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Implementation of the Addendum Guidelines for Peanut Allergy Prevention by U.S. Allergists, a Survey conducted by the NIAID, in Collaboration with the AAAAI

Jacqueline L. Johnson, DrPH¹, Ruchi S. Gupta, MD MPH^{2,3}, Lucy A. Bilaver, PhD³, Jack W. Hu, MS¹, Jennifer Martin, BS¹, Jialing Jiang, BA³, Alexandria Bozen, BS³, Matthew M Davis, MD MAPP^{2,3}, Jamie Reese, BS¹, Susan Cooper, MSc⁴, Alkis Togias, MD FAAAAI⁴, Samuel J. Arbes Jr., PhD¹

¹Rho, Inc., Durham, NC

²Ann & Robert H. Lurie Children's Hospital, Chicago, IL

³Northwestern University Feinberg School of Medicine, Chicago, IL

⁴Division of Allergy, Immunology, and Transplantation, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD

Abstract

Background: In 2017, the Addendum Guidelines for the Prevention of Peanut Allergy were published with recommendations on early introduction of peanut-containing foods based on infants' clinical history.

Objective: To conduct a nationwide U.S. survey to assess Guidelines implementation among allergists and immunologists who manage infants for food allergy.

Methods: Survey invitations were delivered to 3281 non-retired, U.S. members of the American Academy of Asthma, Allergy, and Immunology, board certified in allergy and immunology. The survey assessed awareness and implementation of the Guidelines and barriers to implementation. Descriptive statistics were generated.

Results: Twenty-nine percent (946 of 3281) of surveyed allergists/immunologists responded, and 87.1% (825 of 946) of responders met eligibility criteria. Among eligible responders, 97.1% were aware of the Guidelines. Of those, 64.5% reported full implementation of the Guidelines as published, 34.4% reported partial implementation, and 1.1% reported using none of the Guidelines. Barriers to Guidelines use included parental (47.6%) and self (21.8%) concerns about allergic reactions, lack of referrals (33.6%), parents uninterested in early feeding (28.2%), and lack

Corresponding Author: Jacqueline Johnson, DrPH, Rho, Inc., 2635 East NC Highway 55, Durham, NC 27713, Telephone: 919-595-6456, Facsimile: 919-408-0999, Jacqueline_Johnson@rhoworld.com.

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of clinic time (20.9%). The two most common deviations from the Guidelines were considering additional factors not specified in the Guidelines such as family history (50.2%) and conducting skin prick testing in non-high-risk children (43.9%). Of respondents using the Guidelines, 45.7% indicated they needed more education or training.

Conclusion: Essentially all allergists/immunologists who responded to the survey reported full or partial Guidelines implementation. Parental concerns and lack of referrals are major identifiable barriers. Improved Guidelines messaging to parents and referring physicians is warranted.

CAPSULE SUMMARY

An online survey assessed usage of the 2017 Addendum Guidelines for the Prevention of Peanut Allergy by allergists. Most responders reported fully or partially implementing the Guidelines, but barriers to implementation were identified.

Keywords

Peanut allergy; food allergy; prevention guidelines clinical practice; survey

INTRODUCTION

Two percent of the U.S. population is allergic to peanut,^{1,2} and peanut and tree nut allergies are the leading causes of death related to food-induced anaphylaxis in the U.S.^{3,4} The number of life-threatening anaphylactic reactions to these foods continues to increase, and the threat of these reactions poses significant medical, psychological, and social burdens to peanut allergic individuals and their families.⁵

Prior to the 2017 publication of the *Addendum Guidelines for the Prevention of Peanut Allergy in the United States: Report of the National Institute of Allergy and Infectious Diseases–Sponsored Expert Panel*,⁶ peanut avoidance in early life remained a widely practiced approach to peanut allergy prevention. In 2015, a report on the Learning Early about Peanut Allergy (LEAP) trial demonstrated that the early introduction of peanut-containing food into the diets of infants 4-11 months of age decreased the development of peanut allergy by over eighty percent.⁷ In the LEAP trial, participants in the treatment arm were fed at least 6 grams of peanut protein per week, distributed in three or more meals per week, until they reached 60 months of age.⁷ Soon after the publication of the LEAP trial, NIAID convened an expert panel to review these new data and all other available evidence. In 2017, the expert panel published an addendum to the 2010 *Guidelines for the Diagnosis and Management of Food Allergy*.⁸ The addendum, referenced above and referred to heretofore as the Guidelines, contains three guidelines for the early introduction of dietary peanut in infants at various risk levels for the development of peanut allergy. For infants with severe eczema and/or egg allergy, Guideline 1 recommends evaluation by sIgE measurement and/or skin prick testing and, if necessary, an oral food challenge. Based on these test results, introduction of peanut-containing foods can be recommended or not. For infants with mild-to-moderate eczema, Guideline 2 recommends the introduction of peanut-containing foods around age 6 months. For infants without eczema or any food allergy,

