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Early peanut protein introduction in clinical practice

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ABSTRACT

Purpose: New multiple agency recommendations have encouraged the early introduction of peanut protein (PP) in high-risk children to decrease peanut allergies. However, many providers are hesitant to use these recommendations. Our objective was to increase the recommendation of new guidelines by providers during routine infant care and evaluate caregiver acceptance of early PP introduction.
Design and methods: This QI project focused on changing providers' knowledge and attitudes as a means to change practice using the "Plan-Do-Study-Act" model. Following provider educational sessions in 4 clinical sites providers and caregivers were questioned about instruction on the introduction of PP. Pre and post educational intervention data were collected from providers using chart audit and caregivers' report through the modified Promoting Healthy Development Survey (PHDS).
Results: The educational intervention was effective in increasing provider knowledge ($p < .05$), providers' dissemination of knowledge to caregivers through provider report ($p < .001$) and caregiver report ($p < .05$).
Conclusions: Education increased providers' knowledge about the safety and importance of early introductions of PP, and allayed fears about initiating an allergic reaction. The increased provider recommendation to caregivers was validated by both provider and caregiver report. Caregivers felt comfortable initiating peanut protein.
Practice implications: Provider education led to increased recommendation to caregivers on early introduction of PP and increased caregiver comfort introducing PP.

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Introduction

Food allergies begin in childhood, effecting 4.2 million children in 2015. The prevalence of food allergies was 5.4% in children under 18 with peanut being the most common allergen, costing $25 billion in the United States (Allergy Facts and Figures, 2017). Following AAP guidelines, between 2000 and 2008, researchers and pediatric providers recommended delaying introduction of PP (peanut protein) until 36 months of age. By 2008, the new recommendation stated that allergenic foods should not be delayed, but did not have the necessary data to recommend introduction of PP at 6 months of age (American Academy of Pediatrics, 2000; Greer, Sicherer, & Burks, 2008). Recent studies have shown that introducing allergenic foods in the first 6 months of life, particularly PP, can decrease subsequent food allergies in certain individuals (du Toit et al., 2015; Fleischer, 2017; Fleischer et al., 2015; Ierodiakonou et al., 2016). New guidelines designed around the Learning Early About Peanut (LEAP) study encourage early introduction of PP in infants, based on their personal risk factors, to decrease later risk of peanut allergy (du Toit et al., 2015). Although these guidelines are recommended by The National Institute of Allergy and Infectious Diseases (Togias et al., 2017) and endorsed by The American Academy of Pediatrics (Sicherer, Sampson, Eichenfield, & Rotrosen, 2017), the uptake of this new evidence-based change is slow to be initiated in pediatric practices (Cook & Kim, 2019).

Providers' recommendation for solid and allergenic food introduction is the strongest predictor of when and how parents introduce these foods (Hartman et al., 2016). When dealing with food allergies, providers' role historically has been to identify and manage food allergies, while not advising unnecessary avoidance (Lau & Gupta, 2013). However, pediatric providers may have difficulty counseling families on food allergy guidelines due to unfamiliarity with new evidence and unclear provider role in food allergy management (Gupta et al., 2014).

Interestingly, many providers in this project expressed a concern about providing correct information to caregivers based on patient risk factors, patients having allergic reactions, and not having enough time to adequately discuss the introduction of PP. Additionally, when

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a recommendation is solidified by years of practice, large impetus for change must be present in order to make the necessary practice change. Much time and effort are involved in unfreezing current outdated practice (Shirey, 2013), even when the new guidelines have the potential for enormous positive response (Batras, Duff, & Smith, 2016). As with the "Back to Sleep" program, new guidelines can have a tumultuous introduction, but once established become ingrained in common culture and healthcare practice (de Luca & Hinde, 2016). In this QI project, the Plan-Do-Study-Act (PDSA) model (Institute for Healthcare Improvement, 2019; AHRQ: Agency for Healthcare Research and Quality, 2013) was utilized to facilitate the introduction of new guidelines into practice.

In light of the new guidelines on PP introduction and parents' reliance on the advice of providers for food introduction, provider education is a necessary and effective means to promote counseling of caregivers. The specific aims of this project are to improve providers' knowledge of PP introduction, satisfaction with an educational intervention on the new PP guidelines, use of new PP guidelines in practice, and subsequent education of caregivers.

