinephrine).

b. If a student with known allergy is found with impaired consciousness, we suggest that child care or school personnel give epinephrine and contact emergency medical services, even if the student shows no other signs of an allergic reaction. If personnel have been instructed and trained to provide basic life support (eg, cardiopulmonary resuscitation), they may do so according to the instructions.

c. If a student's health care provider has issued a signed allergy action plan or note that instructs child care or school personnel to follow a different treatment protocol, we suggest they follow those instructions. Similarly, if a student's health care provider advises personnel by phone to administer certain treatments during a suspected allergic reaction, we suggest they follow those instructions.

d. If local laws limit the ability of child care or school personnel to administer epinephrine, then policymakers and personnel should follow the applicable laws. In such cases, it may be appropriate to advocate for changes to the law.

Stocking unassigned epinephrine (adrenaline) autoinjectors

6. We suggest that child care centers and schools stock unassigned epinephrine autoinjectors on site, instead of requiring students with allergy to submit personal autoinjectors to be stored on site. (Conditional recommendation; very low certainty of evidence.)†

Special circumstances

a. If child care centers and schools decide to stock unassigned epinephrine autoinjectors, most panel members supported an approach in which students with allergy are not required to store personal autoinjectors on site (eg, in a school office) for designated at-school use but are permitted to carry personal autoinjectors with them (eg, in a carrying case) when they are mature enough to do so. Those autoinjectors may be used to treat anaphylaxis if it occurs while the students are traveling to or from their child care centers or schools, participating in off-site activities, or in other contexts where stock autoinjectors are not readily available.

b. Some child care centers and schools may have enough stock autoinjectors available to equip personnel on field trips and other off-site activities with stock autoinjectors, while maintaining an adequate supply of stock autoinjectors on site. However, in many cases, it is not likely to be feasible or cost-effective to equip personnel on field trips or other off-site activities with stock autoinjectors—due to the number of stock autoinjectors required to provide adequate coverage and the additional oversight and resources needed to ensure that stock autoinjectors are distributed and returned appropriately. If stock autoinjectors will not be available during off-site activities, child care centers and schools should (1) inform students with allergy and their parents of that fact beforehand; (2) require students with allergy to bring personal autoinjectors with them; and (3) take steps to ensure those personal autoinjectors are readily accessible during the activity.

c. In jurisdictions where epinephrine autoinjectors are inaccessible, child care centers and schools may consider stocking prefilled epinephrine syringes or epinephrine ampules with empty syringes as an alternative.

d. If local laws do not allow child care or school personnel to administer stock autoinjectors, there is no rationale for stocking them. In such cases, it may be appropriate to advocate for changes to the law.

Site-wide food prohibitions and allergen-restricted zones

7. We suggest that child care centers and schools do not prohibit specific foods site-wide (eg, nut-free schools). (Conditional recommendation; very low certainty of evidence.)*

8. We suggest that child care centers and schools do not establish allergen-restricted zones (eg, peanut-free classrooms, milk-free tables), except in the limited special circumstances identified. (Conditional recommendation; very low certainty of evidence.)*

Special circumstances

a. When students lack the developmental capacity to self-manage due to very young age (ie, infants, toddlers) or physical or cognitive impairments, it might be appropriate to implement allergen-restricted zones (eg, nut-free classrooms, milk-free tables) to lower the risk that they will accidentally eat a food allergen.

b. If local laws require child care centers or schools to take certain steps to regulate the presence of food allergens, policymakers and personnel should follow the applicable laws. In some cases, it might be appropriate to advocate for changes to the law.

(Continued)

TABLE I. *(Continued)*

c. In jurisdictions where food ingredient labeling is not mandatory or not effectively enforced, any food prohibitions would be impossible to effectively implement.

*When weighing the available data and additional considerations for this question, we placed high value on the health, quality of life, and self-management capacity of students with food allergy. We also considered the quality of life of other stakeholders, such as students without food allergy, parents of students, and child care and school personnel. We assumed that any intervention would be implemented in contexts with finite resources, where the anticipated costs must be justified by the anticipated benefits. Panel members acknowledge that given the lack of high-quality evidence on the health effects of the intervention, the decision to take one approach or another will depend in part on the acceptability, feasibility, and costs of doing so in any given jurisdiction.

†When weighing the available data and additional considerations for this question, we favored an approach that would optimize access to epinephrine autoinjectors for all students who might experience anaphylaxis at child care centers or schools. We placed relatively high value on maximizing cost-effectiveness at a society level, rather than reducing the costs incurred by one payer or another (eg, school systems vs individual students). We recognize that decisions about stocking autoinjectors will depend on the availability of public resources and budget allocations, as well as culturally variable opinions about who should bear the burden and costs of making emergency medications available. Any changes in current practices or costs borne by different payers may require discussion and debate among key stakeholders—including policymakers in health care, education, and child care sectors—to determine the appropriate sources and distribution of required resources.

Review of evidence and development of recommendations

Members of the methodology team performed systematic literature reviews on: (1) the risk of IgE-mediated allergic reactions to food, epinephrine use, anaphylaxis, and death from anaphylaxis in child care centers and schools; and (2) the effects of each intervention on outcomes of interest. They followed the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach[10] to assess the certainty of available evidence and used the GRADEpro online application (www.gradepro.org) to prepare evidence profiles and evidence-to-decision frameworks with descriptions of the effects of each intervention on outcomes of interest; the certainty of the available evidence on those effects; and additional data and considerations related to costs, feasibility, acceptability, and effects on health equity.[11]

Members of the guideline panel reviewed this information and determined the direction and strength of each recommendation through group discussion and voting. For each question, an external committee determined which panel members should be asked to refrain from voting on the final recommendations, due to actual, potential, or perceived conflicts of interest. Members of the methodology team refrained from voting on all recommendations.