Guideline 3 recommends the introduction of peanut-containing foods as age appropriate and in accordance with family preferences and cultural practices.⁶

The introduction of new practice guidelines, especially when they radically differ from previous approaches, needs to be carefully monitored in various groups of practitioners including allergists/immunologists, primary care providers, and parents of infants. Monitoring does not only allow estimation of the prevalence of implementation, but, most importantly, identification of barriers to implementation that can lead to targeted education and future guideline modifications. We herein report the results of a survey conducted in collaboration with the American Academy of Allergy, Asthma and Immunology (AAAAI) aimed at estimating Guidelines implementation among U.S. allergists/immunologists who provide food allergy services to infants 12 months of age. Additional objectives were to assess Guidelines awareness, food allergy services provided for infants, familiarity and agreement, barriers to and concerns about Guidelines implementation, referrals received for the Guidelines-recommended assessments and needs for the Guidelines training and practice aids.

These authors also conducted a similar survey among U.S. pediatricians.⁹ Of 1,868 pediatricians who responded to the survey (5% of the targeted sample), 93.4% reported awareness of the Guidelines, and among pediatricians aware of the Guidelines, 64.3% reported partial Guidelines implementation and 28.9% full implementation. Major identified barriers included parental concerns about allergic reactions, uncertainty in understanding and correctly applying the Guidelines, and conducting in-office, supervised feedings. Two thirds of pediatricians reported a need for further training on the Guidelines.

METHODS

Design

This study was a cross-sectional survey of all physicians (hereafter allergists) within the AAAAI membership database who met all of the following criteria: not retired, mailing address within the 50 United States, certified by the American Board of Allergy and Immunology (ABAI), with a certification number and email-address on file with the AAAAI.

The survey was conducted between September and October 2018. AAAAI staff emailed a survey invitation with a unique link the participant could use to complete the online survey. Over a three-week period, the survey staff e-mailed weekly follow-up letters to non- and partial responders. The AAAAI posted an announcement of the survey in its biweekly membership newsletter prior to emailing the initial survey letter and prior to e-mailing the final follow-up letter. Potential participants were offered a \$25 eGift card to complete the survey.

Prior to conducting the survey, study investigators pre-tested the survey in one-on-one interviews with 8 allergists, then piloted the survey online with 15 allergists. This study was approved by the institutional review board at Lurie Children's Hospital of Chicago.

Data Collection Instrument

The survey instrument (see the Online Supplement) contained 31 fixed-response questions and 2 questions requiring the entry of a number. Thirteen fixed-response questions had an “Other” response that allowed the respondent to type free text. The first three questions screened out respondents who were not practicing allergists, did not see patients for the diagnosis or management of food allergy, or did not see infants 12 months of age for the diagnosis or management of food allergy, respectively. A fourth question near the end of the survey assessed board certification in allergy and immunology. Non board-certified respondents could finish the survey but, post hoc, were counted as ineligible and excluded from analyses. Three questions regarding patient scenarios were included. The questions involved infants 4 months of age with severe eczema and/or egg allergy but differed in peanut skin prick test wheal sizes (0-2 mm, 3-7 mm, or 8 mm). The survey contained skip patterns based on responses to questions about Guidelines awareness and implementation; therefore, the number of expected responses varied by question.

Statistical Analyses

Frequencies, percentages, and associated Clopper-Pearson confidence intervals were calculated for categorical responses. Bivariate associations between selected survey responses and provider and/or practice characteristics were investigated with exact chi-square tests. P-values for tests of associations were not adjusted for the number of tests performed.

The study team adjudicated responses to questions whose answers included an “Other” free-text field. When this free-text field was like an existing fixed response, it was reassigned to one or more of the fixed responses., and when unlike, a new “Other” response was created. If the free text did not answer the question or elaborated on an existing fixed response, the response was deleted. Each analysis used all available data.

RESULTS

Survey Respondents

Participant flow through the survey is summarized in Figure I. Survey invitations were delivered to 3,281 of the 3,288 AAAAI members who met survey sample selection criteria. Of these, 946 (29%) answered at least one survey question, and 825 met all four eligibility criteria. An additional 36 participants exited during the survey, leaving 789 eligible respondents who completed the survey. Among individual questions, completion rates ranged from 89.9% to 99.9%.

Table I summarizes provider and practice characteristics. Respondent’s gender was evenly split with about half being male (52%). Most respondents were non-Hispanic (96%) and white (67%). Median years since medical school graduation was 18, and median time spent in patient care 36 hours per week. Practices were most commonly suburban (63%), not affiliated with an academic institution (68%), and 48% were private group practices. A majority (62%) reported that less than a quarter of their pediatric patients received Medicaid benefits.