Methods

Our study group consisted of two cohorts both located within four private medium-sized pediatrics clinics in North Carolina. The first was a prospective cohort of caregivers of infants between 4 and 10 months of age presenting for well child visits. The second was a convenience cohort of providers, including physicians, nurse practitioners and physician assistants, from the aforementioned pediatrics clinics who received an educational intervention on the early introduction of PP.

Intervention

The PDSA model (Institute for Healthcare Improvement, 2019: AHRQ: Agency for Healthcare Research and Quality, 2013 "Plan-Do-Study-Act (PDSA) cycle", 2013) was used as a foundation to compare the information given to caregivers by pediatric providers during 4, 6 and 9-month well exams before and after an educational intervention for providers. The Promoting Healthy Development Survey (PHDS) was used to collect initial data for three months (June through August 2018) on providers' education of caregivers on early PP introduction.

After initial data was collected, provider education and training on early PP introduction was performed in early September 2018. Educational information was based on addendum guidelines for prevention of peanut allergy presented by the National Institute of Allergy and Infectious Diseases-sponsored expert panel (Togias et al., 2017). Provider education included a 45-min powerpoint presentation on early introduction of PP, a decision tree for patient allergy risk-factors, a script for discussing PP introduction, and handouts on early introduction of PP based on information from Togias et al. (2017) and The National Peanut Board (Managing Peanut Allergies: A Resource for Parents, Educators, and Others Who Care for Children). A provider knowledge test about the guidelines for PP introduction was administered pre and post provider education to determine current practice and changes in knowledge. Provider satisfaction with the educational intervention was determined after the provider education. After completion of the providers' education on early PP introduction, the PHDS was again administered within the same four practice sites for three months (September through November 2018) to determine if provider education increased education of caregivers in practice.

Chart audits ($N = 96$) were performed on visits for 4, 6, and 9-month well checks at all four-practice sites for 3 months prior to ($n = 48$) and three months after ($n = 48$) the providers' educational intervention to quantify documented provider education for caregivers. Charts were chosen from the first Monday and third Wednesday of every month for each of the three months prior to and following the intervention. Chart audit results were compared with PHDS results to evaluate the providers' education to caregivers from the providers' and caregivers' perspective.

Measures

The four measures used during this QI project were the PHDS, chart audits, a provider knowledge test, and a provider satisfaction survey. The PHDS was used to determine the impact of the providers' educational intervention on providers' subsequent education of caregivers. The PHDS is a validated measure with positive construct validity (mean factor loading: 0.69) and internal consistency (mean Cronbach's alpha: 0.80) based on Bright Futures guidelines formulated with the American Academy of Pediatrics. It has been used to measure goals for anticipatory guidance through The Child & Adolescent Health Measurement Initiative (Bethell, Peck, & Schor, 2001). The survey asks, "Since your child was born, did your child's doctors or other health providers talk with you about the following." Several areas of provider education for caregivers are then queried. Because PP guidelines are newer than this measure, the PHDS was modified to ask caregivers three additional questions regarding their education by providers on PP introduction (Table 3), three questions regarding their actual and intended introduction of PP to their infants (Table 4), and a four-option question regarding why they had not introduced PP early if this was the case (Table 5). Any change in discussion of guidelines by providers as measured by the PHDS could be attributed to the educational intervention.

Chart audits were conducted for the same time period as the PHDS administration to further determine whether providers had educated caregivers on PP introduction. Chart audits were compared to identify any significant difference between sites. All data were entered into SPSS for analysis. Data were checked twice for accuracy and missing data were coded as such. The chart audits and PHDS together provided information from the perspectives of providers and caregivers on PP education during well checks.

The provider knowledge test was created by the PI to determine provider knowledge of the PP guidelines. A 25-item True/False pretest-posttest format established baseline knowledge and determined changes following the educational intervention. The measure underwent expert review by two pediatric providers to determine instrument and content validity against the current guidelines for early PP introduction.

The provider satisfaction survey was a 8-item Likert-scale survey, created to measure providers' self-reported use of PP guidelines in practice before and after the educational intervention. On the scale, 1 was "Strongly Disagree" and 5 "Strongly Agree." A standard satisfaction scale was used to measure provider satisfaction with the educational intervention. This measure consisted of a 5-point Likert scale survey with 1 being "Strongly Disagree" and 5 being "Strongly Agree." This measure also underwent peer review with two expert pediatric providers to determine the validity, as current measures for these constructs were not available.