Panel members followed the GRADE approach to label each recommendation as "strong" or "conditional" based on the contents and quality of the underlying evidence. All of the recommendations are labeled "conditional" due to the very low certainty of the evidence. The majority of voting panel members agreed on the direction, strength, and wording of the final recommendations. Dissenting opinions are noted in the appendices.

All panel members reviewed and provided input on these guidelines. We also invited stakeholders from multiple countries to review the draft document. For more information about the guideline development process, see Appendix B: Methods in this article's Online Repository (available at www.jacionline.org).

SUMMARY OF FINDINGS, RECOMMENDATIONS, AND IMPLEMENTATION CONSIDERATIONS

Risk of allergic reactions in child care centers and schools

We performed a systematic review of studies that reported the rate of IgE-mediated allergic reactions to food, epinephrine use for allergic reactions to food, anaphylaxis trigged by food, and death from anaphylaxis in child care centers or schools. The certainty of the available data on risk is very low. We present the detailed results of this review separately (Brozek et al, manuscript in preparation) and discuss the top-level findings here.

Risk of allergic reactions of any or unspecified severity

We found 4 survey- or registry-based studies that reported the incidence of allergic reactions of any severity to food and other triggers in child care centers or schools in Australia, Japan, Spain, and the United States.[12-15] These studies found that about 253 to 3,115 allergic reactions occurred per 100,000 students per year (median: 375 per 100,000).[12-15] At these reported rates, if the average school had 350 students, approximately 1 to 11 allergic reactions (median: 1.3) would occur on average at each school per year. Most of the allergic reactions would not be life-threatening. However, even mild to moderate reactions can be uncomfortable and stressful to manage.

Researchers have found that 3% to 20% (median, 9%) of reported allergic reactions in children occur at child care centers or schools.[13,16-27] Most reported allergic reactions (median, 91%) occur in other or unknown settings, such as children's homes.[13,16-27]

Risk of anaphylaxis

We found 4 survey- or registry-based studies that reported the incidence of anaphylaxis to food and other triggers in child care centers or schools in Australia and the United States.[13,15,28,29] These studies found that about 8 to 118 cases of anaphylaxis occurred per 100,000 students per year (median, 19 per 100,000).[13,15,28,29] At these reported rates, if the average school had 350 students, anaphylaxis to food or other triggers would occur in approximately 1 of every 2 to 34 schools per year (median, 1 in 15 schools). Another study sponsored by an epinephrine autoinjector manufacturer found that in the United States in 2013 and 2014, suspected cases of anaphylaxis occurred in 11% of schools nationwide.[30,31] No cases were reported in 89% of schools.[30,31]

Researchers have found that 0% to 29% (median, 10%) of reported cases of anaphylaxis in children occur at child care centers or schools.[13,18,32-63] Most reported cases of anaphylaxis (median, 90%) occur in other or unknown settings, such as children's homes.[13,18,32-63]

In nearly all reported cases of food-related anaphylaxis, the reaction occurs after someone eats a food allergen. Touching a food allergen may cause localized hives and swelling, and in some reports, people have attributed the development of allergic symptoms—such as itchy and watery eyes, itchy and runny nose, and wheezing—to the inhalation of air-borne food proteins (eg, steam from cooking fish).[22,64-68] However, the risk of anaphylaxis from touching or inhaling food appears to be extremely low. Very few cases have been reported in the research literature, and we found none confirmed through food challenge. In 2 experimental studies where peanut butter was smelled or applied to the skin of children with peanut allergy, none experienced anaphylaxis.[69,70]

Frequency of epinephrine autoinjector use

We found 18 published sources that reported survey- or registry-based data on the incidence of epinephrine use for allergic reactions to food and other triggers in child care centers or schools in Australia and the United States, as well as a set of unpublished school data provided by a panel member in Canada (M. Langlois, personal correspondence, February 2017).[12,15,29,71-85] These sources reported that epinephrine was administered about 1 to 118 times per 100,000 students per year (median, 12 per 100,000).[12,15,28,71-85] Epinephrine was used to treat reactions triggered by food in 31% to 100% of reported cases (median, 58%).[12,15,29,71-73] In the remaining cases, it was used to treat reactions caused by other or unknown triggers.[12,15,29,71-73] In about 15% to 31% of reported cases, students who received epinephrine had no previously known history of allergy.[15,29,30,71,72,74-80]

At these reported rates, if the average school had 350 students, epinephrine would be administered in approximately 1 of every 1 to 362 schools per year (median, 1 in 24 schools).[12,15,29,71-85] Two public health reports from Massachusetts[78,79] reported that epinephrine was administered in 6% to 7% of schools over the course of a year. No doses of epinephrine were used in 93% to 94% of schools.[78,79] However, reported rates of epinephrine use might not represent the rates at which epinephrine is medically indicated. In some cases, epinephrine might not have been used to treat anaphylaxis when it should have been. In other cases, epinephrine might have been used to treat an allergic reaction that did not meet the criteria for anaphylaxis.

Risk of death from anaphylaxis

We found no studies that estimated the risk of death from anaphylaxis in child care centers or schools. However, death from anaphylaxis in any setting is rare. Among children 0 to 19 years of age, the average reported rate of death from food-induced anaphylaxis in any setting is 3.25 per 1,000,000 children with food allergy per year.[86] This estimate includes deaths in any location among children of any age, including infants, preschool-age children, and school-age children (Fig 1).[87,88]

FOOD ALLERGY TRAINING, ALLERGY ACTION PLANS, AND SITE-WIDE PROTOCOLS

Questions

Should child care centers and schools implement training for personnel in the management of food allergy, rather than not implement such training?