Peanut Allergy Prevention Services, Agreement with Early Peanut Introduction, and Referrals

Essentially all eligible respondents indicated they advise parents on peanut allergy prevention (99%), provide peanut-specific skin prick testing (99%) and peanut-specific IgE testing (98%) (Table II). Eighty-eight percent perform graded oral food challenges with peanut, and 86% supervised in-office introductions of peanut-containing foods. A vast majority strongly agree (69%) or agree (28%) that early introduction is effective in preventing peanut allergy. In response to a question about sources of referrals to assess infants for early introduction, 88% indicated they had received a referral from a pediatrician and 55% from a family medicine physician, whereas 79% had self-referred parents. Four percent had not received any referrals to assess an infant for early introduction of peanut. Additionally, 74% indicated that less than half of their referrals for early introduction involved an infant with severe eczema and/or egg allergy. Only 6% stated they receive a peanut-specific IgE result from the referring health care provider most of the time, and 20% stated they never receive a peanut-specific IgE result (Table II).

Guidelines Awareness, Information Sources, Familiarity, and Training Needs

Among eligible respondents, 97% were aware of the Guidelines prior to the survey (Table III). Respondents aware of the Guidelines cited various sources of information about the Guidelines, the largest majority being medical journals (92%) (Table E1 in the online supplement). Although 77% reported being very familiar with the Guidelines and 88% reported having read all or parts of the Guidelines report, almost half (46%) of respondents who were aware of the Guidelines indicated a need for further education or training on the Guidelines (Table E1).

Guidelines Implementation, Deviations, and Barriers

Of those aware, 65% used the Guidelines as published and rarely deviated from any part (full implementation), 34% implemented parts of the Guidelines (partial implementation), and 1% were not implementing the Guidelines (Table III).

Respondents who indicated they partially implemented the Guidelines were asked about the ways in which they deviate from the Guidelines (Table IV). Half stated they consider additional factors, such as family history of food allergy or allergies to other foods, before making recommendations regarding early introduction. A substantial proportion indicated they conduct peanut-specific skin prick testing (44%) or peanut specific IgE testing (31%) on infants without severe eczema or egg allergy. One-third reported deviating by conducting graded oral food challenges when the Guidelines recommended in-home or in-office introduction of peanut.

When asked about barriers to implementing the Guidelines, 48% of respondents identified parental concerns about allergic reaction, followed by lack of referrals (34%), parents who were not interested in the Guidelines (28%), provider concerns about allergic reaction (21%), and lack of clinic time (20%) (Table IV).

Responses to Clinical Scenarios

Results from the three clinical scenarios that were part of the survey are presented in Table V. For the scenario involving an infant with severe eczema and/or egg allergy with the smallest peanut wheal diameter, 0-2 mm, 75% of allergists provided only Guidelines-adherent responses of either introduction at home or a supervised in-office feeding, 15% provided both adherent and non-adherent responses, and 10% provided only non-Guidelines-adherent responses. Similarly, for the scenario involving the largest peanut wheal diameter of 8 mm, 78% of allergists provided only the Guidelines-adherent response of prescribing avoidance, 9% provided both adherent and non-adherent responses, and 13% provided only non-Guidelines-adherent responses. Responses were more varied with the scenario involving a mid-range wheal diameter of 3-7 mm: fewer respondents (69%) gave only Guidelines-adherent responses of a graded oral food challenge or supervised in-office feeding, more respondents (25%) provided only non-Guidelines-adherent responses, and 6% provided both Guidelines-adherent and non-adherent responses. Forty-four percent of respondents provided only Guidelines-adherent responses to all three scenarios. Among respondents who indicated that they use the Guidelines as published and rarely deviate from any part, 52% provided only Guidelines-consistent responses across all three scenarios. Between 10% to 12% of respondents provided free text responses to the “Other” category across the three scenario questions. The most common “Other” responses were to check peanut-specific IgE (2-6%), to check peanut component IgE (1-4%), and to consider parental preferences (6%) when wheal size is 0-2mm (data not shown).

Need for Office Materials and Practice Aids

The office materials most often requested by respondents for parent education were paper or electronic handouts providing answers to frequently asked questions (82%), instructions on the feeding of peanut-containing foods at home (75%), or explanation of the 2017 Guidelines (64%). When asked about practice aids for the provider, respondents most often requested paper or electronic handouts providing a script for explaining the Guidelines to parents (58%), guidance on how to perform a supervised in-office introduction of a peanut-containing food (55%), or guidance on assessments or recommendations (53%).