Analysis

Both qualitative and quantitative methods were used to draw inferences from these data. Provider change in knowledge pre and post educational intervention was determined using a Wilcoxon signed rank test to compare median pre and post values with significance set at ($p < 0.05$). Qualitative median scores were also used to determine provider satisfaction with the educational intervention. Prevalence of "Strongly Agree" and "Agree" were considered an indication of provider satisfaction.

Chart audit results compared provider documentation of caregiver education pre and post educational intervention data using the Fisher's exact test with significance set at ($p < .05$). A significant change in the PHDS report of provider guidance to caregivers was evaluated using

Chi-squared testing based on an affirmative response to questions related to solid food introduction, early introduction of PP, how to introduce PP, infant's risk category for PP introduction, signs and symptoms of allergic reactions, and how to deal with allergic reactions ($p < .05$). For an indication of change in caregivers' actual introduction of PP, comparisons were made using Fisher's exact testing with significance ($p < .05$).

Ethical considerations

This QI project has been formally evaluated using a QI checklist and determined not to be human subjects research. No review was necessary from the Institutional Review Board. All questionnaires, tests and audits contained no identifying information during the process.

Results

Provider knowledge of PP introduction was significantly improved post educational intervention with pre mean scores of 18 and post mean scores of 21 ($z = -2.04$, $p < .05$). Providers were satisfied with the educational intervention and related materials for use in practice, with all satisfaction scores consisting of "Agree" or "Strongly Agree." Results for the five providers were obtained for past (pretest) and intended use (posttest) of PP guidelines in practice. Increases were noted for several areas. After the educational intervention, the providers answered "Agree", but not "Strongly Agree" when questioned if caregivers would say they had received education on early PP intervention. Providers were "Neutral" after the educational intervention with regards to the statement "I believe that my patients have had PP introduced early (Table 1).

Chart audits showed that providers increased their documentation about PP education to caregivers during 4, 6, and 9-month well visits, by 68% from 13% before the intervention to 81% following the intervention (Fisher's exact, $p < .001$). When these results were separated by individual practice site the differences in three of the four remained statistically significant (Table 2).

Providers' education to caregivers during 4, 6, and 9-month well visits was reported by caregivers on the modified PHDS (Table 3). There were no statistically significant differences pre and post intervention about the general discussion of solid food introduction (from 92% pretest to 91% posttest), or the discussion of food allergies in general. These two questions acted as controls for the PHDS since there should be no difference in discussion of these areas. However, statistically significant differences were noted for all areas related to PP introduction after the educational intervention, with discussion of PP introduction increasing from 56% to 83% ($p < .05$), how to introduce PP increasing from 50% to 83% ($p < .05$), and discussion of infants' risk category increased from 41% to 72% ($p < .05$).

Table 1
Change in providers' thinking regarding use of PP guidelines in practice with educational intervention. Scored on a 5-point Likert scale with 1 meaning "disagree" and 5 meaning "strongly agree".

Item	Pre-test median (current use)	Post-test median (intended use)
I intend to educate parents regarding the early introduction of peanut protein to decrease later risk of peanut allergy.	4	5
I believe that many of my patients have had peanut protein introduced early.	2	3
I believe that the majority of the parents of my patients would say they had received education on the early introduction of peanut protein to prevent later peanut allergies.	2	4

Table 2
Providers' percent change in documentation of education to caregivers pre and post educational intervention based on chart audit and sorted by clinical site.

Clinical site	Pre-education chart audit percent charts with PP education documented		Post-education chart audit percent charts with PP education documented	
	Number of charts	%	Number of charts	%
1	12	8	12	92[b]
2	12	17	12	100[a]
3	12	17	12	92[b]
4	12	8	12	42
Total	48	13	48	81

[a] $p < 0.05$ level using Fisher's exact comparing pretest and posttest data.
[b] $p < 0.001$ level using Fisher's exact comparing pretest and posttest data.

Table 3
Percent of positive caregiver responses ("Yes and my questions were answered") to questions about education from the provider for items related to peanut protein introduction on the PHDS, pre and post educational intervention.