Should child care centers and schools require parents of students with food allergy to provide allergy action plans, rather than not require such plans?

Background

Studies have found that child care and school personnel have limited knowledge, skills, and confidence related to the prevention, recognition, and treatment of allergic reactions.[89-99] These gaps likely pose barriers to the optimal management of food allergy, particularly because many sites lack full- or part-time nursing support.[94,97,100-102] To help child care and school personnel learn how to prevent, recognize, and respond to allergic reactions, food allergy advocates have supported the provision of food allergy training. In many jurisdictions, child care centers and schools also ask parents of students with food allergy to fill out allergy action plans. These plans are also known as emergency action plans, emergency care plans, or anaphylaxis emergency plans. They consist of a standardized template or form that outlines the recommended emergency response to a suspected allergic reaction. The form may be personalized with a student's name, emergency contact information, list of allergy triggers, and other information. Additionally or alternatively, some child care centers and schools implement site-wide protocols to guide the treatment of any suspected allergic reaction that occurs on site, including reactions in individuals with no allergy action plans on file. The availability, structure, and contents of allergy training, action plans, and site-wide protocols vary within and between jurisdictions.[1,103-109]

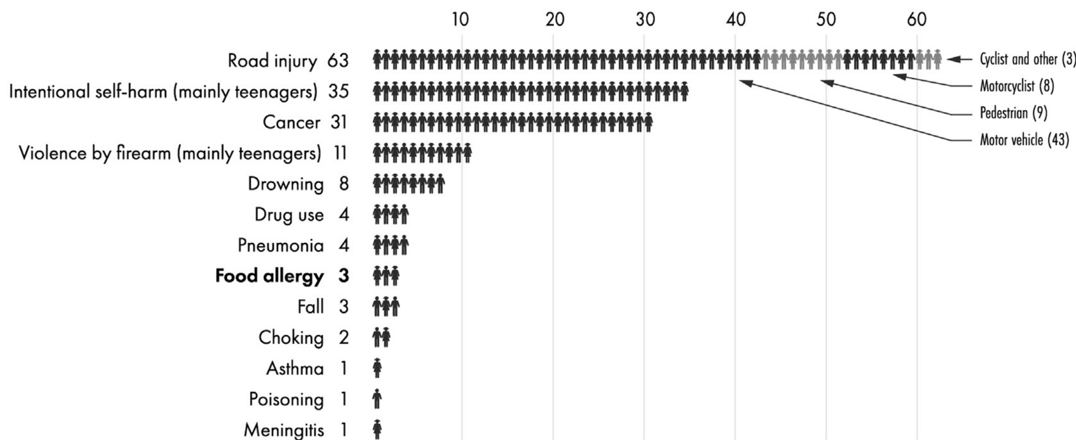
Summary of evidence

There is little evidence available on the effects of food allergy training, action plans, or site-wide protocols on the rate of allergic reactions or other outcomes of interest. Studies have found that training is associated with short-term improvements in allergy-related test scores or self-reported levels of knowledge, skills, and preparedness among child care and school personnel.[110-145] More research is needed to learn how long these improvements last and what effects they may have on health outcomes in students. Some limited and low-quality evidence suggests that implementing training and action plans might help reduce the frequency of allergic reactions or epinephrine use in students.[17,140,142,146-149] However, research on asthma action plans suggests that action plans might provide few additional benefits beyond those provided by training alone.[150]

Studies suggest there is broad community support for the provision of allergy information to child care and school personnel and the implementation of plans to keep students with food allergy safe.[151-156] Although some are resistant to allergy training,[157,158] many personnel think it is helpful or necessary to receive information and training on food allergy.[91-93,95,96,100,114,115,119,127,144,156,159-164] Panel members agreed that in jurisdictions where expert-designed training programs, action plans, and protocols are universally available, it is feasible to implement these interventions. In communities where they are not available, child care centers and schools may need to collaborate with health care professionals and other stakeholders to develop or access the required resources.

Recommendations

4. We suggest that child care centers and schools implement training for teachers and other personnel in the prevention, recognition, and treatment of allergic reactions to food. (Conditional recommendation; very low certainty of evidence.)
5. We suggest that child care centers and schools require all parents of students with diagnosed food allergy to provide an up-to-date allergy action plan. (Conditional recommendation; very low certainty of evidence.)



B

Selected causes of death among **10 million children (general population)** per year

10 20 30 40 50 60 70 80 90 100

Road injury 633

Intentional self-harm (mainly teenagers) 351

Cancer 314

Violence by firearm (mainly teenagers) 112

Drowning 80

Drug use 44

Pneumonia 39

Fall 32

Choking 19

Asthma 14

Poisoning 12

Meningitis 12

Environmental exposure to heat or cold 4

Alcohol use 4

Exposure to electric current 4

Tuberculosis 3

Appendicitis 2

Contact with a non-venomous animal 2

Food allergy 1

Contact with a venomous animal 1

Sexually transmitted diseases (exclusing HIV) 1

FIG 1. Risk of death from selected causes among children in any setting. For the sake of illustration, we present the risk of death from anaphylaxis to food alongside the risk of death from other causes. This includes deaths in any setting, not only schools and child care centers. **A,** The risk of death among children with food allergy (rate per 1 million per year) is shown. **B,** The risk of death among all children, including those with and without food allergy (rate per 10 million per year) is shown. The risk of death from food allergy in any setting is based on a systematic review conducted by Umasunthar et al,[86] who compiled data on children 0 to 19 years of age from studies conducted between 1999 and 2012. The estimated rates of death from other causes are based on survey data collected from high-income countries for 2016,[87,88] with an assumed prevalence of food allergy of 4%.[86] This figure assumes that children with food allergy have the same risk of death from other causes (eg, road traffic injuries) as children without food allergy. The actual risk of death from any given cause varies from one community to another.