Associations of Survey Responses with Provider Characteristics

Table VI summarizes significant relationships between selected survey responses and provider characteristics of years since medical school graduation and academic affiliation. Only associations with year of medical school graduation and academic affiliation are reported because they were associated with the greatest number of questions and are identifiable targets for intervention. More recent graduates were more likely to use the Guidelines as published ($p=0.012$), provide graded oral food challenges ($p<0.0001$), provide supervised in-office feedings ($p=0.0012$), strongly agree that early introduction prevents peanut allergy ($p=0.0003$), and have read the full Guidelines report ($p=0.0008$). Less recent graduates were more likely to express a need for more training on the Guidelines ($p=0.0014$) and listed conducting a graded oral food challenge ($p=0.0008$) or insufficient insurance coverage or reimbursement ($p<0.0001$) as barriers to Guidelines implementation. In turn, academically affiliated allergists were more likely to provide graded oral food challenges

($p=0.0002$), strongly agree that early introduction prevents peanut allergy ($p=0.0002$), have read the full Guidelines report ($p=0.0002$), and have listed lack of clinic time as a barrier to Guidelines implementation ($p<0.0001$). Non-academically affiliated allergists were more likely to list provider concerns about allergic reactions ($p<0.0001$) and legal liability ($p<0.0001$) as barriers to implementation.

DISCUSSION

Within 21 months of the publication of the Addendum Guidelines for the Prevention of Peanut Allergy in the United States, we conducted a nationwide U.S. survey among practicing allergists, to assess the level of Guidelines implementation and to identify barriers that may require targeted efforts for improvement of implementation and, possibly, of the Guidelines themselves. Among members of the target population, 29% answered at least one survey question, and 24% completed the survey.

The survey found that essentially all allergists were aware of the Guidelines with two-thirds stating that they were using the Guidelines as published and rarely deviating from any part. Compatible with this finding was the fact that almost all respondents agreed that early introduction prevents peanut allergy, and two-thirds strongly agreed. This is an important observation because the Guidelines rely on allergists to implement a substantial part of the Guidelines.

One third of respondents indicated that they partially deviate from the Guidelines and less than half selected only Guidelines-consistent recommendations in all three clinical scenarios. Commonly reported deviations included considering additional risk factors, conducting IgE and skin prick testing in children who do not have severe eczema or egg allergy, and conducting graded oral food challenges when in-home or in-office introduction of peanut was recommended. Among infants who do not have severe eczema or egg allergy, the Guidelines recommend the introduction of peanut-containing foods without testing. Widespread testing of non-high-risk infants is not feasible and could potentially delay wider introduction of peanut-containing foods in infants, thus reducing the effectiveness of the peanut allergy prevention guidelines. For the clinical scenarios, the most variation in the responses was regarding recommendations for a high-risk infant with a peanut wheal diameter of 3-7 mm. One fifth of respondents would prescribe avoidance in this case, even though the Guidelines encourage performing a graded oral food challenge or supervised in-office introduction. This deviation is fully understandable given the lack of extensive clinical experience with oral food challenges in infants, but also in view of the variance around skin prick test wheal size which relates to materials and technique, something that the Guidelines do discuss.

Our survey's documentation of these variations in the clinical approach is of major importance as it identifies the immediate need for education to improve adherence to the Guidelines. Almost half of the allergists indicated a need for further Guidelines education or training. Allergists who had graduated medical school less recently or who were not affiliated with an academic institution were more likely to express a need for further training. Both groups also were less likely to use the Guidelines and to perform

recommended services such as oral food challenges and in-office peanut introduction. One strategy for these subsets of allergists would be through continuing education. For example, the ABAI through its Maintenance of Certification Program could consider making the full Guidelines report one of its recommended manuscripts. Only about half of the allergists indicated they had read the full report.

Our documentation of these variations also identifies the need for further research to explore if additional risk factors or commonly practiced Guidelines deviations should be included in any future Guidelines modifications. The Guidelines' reliance on severe eczema and/or egg allergy to guide testing was based on the LEAP study.⁷ Whether or not additional risk factors, such as food allergies other than egg, family history, or other commonly practiced deviations should be added to future Guidelines modifications must be based on clinical research that evaluates these additional factors as predictors of the success of the early introduction of peanut-containing foods. The ultimate success of the current or future modifications of the Guidelines will require monitoring the incidence of peanut allergy over time at the population level.