PHDS item	Positive response Pre intervention %	Positive response Post intervention %
Issues related to food such as the introduction of solid foods	92	91
Introducing peanut protein early to prevent a later peanut allergy	56	83[c]
How to introduce peanut protein to your infant	50	83[c]
Your infant's category of risk for peanut allergy	41	72[c]
Signs and symptoms of an allergic reaction when introducing solids	61	74
How to deal with an allergic reaction when introducing solids	51	67

[c] $p < 0.05$ level using Chi squared test comparing pretest and posttest data.

No statistically significant differences were seen between pre and post PHDS scores regarding caregivers' actual or intended early introduction of PP (Tables 4 and 5). Two caregivers (9%) reported an allergic reaction to PP prior to the educational intervention and none following. Clarification on the symptoms of these reactions was not available. Following the educational interventions there was an increase in percentage of caregivers planning on introducing PP but not having done so yet, and an increase in percentage of caregivers knowing PP could be introduced at an early age. P-values were not calculated on these data due to a number of missing values. This was a voluntary question and many individuals did not answer.

Discussion

Summary

This QI project met its primary goals of improving providers' knowledge of early PP introduction guidelines, increasing providers' use of the guidelines in practice and increasing education of caregivers in the

Table 4
Percent of caregiver positive responses on the PHDS to questions related to actual PP initiation.

Item	Pre-test %	Post-test %
Have you introduced peanut protein or products to your child?	19	24
If you HAVE introduced peanut protein or products to your child, have they had an allergic reaction?	9	0
If you HAVE NOT introduced peanut protein or products to your child, do you plan on doing this before your infant turns 11 months old?	78	80

Table 5
Caregivers' reasons for not introducing peanut protein early before and after provider education. Percent of positive responses to the 4 questions.

Item	Pre-test %	Post-test %
I already knew I could introduce peanut protein or products at this age.	48	60
I was nervous about my child having an allergic reaction.	21	20
I did not know how to introduce peanut protein or products to my child.	17	26
I am planning on introducing prior to 11 months but have not done so yet.	29	40

appropriate age group. Although providers had a fairly good initial understanding of PP introduction, the educational intervention helped them clarify areas of how to teach patients and to triage different types of potentially allergic infants. They were satisfied with the educational intervention, and stated they would use the majority of the tools provided to improve their adherence to the guidelines.

Providers did increase their use of the guidelines in practice, which was validated through chart audit and verified by caregivers on the PHDS. The items related to early introduction of PP showed the most change, as would be expected, and supported the documented increase that providers were actually using the guidelines in their clinical practice. Based on answers from the providers, the educational intervention could have been more streamlined. Several providers believed the decision tree and script were not necessary; however, all providers identified the parent handouts and powerpoint education as effective and useful in their clinical practice. They were motivated after the educational intervention to provide information to caregivers, but still reported some hesitancy in the ability to follow through on the new guidelines.

Uncertainty is not unexpected for a big change like this. As with the introduction of any new guideline, such as the "Back to Sleep" campaign, information takes time to be integrated as standard of care and to become part of a providers' regular anticipatory guidance (de Luca & Hinde, 2016). Instituting these guidelines on a large scale is challenging, and requires continuing support (Fisher, Keet, Lack, & du Toit, 2019; Hartman et al., 2016). Clinical site 4 did not have an in-office champion for the providers to push the project forward. This may explain why implementation there was slower.

The results from random chart audits were compelling and supported the project aims. Provider accountability for charting of PP education and awareness of the new guidelines may have been the driver for the increase in overall documentation (Harrison, Dowswell, Wright, & Russell, 2003). It did not guarantee that providers were giving the education, but it did show that they were thinking about these new guidelines and incorporating them into the electronic medical record on almost every well visit.

The caregivers' perspective was used to verify that education on PP introduction really did increase. These data support that providers were not only charting about the guidelines but actually discussing them with the caregivers 72% to 81% of the time. Provider guidance on introduction of solid foods is one of the main influences on how they are introduced (Hartman et al., 2016). Providers were attuned to their education of caregivers, realizing that after the educational intervention they were more likely to provide education on early PP introduction but that this would not necessarily translate to an increase in introduction of PP by caregivers.