3. We suggest that child care centers and schools implement site-wide protocols for the management of suspected allergic reactions to food in individuals with no allergy action plans on file. (Conditional recommendation; very low certainty of evidence.)

Implementation considerations

If child care centers or schools implement food allergy training for personnel, allergy action plans for students, and/or site-wide protocols for managing suspected allergic reactions, the contents of those interventions should be evidence-based and standardized. Training programs, action plans, and protocols should be designed, reviewed, and regularly updated by health care professionals with expertise in food allergy. Where expert-designed training programs, action plans, or protocols are not currently available, we encourage policymakers and program developers to facilitate their preparation and dissemination. In many cases, it might be more cost-effective to adapt existing resources from other jurisdictions, provided they have been designed and reviewed by qualified health care professionals.

If allergy action plans for students with food allergy are received, they should be kept in locations that child care and school personnel can easily access in the case of an allergic reaction. To protect student privacy, we suggest that these plans should not be posted in areas visible to the general public. Child care and school personnel should take steps to ensure they are familiar with the plans of students under their supervision, as well as any site-wide protocols. Child care centers and schools should ask parents of students with known food allergy to regularly review their action plans and report any changes.

For more detailed discussion of the underlying rationale and implementation considerations for these recommendations, see Appendix C: Food Allergy Training, Allergy Action Plans, and Site-Wide Protocols in this article's Online Repository (available at www.jacionline.org).

EPINEPHRINE (ADRENALINE) VS OTHER TREATMENTS FOR ALLERGIC REACTIONS

Question

Should epinephrine be used as the first universal treatment for all suspected allergic reactions in child care centers and schools, rather than watchful waiting, other medications, or epinephrine depending on the specific symptoms of a reaction?

Background

Most allergic reactions to food are not anaphylaxis and resolve without treatment or with the use of oral antihistamines. However, when signs or symptoms of anaphylaxis develop, epinephrine is the recommended first-line treatment.[165,166]

Currently, instructions for epinephrine use in child care centers and schools vary. Depending on local policies, personnel may be instructed to do one of the following:

1. Use epinephrine to treat any and all suspected allergic reactions, including allergic reactions that do not meet the criteria for anaphylaxis.
2. Use epinephrine to treat suspected anaphylaxis only. For allergic reactions that are not suspected anaphylaxis, use other medications (eg, oral H_1-antihistamines) or use no medications and monitor the student for signs and symptoms of anaphylaxis that might develop ("watchful waiting").

In some cases, child care and school personnel have been instructed to preemptively give epinephrine if they know or suspect that a student has eaten a food to which they have a diagnosed allergy or history of anaphylaxis, even if the student shows no signs or symptoms of an allergic reaction at all ("preemptive epinephrine use").

Debates over different treatment approaches take place in the context of wider concerns about the potential underuse of epinephrine for treating anaphylaxis—as well as the potential overuse of epinephrine for treating milder allergic reactions that do not meet the criteria for anaphylaxis. When anaphylaxis occurs, personnel may be hesitant to administer epinephrine, due to uncertainty about the proper timing or technique for epinephrine use or other issues.[93,115,119,125,126,161,163,167-170] Studies in other contexts have found that people often do not follow recommendations to treat anaphylaxis with epinephrine.[105,171,172] On the other hand, if personnel use epinephrine to treat any and all suspected allergic reactions to food, they will use it to treat allergic reactions for which it is not medically required. After all, most allergic reactions are not anaphylaxis and do not require epinephrine to treat.

Summary of evidence

We found no direct research evidence comparing the health effects of using epinephrine as the first universal treatment for all suspected allergic reactions to food in child care centers or schools versus using epinephrine to treat only suspected anaphylaxis. It is possible that advising personnel to use epinephrine to treat all suspected allergic reactions might promote timely epinephrine use when anaphylaxis does occur. However, we found no data on how different treatment protocols affect the actual practices of child care or school personnel or health outcomes in students. Nor are there any direct data on how epinephrine use affects the risk of death from anaphylaxis in child care centers or schools. If advising personnel to use epinephrine to treat all suspected allergic reactions does reduce the underuse of epinephrine to treat anaphylaxis and the risk of death from anaphylaxis, then the magnitude of this potential benefit is unknown but likely small, because the risk of death from anaphylaxis is low. We found no data to support preemptive epinephrine use in cases when no signs or symptoms of an allergic reaction have developed. Some research suggests that administering epinephrine when anaphylaxis has not developed might negatively affect quality of life in parents of children with allergy.[173] Likewise, some panel members suggested that giving an injection that is not medically required might negatively affect quality of life in students with allergy and in personnel.

The costs, acceptability, and feasibility of implementing each treatment approach varies from one context to another. There is variability within and between jurisdictions in the accessibility and cost of epinephrine,[9,174-177] the confidence and ability of child

care and school personnel to recognize anaphylaxis,[89,95,97,111,114,116,118,120-122,125,126,130,131,133,134,139,143,178,179] and the presence of laws that might prohibit or enable personnel to administer medications. In general, epinephrine is more expensive than oral antihistamines. In some jurisdictions, child care and school personnel are also instructed to contact emergency medical services (eg, 911) every time they give epinephrine, which substantially increases the costs associated with epinephrine use.[6,180] Therefore, it is rational to assume that using epinephrine to treat all suspected allergic reactions is more expensive than using epinephrine to treat suspected anaphylaxis alone.