The greatest barriers to Guidelines implementation that the survey identified were parental concerns about allergic reactions, parents who were not interested in early feeding, and lack of referrals. In both this survey of allergists and our survey of U.S. pediatricians,⁹ parental concern about allergic reactions was the most frequently identified barrier to implementation, a finding that is not surprising at this early stage of Guidelines implementation and consistent with surveys of parental acceptance of the early introduction of peanut-containing foods.^{10,11} Lai and Sicherer reported that the most common physician-perceived implementation barrier was parental acceptance, and the most common parent-identified barriers were fear of reaction and choking, although 90% of parents indicated comfort with early peanut introduction when answering yes or no. These authors suggested that parental fears could be addressed by the pediatrician and with written materials.¹¹ Most allergists in our survey indicated they would like to have paper or electronic handouts for parents that provide answers to frequently asked questions, provide instructions on the feeding of peanut-containing foods at home, and explain the Guidelines. The survey found that most allergists had received referrals from a pediatric or a family medicine practice for assessment of early peanut introduction, and most had also assessed infants of self-referred families. However, for most respondents, less than half of those referrals adhered to the Guidelines involving infants with severe eczema and/or egg allergy. In addition, only a few respondents indicated that most infants referred to them had peanut-specific IgE measured prior to referral. That many of these referrals may be unnecessary is concerning and could potentially delay the introduction of peanut and reduce its effectiveness in preventing peanut allergy. Allergists who are receiving numerous referrals for low and moderate risk children may need to consider having discussions regarding Guidelines assessments with their referral sources. In a parallel survey we conducted on U.S. pediatricians, the need for additional educational efforts among pediatricians was clearly identified.⁹

One limitation of this study is the survey response rate. Among AAAAI members, 29% answered at least 1 question in the survey and 24% completed the survey. While this response rate is considerably higher than the 5% response rate in our survey of pediatricians,

⁹ this still represents a minority of the target population. A potential source of bias is the possibility that those allergists who were aware and implementing the Guidelines were more likely to respond to the survey, which would inflate the prevalence of Guidelines awareness and implementation. However, given that implementation rates were very high, a very large number of non-responders would need to not be implementing the Guidelines in order to change the overall conclusion that most allergists are implementing the Guidelines. A related limitation of this study is the lack of data to compare responders and non-responders in order to assess survey bias. The available AAAAI membership database does not include gender, ethnicity, race, year of medical school graduation, hours practiced per week, or other characteristics that would make a comparison of responders to non-responders informative. However, in the AAAAI database, one variable was available for comparison between responders and non-responders: whether the respondent identified as a medical school faculty. We found that responders were more likely than non-responders to be medical school faculty (21.0% versus 15.6%); however, it is unlikely that this difference substantially influences the primary findings of this survey. Another limitation is that the survey did not ask allergists about their primary training. It is possible that Guidelines implementation differs by training in pediatrics versus internal medicine. A final limitation is that the survey assessed Guidelines implementation but not sustainability or cost of implementation; these aspects were beyond the scope of this survey.

In conclusion, this survey indicates that, approximately 21 months after publication, the vast majority of allergists are aware of the Guidelines for the Prevention of Peanut Allergy and most are fully implementing them. However, deviations do occur, some reflecting areas of controversy requiring additional research. Also, educational activities and processes to facilitate Guidelines implementation are needed. In addition to allergists, these should focus on primary care providers and parents of infants.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Conflict of Interest Statement:

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ABBREVIATIONS

AAAAI	American Academy of Allergy, Asthma and Immunology
ABAI	American Board of Allergy and Immunology
CI	Confidence Interval
DAIT	Division of Allergy, Immunology, and Transplantation
NIAID	National Institute of Allergy and Infectious Diseases
NIH	National Institutes of Health
IgE	Immunoglobulin E

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KEY MESSAGES

- The vast majority of allergists were aware of and fully or partially implementing the Guidelines 21 months after publication.
- Improved messaging to parents and referring physicians is warranted.