Oddly, in this project's population, 78% of caregivers stated they were already planning on introducing PP prior to 11 months, and this only increased to 80% post education. These equivocal numbers may be due to the small sample size, particularly if there was a low percentage of the sample at high-risk for PP allergy, leaving caregivers more inclined to introduce allergenic foods early prior to the intervention. Initially 48% of caregivers stated they did know they could introduce PP as early as 4 months of age and this improved to 60% after the educational intervention. When asked about the education, few remembered hearing specifics about how to introduce and allergic reactions (Table 5). Often during anticipatory guidance caregivers only comprehend a portion of what has been discussed, or the education was not actually provided. Even though 83% said they had been informed of the guidelines postintervention, only 24% had introduced PP early. With today's emphasis on shared decision making and easy access to technology, caregivers are more likely to be aware of new guidelines and treatment options and broach these topics preemptively with preferences in mind (Blaiss et al., 2018). These practices included caregivers with fairly unlimited resources for personal education and it is suspected that many of them had heard about early introduction of PP before the project, although they were not asked specifically.

New anticipatory guidance can be difficult for both providers and caregivers to incorporate. Concerns about allergic reactions during introduction of PP were cited by 20% of caregivers. This did not change appreciably from pre- to post-intervention, but providers need to reassure and guide caregivers through this potentially scary process. In this project, two patients stated they had PP allergic reactions prior to provider education about new guidelines. Further information on these was not available and could be a recount of another child in the family.

The educational intervention encouraged adding the early introduction of PP into existing anticipatory guidance on solid and allergenic food introduction to streamline the conversation and to remind the provider to discuss PP introduction. As providers become more comfortable with the guidelines and risk categories, the discussion will become easier. Providers have limited time during well visits, and choose anticipatory guidance based on their perceived areas of risk and benefit for patients. The benefit of decreasing likelihood of allergic reaction to PP and the subsequent increased quality of life should reassure providers that they are making the right decision in spending a few minutes discussing the new guidelines and recommendations (Greer, Sicherer & Burks, 2019).

Limitations

Limitations were noted in this QI project. Notably, the educational program was not validated. While the education was based on the work by Togias et al. (2017) and the PP guidelines outlined therein, no existing program was available. Measures testing provider satisfaction with education, thinking regarding PP introduction, and modifications to the PHDS were also not validated as guidelines are so new that such measures were not available. Regarding providers' knowledge of PP guidelines, we are aware of the test-retest phenomenon, where knowledge increases due to test recall. In this education, the main concern was if providers had the knowledge needed after the educational intervention and applied this knowledge in their practice, negating test recall as a factor. Finally, the statistical significance of Tables 4 and 5 could not be tested due to too many missing values. Therefore, while some differences were noted, it is unable to be determined if they are significant.

Practice implications

The guidelines on early introduction of PP to prevent later peanut allergies can be challenging to implement. Many barriers are present, including lack of time for education of caregivers, lack of knowledge regarding recommendations, and the erroneous belief that early introduction of PP is not feasible nor effective. The educational intervention used in this QI project demonstrated a positive effect, improving providers' knowledge of early PP introduction guidelines, increasing providers' use of the guidelines in practice and increasing education of caregivers in the appropriate population. A simple, cost-effective educational intervention for providers can have a substantial impact on the incidence and prevalence of peanut allergies in the pediatric population.

Other studies are being conducted to determine if introducing other allergenic foods, such as fish and eggs, early would be feasible and have

a similar protective effect while limiting any negative effects, as seen with PP introduction (Perkin, et al., 2016). If early introduction of all allergenic foods has a positive effect, the method of education laid out in this project would, by extension, be effective in educating providers and caregivers regarding new allergenic food introduction guidelines.

Conclusions

Changing years of ingrained thinking that it is harmful to introduce PP early will take time and effort. Correctly categorizing infant risk and guiding caregivers to the appropriate timing of PP introduction will be crucial during the implementation of new recommendations. Although we demonstrated a change in clinical practice, we did not evaluate sustainability of that change, which is an integral step in the change process. Adding the new PP guidelines to existing education on solid and allergenic food introduction should make it easier to transition to new areas of guidance, as small changes are easier to initiate and maintain within a larger change initiative (Crowl, Sharma, Sorge, & Sorensen, 2003; Hespe, Rychetnik, Peiris, & Harris, 2018). Reliance on a site champion to encourage providers to educate and to remind them to introduce the new guidelines may be helpful, but the champion must be truly committed to the overall implementation to have a positive effect (Hespe et al., 2018). Additionally, all clinical staff should be aware of and committed to the change. Future work should focus on supporting providers' knowledge and comfort level with early introduction of PP. A validated measure for measuring provider knowledge of PP guidelines would be also help when determining baseline provider knowledge and areas to improve education.