Recommendations

4. We suggest that child care and school personnel use epinephrine only when they suspect that someone is experiencing anaphylaxis, rather than use epinephrine as the first universal treatment for all suspected allergic reactions. (Conditional recommendation; very low certainty of evidence.)
5. We suggest that child care and school personnel do not preemptively administer epinephrine in cases when no signs or symptoms of an allergic reaction have developed, even if a student has eaten a food to which they have a known allergy or history of anaphylaxis. (Conditional recommendation; very low certainty of evidence.)

Special circumstances

If child care or school personnel think that someone might be experiencing anaphylaxis but are not certain, we suggest that they give epinephrine immediately (ie, when in doubt, give epinephrine).

If a student with known allergy is found with impaired consciousness, we suggest that child care or school personnel give epinephrine and contact emergency medical services, even if the student shows no other signs of an allergic reaction. If personnel have been instructed and trained to provide basic life support (eg, cardiopulmonary resuscitation), they may do so according to the instructions they have received.

If a student's health care provider has issued a signed allergy action plan or note that instructs child care or school personnel to follow a different treatment protocol, we suggest they follow those instructions. Similarly, if a student's health care provider advises personnel by phone to administer certain treatments during a suspected allergic reaction, we suggest they follow those instructions.

If local laws limit the ability of child care or school personnel to administer epinephrine, then policymakers and personnel should follow the applicable laws. In such cases, it may be appropriate to advocate for changes to the law.

Implementation considerations

Regardless of the specific approach that child care centers and schools take, we suggest they train personnel on the chosen treatment protocol. If personnel are expected to administer epinephrine in cases of suspected anaphylaxis, they should receive training in how to recognize anaphylaxis. Personnel should also be trained on how to monitor someone for new or changing symptoms of anaphylaxis, how to give epinephrine, when to give additional doses of epinephrine, and when and how to contact emergency medical services. If child care centers and schools require students with allergy to have allergy action plans on file, those plans should be updated to reflect any changes made to treatment protocols.

According to expert-consensus guidelines,[165,166] an allergic reaction is likely anaphylaxis if it involves symptoms in 2 or more of the following organs systems or tissues: skin or mucous membranes (eg, hives, rash, redness, itching, swelling); digestive tract (eg, abdominal pain, cramping, nausea, vomiting, diarrhea); respiratory tract (eg, suddenly congested or runny nose, throat tightness or swelling, voice hoarseness, inability to speak, wheezing, coughing, chest tightness, shortness of breath, labored breathing); circulatory system (eg, pale skin, cool and clammy skin, weak and rapid pulse, chest pain, dizziness, fainting, collapse, floppy body in very young children).

An allergic reaction should also be treated as anaphylaxis if the person has trouble breathing or shows signs of reduced blood pressure (eg, dizziness, fainting, collapse, floppy body in very young children) after they have been exposed to a known allergen, even if they develop no signs or symptoms in other organ systems or tissues.[165,166]

If child care or school personnel suspect that someone is experiencing anaphylaxis, they should give a weight-appropriate dose of epinephrine immediately, before giving any other medications. It is appropriate to give another dose of epinephrine if the symptoms of anaphylaxis do not resolve within 5 minutes, the symptoms resolve but then return, or the symptoms worsen. Professional allergy organizations generally advise caregivers to contact emergency medical services or arrange for the patient to be transported to an emergency department whenever epinephrine is used to treat suspected anaphylaxis,[165,181-184] although some researchers have raised concerns about the cost-effectiveness of this practice.[185] If no epinephrine is available to treat suspected anaphylaxis, personnel should contact emergency medical services immediately.

If an individual develops signs or symptoms of a mild to moderate allergic reaction that does not meet the criteria for anaphylaxis, personnel should monitor the individual closely for signs and symptoms of anaphylaxis that might develop—and give epinephrine immediately if suspected anaphylaxis does develop. In some jurisdictions, local laws and regulations might also permit child care or school personnel to administer other medications that health care professionals have prescribed or recommended for the treatment of mild to moderate allergic reactions (eg, oral H_1-antihistamines). The treatment of mild to moderate allergic reactions fell outside the scope of our literature review for these particular guidelines.

For more detailed discussion of the underlying rationale and implementation considerations for these recommendations, see Appendix D: Epinephrine (Adrenaline) versus Other Treatments in this article's Online Repository (available at www.jacionline.org).

STOCKING UNASSIGNED EPINEPHRINE (ADRENALINE) AUTOINJECTORS

Questions

Should child care centers and schools stock unassigned epinephrine autoinjectors ("stock autoinjectors"), in addition to or instead of requiring students with allergy to supply their own

personal autoinjectors to be stored on site for designated at-school use?

Should child care centers and schools equip personnel on field trips and other off-site activities with stock autoinjectors, rather than not provide stock autoinjectors during off-site activities?