Figure I:
Participant Flow

Table I:**Provider and Practice Characteristics**

	%	95% CI		%	95% CI
Gender (N=787)			Practice Academic Affiliation (N=789)		
Male	51.6	(48.0 - 55.1)	No	68.1	(64.7 - 71.3)
Female	48.4	(44.9 - 52.0)	Yes	31.9	(28.7 - 35.3)
Ethnicity (N=791)			Practice Location Region Division^I (N=789)		
Not Hispanic or Latino	95.8	(94.2 - 97.1)	South Atlantic	18.5	(15.9 - 21.4)
Hispanic or Latino	4.2	(2.9 - 5.8)	Mid Atlantic	16.0	(13.5 - 18.7)
Race (Select all that apply) (N=774)			East North Central	15.0	(12.5 - 17.6)
White	66.9	(63.5 - 70.2)	Pacific	15.0	(12.5 - 17.6)
Asian	30.7	(27.5 - 34.1)	West South Central	11.2	(9.0 - 13.6)
Black or African American	1.9	(1.1 - 3.2)	New England	7.0	(5.3 - 9.0)
American Indian or Alaska Native	0.5	(0.1 - 1.3)	West North Central	6.2	(4.6 - 8.1)
Native Hawaiian or Other Pacific Islander	0.3	(0.0 - 0.9)	Mountain	6.1	(4.5 - 8.0)
Other	0.8	(0.3 - 1.7)	East South Central	5.2	(3.8 - 7.0)
Years Since Medical School Graduation (N=790)			Practice Type (N=789)		
0 - 10	18.1	(15.5 - 21.0)	Private Group Practice	48.4	(44.9 - 52.0)
11 - 20	40.0	(36.6 - 43.5)	Academic Medical Center or Practice	22.2	(19.3 - 25.2)
21 - 30	17.1	(14.5 - 19.9)	Private Solo Practice	16.7	(14.2 - 19.5)
31+	24.8	(21.8 - 28.0)	Hospital Practice or Clinic	5.6	(4.1 - 7.4)
Median (Q1, Q3)	18.0	(30.0, 62.0)	Managed Care Organization or HMO	4.8	(3.4 - 6.6)
Hours per Week in Patient Care (N=789)			Military or US Government	1.3	(0.6 - 2.3)
Part-time (<40 hours)	55.0	(51.5 - 58.5)	Community Clinic or Health Center	1.0	(0.4 - 2.0)
Full-time (40+ hours)	45.0	(41.5 - 48.5)	Percent of Patients Receiving Medicaid (N=789)		
Median (Q1, Q3)	36.0	(30.0, 40.0)	0 - 25%	61.5	(58.0 - 64.9)
Practice Location (N=789)			26 - 50%	26.1	(23.1 - 29.3)
Suburban	63.1	(59.6 - 66.5)	51 - 75%	10.9	(8.8 - 13.3)
Urban	33.1	(29.8 - 36.5)	76 - 100%	1.5	(0.8 - 2.6)
Rural	3.8	(2.6 - 5.4)			

^IState categorizations for region division: http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

Table II:**Guidelines Services, Agreement with Early Peanut Introduction, and Referrals**

	%	95% CI
Which of the following peanut allergy services, if any, do you provide for infants? (Select all that apply) (N=824)		
Advising parents on peanut allergy prevention	98.9	(97.9 - 99.5)
Peanut-specific skin prick testing	98.7	(97.6 - 99.3)
Peanut-specific IgE testing	98.3	(97.2 - 99.1)
Graded oral food challenges with peanut	87.7	(85.3 - 89.9)
Supervised in-office introduction of peanut	85.8	(83.2 - 88.1)
Indicate your level of agreement with the following statement: The early introduction of peanut-containing foods is an effective method for the prevention of peanut allergy. (N=824)		
Strongly agree	68.9	(65.6 - 72.1)
Agree	27.7	(24.6 - 30.9)
Neither agree nor disagree	3.2	(2.1 - 4.6)
Disagree	0.2	(0.0 - 0.9)
Strongly disagree	0.0	(0.0 - 0.4)
Which of the following has referred an infant to you to assess the infant for the early introduction of peanut? (N=818)		
Pediatrician	88.1	(85.7 - 90.3)
Parent self-referral	78.7	(75.8 - 81.5)
Family Medicine physician	55.1	(51.7 - 58.6)
Dermatologist	22.5	(19.7 - 25.5)
Allergist/Immunologist	13.8	(11.5 - 16.4)
Internist	6.2	(4.7 - 8.1)
I have not received such a referral	4.3	(3.0 - 5.9)
Other	1.5	(0.8 - 2.5)
Approximately what percentage of your referrals for the early introduction of peanut involve an infant with severe eczema and/or egg allergy? (N=782)		
0-25%	41.6	(38.1 - 45.1)
26-50%	32.7	(29.5 - 36.1)
51-75%	18.8	(16.1 - 21.7)
76-100%	6.9	(5.2 - 8.9)
When you receive a referral for the early introduction of peanut, how often is a peanut-specific IgE result provided by the referring healthcare provider? (N=781)		
Some of the time	74.1	(70.9 - 77.2)
None of the time	20.0	(17.2 - 23.0)
Most of the time	5.9	(4.3 - 7.8)

Table III:

Guidelines Awareness and Implementation

	%	95% CI
Prior to this survey, were you aware of the 2017 Guidelines that recommend the early introduction of peanut-containing foods into the diets of infants to prevent peanut allergy? (N=824)		
Yes	97.1	(95.7 - 98.1)
No	2.9	(1.9 - 4.3)
Which statement best describes your use of the 2017 Guidelines in your practice? (N=794; asked of respondents aware of the Guidelines)		
I am using the 2017 Guidelines as published and rarely deviate from any part	64.5	(61.0 - 67.8)
I am using only parts of the 2017 Guidelines	34.4	(31.1 - 37.8)
I am NOT using the 2017 Guidelines in my practice	1.1	(0.5 - 2.1)

Table IV:

Guidelines Deviations and Barriers

	%	95% CI
Which of the following statements describe parts of the 2017 Guidelines you do NOT use or ways in which you deviate from the 2017 Guidelines? (Select all that apply regardless of whether you do them routinely or occasionally) (N=253; asked of respondents using only parts of the Guidelines)		
I consider additional factors, such as family history of food allergy or food allergies other than egg, in deciding whether to recommend the early introduction of peanut	50.2	(43.9 - 56.5)
I conduct a peanut-specific skin prick test in children who do not have severe eczema or egg allergy	43.9	(37.7 - 50.2)
I conduct a graded oral food challenge even when the 2017 Guidelines recommend the introduction of peanut at home or at an in-office feeding	31.2	(25.6 - 37.3)
I conduct a peanut-specific IgE test in children who do not have severe eczema or egg allergy	30.8	(25.2 - 36.9)
I rely on peanut-specific IgE results more than I rely on peanut-specific skin prick test wheal size	22.5	(17.5 - 28.2)
In making decisions about the early introduction of peanut, I use different peanut wheal size thresholds than the ones stated in the 2017 Guidelines	22.5	(17.5 - 28.2)
I do not conduct supervised in-office introductions of a peanut-containing food	15.4	(11.2 - 20.5)
I don't recommend the introduction of a peanut-containing food for a child with severe eczema and/or egg allergy until the child is older than 6 months	13.4	(9.5 - 18.3)
I do not conduct graded oral food challenges	11.9	(8.1 - 16.5)
I recommend avoidance of peanut even when the 2017 Guidelines recommend the introduction of peanut	7.1	(4.3 - 11.0)
Other	2.4	(0.9 - 5.1)
Which of the following has been a barrier or concern for you in using the 2017 Guidelines? (Select all that apply) (N=760; asked of respondents using parts or all of the Guidelines)		
<u>Allergist-identified Parental Concerns</u>		
Parental concerns about allergic reactions	47.6	(44.0 - 51.3)
Parents who are not interested	28.2	(25.0 - 31.5)
Parental concerns about blood draws	18.7	(16.0 - 21.6)
<u>Feasibility</u>		
Lack of referrals	33.6	(30.2 - 37.0)
Lack of clinic time	20.9	(18.1 - 24.0)
Insufficient insurance coverage or reimbursement	17.9	(15.2 - 20.8)
Legal liability	17.5	(14.9 - 20.4)
<u>Physician Concerns</u>		
My concerns about allergic reactions	21.8	(19.0 - 25.0)
Conducting a graded oral peanut challenge	19.5	(16.7 - 22.5)
Conducting a supervised in-office introduction of a peanut-containing food	17.6	(15.0 - 20.5)
The newness of the Guidelines	15.8	(13.3 - 18.6)
Understanding and correctly applying the Guidelines	14.6	(12.2 - 17.3)
I have not had any barriers or concerns	8.3	(6.4 - 10.5)
I disagree with part or all of the Guidelines	7.5	(5.7 - 9.6)
Other	6.1	(4.5 - 8.0)
Conducting peanut-specific IgE antibody testing	5.1	(3.7 - 6.9)

Table V:

Clinical Scenarios

	%	95% CI
For infants with severe eczema and/or egg allergy AND a skin prick test wheal size of 0-2 mm for peanut, what do you typically recommend with respect to the early introduction of peanut to prevent peanut allergy? ¹ (Select all that apply) (N=800)		
<i>The introduction of age-appropriate peanut-containing foods at home</i>	62.1	(58.7 - 65.5)
<i>Supervised in-office introduction of a peanut-containing food</i>	46.8	(43.2 - 50.3)
A graded oral peanut challenge	14.9	(12.5 - 17.5)
Other	9.5	(7.6 - 11.7)
Avoidance of peanut-containing food with continued evaluation and monitoring	2.9	(1.8 - 4.3)
All responses from respondent adherent to the Guidelines	75.4	(72.2 - 78.3)
Some responses from respondent adherent, some responses not adherent	14.5	(12.1 - 17.1)
All responses from respondent not adherent to the Guidelines	10.1	(8.1 - 12.4)
For infants with severe eczema and/or egg allergy AND a skin prick test wheal size of 3-7 mm for peanut, what do you typically recommend with respect to the early introduction of peanut to prevent peanut allergy? ¹ (Select all that apply) (N=797)		
<i>A graded oral peanut challenge</i>	46.3	(42.8 - 49.8)
<i>Supervised in-office introduction of a peanut-containing food</i>	41.5	(38.1 - 45.0)
Avoidance of peanut-containing food with continued evaluation and monitoring	21.8	(19.0 - 24.9)
Other	12.3	(10.1 - 14.8)
The introduction of age-appropriate peanut-containing foods at home	2.0	(1.2 - 3.2)
All responses from respondent adherent to the Guidelines	68.6	(65.3 - 71.8)
Some responses from respondent adherent, some responses not adherent	6.3	(4.7 - 8.2)
All responses from respondent not adherent to the Guidelines	25.1	(22.1 - 28.3)
For infants with severe eczema and/or egg allergy AND a skin prick test wheal size > =8mm for peanut, what do you typically recommend with respect to the early introduction of peanut to prevent peanut allergy? ¹ (Select all that apply) (N=796)		
<i>Avoidance of peanut-containing food with continued evaluation and monitoring</i>	87.1	(84.5 - 89.3)
Other	12.7	(10.5 - 15.2)
A graded oral peanut challenge	10.7	(8.6 - 13.0)
Supervised in-office introduction of a peanut-containing food	3.3	(2.1 - 4.7)
The introduction of age-appropriate peanut-containing foods at home	0.4	(0.1 - 1.1)
All responses from respondent adherent to the Guidelines	78.0	(75.0 - 80.8)
Some responses from respondent adherent, some responses not adherent	9.0	(7.1 - 11.3)
All responses from respondent not adherent to the Guidelines	12.9	(10.7 - 15.5)
Summary of the patient scenario questions (N=794)		
All responses to all three questions adherent to the Guidelines	44.2	(40.7 - 47.7)
Among respondents using Guidelines as published (N=500)	52.4	(47.9 - 56.9)
Among respondents parts of the Guidelines (N=259)	30.1	(24.6 - 36.1)