Introduction of PP early can be equilibrated to sleep recommendations changing to “Back to Sleep” effectively decreasing SIDS. It will take sustained time, effort, and years of positive outcomes with the new guidelines for providers and caregivers to fully embrace this change. Using an educational intervention for providers translates to increased provider knowledge on early PP introduction and use of these guidelines to direct caregivers' introduction of PP to their infants in clinical practice. This quality improvement project, and understanding how to clinically institute these guidelines, is an important first step on the road to decreasing the incidence and prevalence of peanut allergy in the pediatric population.

Declaration of interest

None.

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References

AHRQ: Agency for Healthcare Research and Quality. (2013). Plan-Do-Study-Act (PDSA) cycle. Retrieved from https://innovations.ahrq.gov/qualitytools/plan-do-study-act-pdsa-cycle

Allergy Facts and Figures. (2017). Asthma and Allergy Foundation of America. Retrieved from http://www.aafa.org/page/allergy-facts.aspx

American Academy of Pediatrics (2000). Committee on Nutrition. Hypoallergenic infant formulas. *Pediatrics*, *106*, 346–349 2 Pt 1.

Batras, D., Duff, C., & Smith, B. J. (2016). Organizational change theory: Implications for health promotion practice. *Health Promotion International*, *31*(1), 231–241. https://doi.org/10.1093/heapro/dau098.

Bethell, C., Peck, C., & Schor, E. (2001). Assessing health system provision of well-child-care: The promoting healthy development survey. *Pediatrics*, *107*(5), 1084–1094.

Blaiss, M. S., Steven, G. C., Bender, B., Bukstein, D. A., Meltzer, E. O., Winders, T. (2018). Shared decision making for the allergist. Annals of allergy, asthma & immunology: Official Publication of the American College of Allergy, Asthma, & Immunology, pii: S1081-1206(18), 30710–30715. doi:https://doi.org/10.1016/j.anai.2018.08.019.

Cook, Q. S., & Kim, E. H. (2019). Update on peanut allergy: Prevention and immunotherapy. *Allergy and Asthma Proceedings*, *40*(1), 14–20. https://doi.org/10.2500/aap.2019.40.4190.

Crowl, A., Sharma, A., Sorge, L., & Sorensen, T. (2003). Accelerating quality improvement within your organization: Applying the model for improvement. *Journal of the American Pharmacists Association*, *55*(4), e364–e374. https://doi.org/10.1331/JAPhA.2015.15533.

Fisher, H. R., Keet, C. A., Lack, G., & du Toit, G. (2019). Preventing peanut allergy: Where are we now? *The Journal of Allergy and Clinical Immunology. In Practice*, *7*(2), 367–373. https://doi.org/10.1016/j.jaip.2018.11.005.

Fleischer, D. M. (2017). Life after LEAP: How to implement advice on introducing peanuts in early infancy. *Journal of Pediatrics and Child Health*, *53*(S1), 3–9. https://doi.org/10.1111/jpc.13491.

Fleischer, D. M., Sicherer, S., Greenhawt, M., Campbell, D., Chan, E. S., Muraro, A., & Sampson, H. (2015). Consensus communication on early peanut introduction and the prevention of peanut allergy in high-risk infants. *The World Allergy Organization Journal*, *8*(1), 27. https://doi.org/10.1186/s40413-015-0076-x.

Greer, F. R., Sicherer, S. H., & Burks, A. W. (2008). American Academy of Pediatrics Committee on Nutrition: American Academy of Pediatrics Section on Allergy and Immunology. Effects of early nutritional interventions on the development of atopic disease in infants and children: The role of maternal dietary restriction, breastfeeding, timing of introduction of complementary foods and hydrolyzed formulas. *Pediatrics*, *121*(1), 183–191. https://doi.org/10.1542/peds.2007-3022.