Background

An epinephrine autoinjector is a self-injectable device that contains a premeasured dose of epinephrine. In countries where epinephrine autoinjectors are routinely prescribed to children with allergy, child care centers and schools often ask each student with allergy to have 1 or more personal autoinjectors available on site. Personal autoinjectors are also known as assigned, designated, student-specific, or prescribed autoinjectors. In general, they are used to treat suspected cases of anaphylaxis in the student to whom they belong. Depending on local policies, students may (1) carry personal autoinjectors with them (eg, in a carrying case or bag); and/or (2) submit personal autoinjectors to be stored on site (eg, in a school nurse's office, classroom, or cafeteria) for designated at-school use.[158,186]

To treat suspected anaphylaxis in students who do not have personal autoinjectors available, some child care centers and schools stock unassigned autoinjectors. These devices are also known as stock, undesignated, non-student-specific, or general-use autoinjectors. Depending on local policies and practices, stock autoinjectors have been used to treat suspected anaphylaxis in students, staff members, volunteers, and other individuals with or without known history of allergy.[29,73,187-190] For example, they have been used when an individual's personal autoinjector was not readily accessible, their personal autoinjector was available but malfunctioned, additional doses of epinephrine were needed after their personal autoinjector was administered, or they did not have a personal autoinjector.[29,72,73,187,189,190] In approximately 15% to 31% of reported cases, students who have received epinephrine in child care centers or schools had no previously known history of allergy.[15,29,30,71,72,74-80]

Summary of evidence

We found no studies on the effects that stocking autoinjectors in child care centers or schools might have on the rate of severe or fatal allergic reactions, the rate of adverse effects from epinephrine, the use of emergency medical services, or the quality of life of students and other stakeholders. In settings where stock autoinjectors are available, studies have found they have been used to treat allergic reactions in 20% to 77% (median, 49%) of cases when epinephrine was administered.[15,29,31,72,73,187,190-193] Using a stock autoinjector to treat anaphylaxis could potentially prevent a near-fatal or fatal allergic reaction when a personal autoinjector is not available, including in cases when students with no known history of prior allergic reaction experience anaphylaxis. The number of lives saved from the use of stock autoinjectors is unknown but likely small, because death from anaphylaxis is rare.[42,44,194-198]

Stocking autoinjectors while also requiring students to store personal autoinjectors on site for designated at-school use provides minimal anticipated health benefits at a high cost.[199,200] However, panel members agreed that stock autoinjectors may provide a suitable and more cost-effective alternative to the personal autoinjectors that some child care centers and schools currently collect from students to store on site. When students with allergy are required to submit personal autoinjectors to be stored on site, they must obtain additional autoinjectors for use at home and other settings. As an alternative, child care centers and schools may instead stock a small number of unassigned autoinjectors to treat suspected anaphylaxis in any individual. This would reduce the total number of autoinjectors being purchased, stored on site, and thrown away after expiring. Stocking autoinjectors may also improve access to epinephrine for students who face barriers to obtaining personal autoinjectors, due, for example, to the price of autoinjectors in jurisdictions that lack universal public drug coverage.[130,201-207]

Most panel members agreed that if child care centers or schools decide to stock unassigned autoinjectors, they should not require students with allergy to submit personal autoinjectors to be stored on site for designated at-school use. However, they should permit students with allergy to carry personal autoinjectors with them (eg, in a carrying case) when they are mature enough to do so. Those panel members agreed that learning to carry an autoinjector is an important self-management habit for children with allergy to develop. Most cases of anaphylaxis occur outside of child care centers and schools.[13,18,32-63] If students with allergy learn to carry personal autoinjectors with them, it might help prepare them for anaphylaxis in other settings. Students may use those personal autoinjectors to treat anaphylaxis in any setting where they carry them, including when they are at home or visiting friends, traveling to or from their child care center or school, participating in field trips or other off-site activities, or spending time in other areas where stock autoinjectors are not readily accessible. Personal autoinjectors may also provide a treatment option if stock autoinjectors malfunction or they have not been replaced after being used or expiring.

The costs, acceptability, and feasibility of stocking autoinjectors at child care centers and schools vary from one jurisdiction to another, depending in part on the local availability and price of autoinjectors,[9,174-177] the availability of funding for stock autoinjectors,[158,208-211] the availability of prescribing physicians in jurisdictions where a prescription is needed to obtain autoinjectors,[208-210] and the existence of laws or policies that prohibit or enable child care and school personnel to administer stock autoinjectors. Studies have found that school nurses and parents of children with allergy are generally supportive of stock autoinjector programs,[101,155,158,212,213] although some parents have concerns about the adequacy of stock autoinjector coverage in large schools or those with multiple buildings.[212] In contrast, some administrators, teachers, and other personnel are reluctant to implement stock autoinjector programs, due to concerns about increased responsibility or real or perceived legal liability.[93,208,209,212,213] Research among school nurses suggests that equipping personnel on field trips and other off-site activities with stock autoinjectors tends to be less feasible and acceptable to personnel than stocking autoinjectors on site alone, due to cost and other barriers.[158]

Recommendation

6. When laws permit, we suggest that child care centers and schools stock unassigned epinephrine autoinjectors on site, instead of requiring students with allergy to submit personal autoinjectors to be stored on site for designated

at-school use. (Conditional recommendation; very low certainty of evidence.)

Special circumstances

If child care centers and schools decide to stock unassigned epinephrine autoinjectors, most panel members supported an approach in which students with allergy are not required to store personal autoinjectors on site (eg, in a school office) for designated at-school use but are permitted to carry personal autoinjectors with them (eg, in a carrying case) when they are mature enough to do so. Those autoinjectors may be used to treat anaphylaxis if it occurs while the students are traveling to or from their child care centers or schools, participating in off-site activities, or in other contexts where stock autoinjectors are not readily available.