	%	95% CI
Some responses to three questions adherent to the Guidelines	55.2	(51.6 - 58.7)
All responses to all three questions not adherent to the Guidelines	0.6	(0.2 - 1.5)

¹ Answers consistent with the Guidelines are marked in italics.

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Table VI

Associations of Survey Responses with Provider Characteristics

Years Since Medical School Graduation	0-10 Years	11-20 Years	21-30 Years	31+ Years	
Survey Response	% (N) (95% CI)	% (N) (95% CI)	% (N) (95% CI)	% (N) (95% CI)	P
Uses the Guidelines as published	72.1 (101) (63.9 - 79.4)	66.6 (203) (61.0 - 71.8)	63.8 (81) (54.8 - 72.1)	58.9 (112) (51.6 - 66.0)	0.012
Provides graded oral food challenges with peanut	95.8 (137) (91.1 - 98.4)	91.8 (290) (88.1 - 94.6)	88.1 (119) (81.5 - 93.1)	75.5 (148) (68.9 - 81.4)	<0.0001
Provides supervised in-office introductions with peanut	93.7 (134) (88.4 - 97.1)	87.7 (277) (83.5 - 91.1)	80.0 (108) (72.3 - 86.4)	82.7 (162) (76.6 - 87.7)	0.0012
Strongly agrees that early introduction prevents peanut allergy	81.1 (116) (73.7 - 87.2)	69.9 (221) (64.6 - 74.9)	65.2 (88) (56.5 - 73.2)	62.2 (122) (55.1 - 69.1)	0.0003
Has read the full Guidelines report	60.3 (85) (51.7 - 68.4)	57.8 (177) (52.1 - 63.4)	46.5 (60) (37.7 - 55.5)	45.3 (86) (38.0 - 52.6)	0.0008
Expressed need for more training on Guidelines	38.3 (54) (30.2 - 46.9)	40.8 (125) (35.3 - 46.6)	51.9 (67) (43.0 - 60.8)	52.6 (100) (45.3 - 59.9)	0.0014
Listed conducting a graded oral food challenge as a barrier to Guidelines implementation	12.1 (17) (7.2 - 18.7)	17.9 (54) (13.7 - 22.7)	21.4 (27) (14.6 - 29.6)	26.5 (49) (20.3 - 33.5)	0.0008
Listed insufficient insurance coverage or reimbursement as a barrier to Guidelines implementation	6.4 (9) (3.0 - 11.9)	17.2 (52) (13.1 - 22.0)	21.4 (27) (14.6 - 29.6)	24.9 (46) (18.8 - 31.7)	<0.0001
Academic Affiliation	No	Yes			
Survey Response	% (N) (95% CI)	% (N) (95% CI)			
Provides graded oral food challenges with peanut	84.9 (456) (81.6 - 87.8)	94.4 (238) (90.9 - 96.9)			
Strongly agrees that early introduction prevents peanut allergy	65.0 (349) (60.8 - 69.0)	78.2 (197) (72.6 - 83.1)			
Has read the full Guidelines report	48.6 (250) (44.2 - 53.1)	62.9 (158) (56.6 - 68.9)			
Listed provider concerns about allergic reactions as a barrier to Guidelines implementation	26.5 (133) (22.7 - 30.6)	12.8 (32) (8.9 - 17.6)			
Listed lack of clinic time as a barrier to Guidelines implementation	15.9 (80) (12.8 - 19.4)	30.8 (77) (25.1 - 36.9)			
Listed legal liability as a barrier to Guidelines implementation	21.9 (110) (18.3 - 25.8)	8.0 (20) (5.0 - 12.1)			