Greer, F. R., Sicherer, S. H., Burks, A. W., (2019). Committee on Nutrition; Section on Allergy and Immunology. The effects of early nutritional interventions on the development of atopic disease in infants and children: The role of maternal dietary restriction, breastfeeding, hydrolyzed formulas, and timing of introduction of allergenic complementary foods. Pediatrics, pii: e20190281. doi:https://doi.org/10.1542/peds.2019-0281. (Epub ahead of print).

Gupta, R. S., Lau, C. H., Dyer, A. A., Sohn, M. W., Altshuler, B. A., Kaye, B. A., & Necheles, J. (2014). Food allergy diagnosis and management practices among pediatricians. *Clinical Pediatrics*, *53*(6), 524–530. https://doi.org/10.1177/0009922813518425.

Harrison, S., Dowswell, G., Wright, J., & Russell, I. (2003). General practitioners' uptake of clinical practice guidelines: A qualitative study. *Journal of Health Services Research & Policy*, *8*(3), 149–153.

Hartman, H., Dodd, C., Rao, M., DeBlasio, D., Labowsky, C., D'Souza, S., & Assa'ad, A. (2016). Parental timing of allergenic food introduction in urban and suburban populations. *Annals of Allergy, Asthma & Immunology*, *117*(1), 56–60. https://doi.org/10.1016/j.anai.2016.04.010.

Hespe, C., Rychetnik, L., Peiris, D., & Harris, M. (2018). Informing implementation of quality improvement in Australian primary care. *BMC Health Services Research*, *18*(1), 287. https://doi.org/10.1186/s12913-018-3099-5.

Ierodiakonou, D., Garcia-Larsen, V., Logan, A., Groome, A., Cunha, S., Chivinge, J., & Boyle, R. J. (2016). Timing of allergenic food introduction to the infant diet and risk of allergenic or autoimmune disease: A systematic review and meta-analysis. *JAMA*, *316*(11), 1181–1192. https://doi.org/10.1001/jama.2016.12623.

Institute for Healthcare Improvement. (2019). Model for improvement: Plan-Do-Study-Act (PDSA) cycles. Retrieved from http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementTestingChanges.aspx.

Lau, C. H., & Gupta, R. S. (2013). The pediatrician's role in the diagnosis and management of food allergy. *Pediatric Annals*, *42*(7), 116–121. https://doi.org/10.3928/00904481-20130619-08.

de Luca, F., & Hinde, A. (2016). Effectiveness of the “back to sleep” campaigns among healthcare professionals in the past 20 years: A systematic review. *BMJ Open*, *6*(9), Article e011435. https://doi.org/10.1136/bmjopen-2016-011435.

Managing Peanut Allergies: A Resource for Parents, Educators, and Others Who Care For Children. (n.d.). Retrieved from https://peanutallergyfacts.org/

Perkin, M. R., Logan, K., Marrs, T., Radulovic, S., Craven, J., Flohr, C., ... EAT Study Team (2016). Enquiring about tolerance (EAT) study: Feasibility of an early allergenic food introduction regimen. *The Journal of Allergy and Clinical Immunology*, *137*(5), 1477–1486.e8. https://doi.org/10.1016/j.jaci.2015.12.1322.

Shirey, M. R. (2013). Lewin's theory of planned change as a strategic resource. *Journal of Nursing Administration*, *43*(2), 69–72. https://doi.org/10.1097/NNA.0b013e31827f20a9.

Sicherer, S. H., Sampson, H. A., Eichenfield, L. F., & Rotrosen, D. (2017). The benefits of new guidelines to prevent peanut allergy. *Pediatrics*, *139*(6).

SQUIRE. (2017). Revised standards for quality improvement reporting excellence: SQUIRE 2.0. Retrieved from http://squire-statement.org/index.cfm?fuseaction=page.viewpage&pageid=471

Togias, A., Cooper, S. F., Acebal, M. L., Assa'ad, A., Baker, J. R., Beck, L. A., & …Boyce, J. A. (2017). 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. *The Journal of Allergy and Clinical Immunology*, *139*(1), 29–44. https://doi.org/10.1016/j.jaci.2016.10.010.

du Toit, G., Roberts, G., Sayre, P. H., Bahnson, H. T., Radulovic, S., Santos, A. F., & Lack, G. (2015). Randomized trial of peanut consumption in infants at risk for peanut allergy. *The New England Journal of Medicine*, *372*, 803–813. https://doi.org/10.1056/NEJMoa1414850.