Some child care centers and schools may have enough stock autoinjectors available to equip personnel on field trips and other off-site activities with stock autoinjectors, while maintaining an adequate supply on site. However, in many cases, it is not likely to be feasible or cost-effective to allow personnel to take stock autoinjectors on field trips or other off-site activities—due to the number of stock autoinjectors required to provide adequate coverage and the additional oversight and resources needed to ensure that stock autoinjectors are distributed and returned appropriately. If stock autoinjectors will not be available during off-site activities, we suggest that child care centers and schools should (1) inform students with allergy and their parents of that fact beforehand; (2) require students with allergy to bring personal autoinjectors with them; and (3) take steps to ensure those personal autoinjectors are readily accessible during the activity.

In jurisdictions where epinephrine autoinjectors are inaccessible, child care centers and schools may consider stocking prefilled epinephrine syringes or epinephrine ampules with empty syringes as an alternative.

If local laws do not allow child care or school personnel to administer stock autoinjectors, there is no rationale for stocking them. In such cases, it may be appropriate to advocate for changes to the law.

Implementation considerations

If child care centers and schools stock unassigned epinephrine autoinjectors, panel members suggested they should develop clear policies and procedures for obtaining, storing, using, and replacing stock autoinjectors; stock at least 2 autoinjectors in each dose required to provide weight-appropriate options for all students (dose options vary from one jurisdiction to another); store stock autoinjectors in a location that is known to all personnel and that can be quickly and easily accessed at any time; store stock autoinjectors at an appropriate temperature, according to the manufacturer's specifications (20°C-25°C/68°F-77°F); promptly replace spent and expired stock autoinjectors; and train personnel on where to find and how to use stock autoinjectors.

The chances that multiple episodes of anaphylaxis will occur in a single child care center or school in a year are low, and the chance that multiple episodes will occur in a single month, week, or day are even lower. If stock autoinjectors are promptly replaced after they have been used or expired, that will mitigate the risk of having inadequate stock on hand to treat anaphylaxis that might occur in the future. If child care centers and schools have large campuses or multiple buildings, they may need to purchase more stock autoinjectors to ensure they are readily accessible across the site.

If local laws permit, panel members agreed that personnel should be trained to use stock autoinjectors to treat any suspected cases of anaphylaxis that occur in students, staff members, volunteers, or visitors, even if the individual has no known history of allergy. In some jurisdictions, changes to local regulations or laws may be needed to enable child care or school personnel to administer stock autoinjectors to individuals who experience suspected anaphylaxis; protect personnel from risk of legal liability when they use stock autoinjectors; and/or enable child care centers and schools to obtain stock autoinjectors without a prescription or enable physicians to prescribe stock autoinjectors. In other jurisdictions, regulations or laws have already been passed to address these issues. Policymakers may consult with legal professionals to learn about relevant regulations and laws in their jurisdictions.

Stock autoinjector programs are more feasible when autoinjectors are readily available and adequate funding is provided to cover the costs of acquiring them, which may require changes in government policies or funding allocations. Manufacturers in some jurisdictions currently offer a limited number of free stock autoinjectors to schools that meet certain criteria, but it is possible that such programs might be discontinued or changed in the future. Panel members speculated that in some cases, child care and school systems might be able to negotiate a reduced price on bulk orders of stock autoinjectors. To limit the risk of autoinjector shortages, it might be beneficial for administrators to communicate with autoinjector manufacturers and distributors to learn whether bulk orders can be accommodated.

To determine when students with allergy are mature enough to carry their personal autoinjectors with them, child care centers and schools should engage each student's parents in a discussion about the child's abilities. In general, a student is mature enough to carry their personal autoinjector when they can keep it on their person without losing it, playing with it, or taking it out at inappropriate times.

For more detailed discussion of the underlying rationale and implementation considerations for this recommendation, see Appendix E: Stocking Unassigned Epinephrine (Adrenaline) Autoinjectors in this article's Online Repository (available at www.jacionline.org).

SITE-WIDE FOOD PROHIBITIONS AND ALLERGEN-RESTRICTED ZONES

Questions

Should child care centers and schools prohibit specific foods site-wide (eg, nut-free schools), rather than not implement such restrictions?

Should child care centers and schools establish allergen-restricted zones for specific foods (eg, peanut-free classrooms, milk-free tables), rather than not have such zones?

Background

In an effort to reduce the risk of accidental exposure to food allergens, some child care centers and schools have implemented

site-wide food prohibitions on products that contain specific allergens (eg, nut-free schools).[159,214-216] These prohibitions are sometimes known as food restrictions or food bans. Some child care centers and schools have taken another approach by establishing allergen-restricted zones where foods that contain specific allergens are prohibited (eg, peanut-free classrooms, milk-free tables).[159,214-216] In some cases, allergen-restricted zones have been implemented along with site-wide food prohibitions. For example, some schools have established milk-free tables while also prohibiting nut-containing foods across the entire site.

Summary of evidence

There is very little research evidence on the effects of site-wide food prohibitions or allergen-restricted zones, and the available evidence is of very low certainty. The results of this research have been mixed. Studies have not consistently found that these interventions lower the risk of allergic reactions[20,22,217] or improve quality of life.[218] Some students with food allergy feel safer in classrooms or schools where their food allergens have been prohibited.[219] However, it can be challenging to effectively monitor and promote community adherence to such prohibitions.[94,158,220] Some students still bring prohibited foods to school,[221] and there are documented cases of allergic reactions to a food (peanut) occurring in schools where it is prohibited.[20,22,24] Several panel members suggested that site-wide food prohibitions and allergen-restricted zones might contribute to reduced vigilance among students or personnel: in cases when allergic reactions to prohibited foods do occur, students or personnel might be less likely to promptly recognize and treat the reaction if they mistakenly believe the foods are not present.

Support for site-wide food prohibitions and allergen-restricted zones varies widely among school personnel and parents of children with and without food allergy.[134,151,152,154-156,214,222-224] These interventions limit the autonomy and dietary choices of students who are not allergic to prohibited foods, which might have negative effects on their food access.[7,205,225-229] Allergen-restricted zones may also negatively affect the autonomy of students with food allergy if they are compelled against their wishes to eat separately from peers.[219] These interventions might put students with food allergy at higher risk of bullying or isolation.[230] They might also limit the development of self-management and social skills in students with food allergy, which might reduce their preparedness for settings where their allergens are not prohibited.

Recommendations

7. We suggest that child care centers and schools do not prohibit specific foods site-wide. (Conditional recommendation; very low certainty of evidence.)
8. We suggest that child care centers and schools do not establish allergen-restricted zones, except in the limited special circumstances identified. (Conditional recommendation; very low certainty of evidence.)

Special circumstances

When students lack the developmental capacity to self-manage due to very young age (ie, infants, toddlers) or physical or cognitive impairments, it might be appropriate to implement allergen-restricted zones (eg, nut-free classrooms, milk-free tables) to lower the risk that they will accidentally eat a food allergen.

If local laws require child care centers or schools to regulate the presence of certain foods, policymakers and personnel should follow the applicable laws. In some cases, it might be appropriate to advocate for changes to the law.

In jurisdictions where food ingredient labeling is not mandatory or not effectively enforced, any food prohibitions would be impossible to effectively implement.

Implementation considerations

Child care centers and schools should communicate their food policies to all community members, including parties that use the facilities outside of regular operating hours. If child care centers or schools already have site-wide food prohibitions (eg, nut-free school) or allergen-restricted zones (eg, nut-free classroom or table) in place, it might be reasonable to maintain those interventions for a transitional period, while engaging community members in dialogue about the rationale for phasing the interventions out and emphasizing other strategies to limit the risk of accidental exposure to food allergens.

Many steps may be taken to potentially lower the risk of accidental exposure to food allergens. Starting from a young age, parents and other caregivers play a critical role in helping children develop the knowledge and skills needed to manage the risk of accidental exposure (eg, by reading food labels, washing their hands before and after eating, not sharing foods or drinks). When students with food allergy are mature enough to practice these strategies, child care and school personnel may encourage them to do so. Child care and school personnel may also promote inclusion and limit the risk of accidental exposure to food allergens by taking students' food allergies into account when planning field trips and classroom activities (eg, avoid using students' food allergens in crafts, science projects, and classroom celebrations). Although we did not assess the efficacy of these strategies in our review, other common-sense approaches for managing the risk of allergic reactions at child care centers and schools include providing active adult supervision during snack and meal times, cleaning surfaces where food is prepared or eaten, implementing rules against food sharing among students, and proactively addressing incidents of food-related bullying.

For more detailed discussion of the underlying rationale and implementation considerations for the recommendations, see Appendix F: Site-wide Food Prohibitions and Allergen-restricted Zones in this article's Online Repository (available at www.jacionline.org).

CONCLUSIONS

The recommendations in these guidelines may help support informed decision making by policymakers and other members of child care and school communities. However, the evidence that informs these guidelines has important limitations. Very few studies have assessed the effects of food allergy interventions on the rate of allergic reactions in child care centers and schools, including severe or fatal allergic reactions. Studies on these outcomes are likely to require well-coordinated collaboration among large numbers of child care centers and schools over long periods of time. Well-designed and adequately maintained registries with standardized mandatory reporting mechanisms

would be beneficial. More appropriately designed studies are also needed to assess the effects of food allergy interventions on the quality of life and psychosocial well-being of students with food allergy, as well as students without food allergy, parents, and personnel. More research may also be beneficial for assessing the cost-effectiveness, feasibility, acceptability, and equitability of different interventions. The findings of future research could substantially affect the recommendations in these guidelines.

We encourage all stakeholders who would like to adapt the recommendations to their local circumstances to follow the systematic and transparent GRADE-ADOLOPMENT process (see Appendix A: Instructions for Use and Adaptation in this article's Online Repository at www.jacionline.org).[231]

Gina Clowes (formerly of Food Allergy Research and Education), Beatrice Povolo (Food Allergy Canada), and Jennifer Protudjer (University of Manitoba) contributed to the development of these guidelines as panel members, but they chose not to be included as co-authors because they disagreed with some of the recommendations and/or they had concerns about the process that was undertaken to identify and manage potential, perceived, or real conflicts of interests among panel members. Hannah Lank helped to identify the questions and outcomes of interest to be addressed in these guidelines. Bart Dietl and Zbigniew Leś assisted in screening the research literature. The following individuals and organizations reviewed and provided feedback on the guidelines (please note: having served as a reviewer does not necessarily imply that the reviewer agreed with all of the conclusions or recommendations in this document): Lorianna Bennett; Scott Cameron; Pantipa Chatchatee; Michael Pistiner; Maria Said; Hugh Sampson; Carina Venter; Gary Wong; the Allergy and Asthma Network; the American Academy of Allergy, Asthma, and Immunology; the American College of Allergy, Asthma, and Immunology; the Anaphylaxis Campaign; the Australasian Society of Clinical Immunology and Allergy; the Canadian Society of Allergy and Clinical Immunology; the European Academy of Allergy and Clinical Immunology; the Food Allergy Canada; the Food Allergy Research and Education; the German Allergy and Asthma Association; the National Association of School Nurses; and the World Allergy Organization.

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