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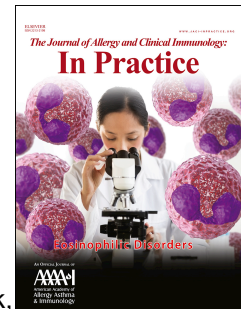
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66 Kaleo, Merck, Covis and Pediapharm, and has been part of an advisory board for Pfizer and
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68 research with DBV Technologies. ESC has received research support from DBV Technologies,
69 has been a member of advisory boards for Pfizer, Pediapharm, Leo Pharma, Kaleo, DBV,
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71 advisory board for Food Allergy Canada; was an expert panel and coordinating committee
72 member of the National Institute of Allergy and Infectious Diseases (NIAID)-sponsored
73 Guidelines for Peanut Allergy Prevention; and was co-lead of the CSACI oral immunotherapy
74 guidelines. SJ has been on speaker's bureaus for Aralez, AstraZeneca, Sanofi, and Novartis.

MH has provided speaker services for Pfizer and Pediapharm. SBC has been a member of advisory boards for Bausch Health, and Pfizer and was a committee member of the CSACI oral immunotherapy guidelines. VC has been a member of advisory boards for Sanofi Genzyme, Bausch Health, and ALK, and has provided speaker services for Aralez Pharmaceuticals and CSL Behring. EMA is on the National Advisory Committee for Food Allergy Canada. JP sits on the steering committee of Canada's National Food Allergy Action Plan, and is Section Head, Allied Health, of the Canadian Society of Allergy and Clinical Immunology. TW has provided speaking engagements for Pfizer and Stallergenes-Greer and has been part of an advisory board for Leo Pharma and ALK.

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Clinical Implications

The COVID-19 pandemic has limited access to in-person allergist assessments. Virtually-supported food introduction can be a feasible and safe approach to avoid delays in high-risk individuals, supported by positive experience and high satisfaction rates for both caregivers and allergists.

The Coronavirus Disease 2019 (COVID-19) pandemic has resulted in the modification and postponement of many allergy clinic services.^[1,2] As a result, effective implementation of food allergy prevention poses a challenge, particularly in high-risk infants and families requiring support from healthcare providers for early introduction of allergenic foods.^[3] This may, in turn, increase the risk of developing a potentially preventable allergy with recent and emerging

literature advocating for a more liberal food introduction in infants.^[4-6] The feasibility of virtually-supported home peanut introduction was recently demonstrated through a case series.^[7] Families interacted with the clinician at the beginning of the encounter and throughout the procedure, which was not burdensome to the physician and was appreciated by caregivers. However, the virtually-supported encounters were limited to peanut introduction, and little is known regarding feasibility and satisfaction of allergists and caregivers during this process. Many countries are currently experiencing second and third waves of COVID-19, and virtually-supported care is becoming increasingly important as in-person allergy services continue to be delayed. We performed a Canada-wide multi-center quality improvement (QI) initiative to further assess the safety and feasibility of virtually-supported introduction of any allergenic food in high-risk infants. In addition, we explored both allergist and caregiver satisfaction of the virtually-supported food introduction.

Infants (≤ 24 months) meeting our definition of “high risk” for development of food allergy (Figure E1a) underwent virtually-supported oral introduction to allergenic foods. Visits were held via secure telehealth platforms. An initial assessment of the child’s health was performed prior to the virtually-supported food introduction. Caregivers were counselled about the low risk of anaphylaxis at first ingestion, provided with food preparation instructions, and asked to obtain an epinephrine autoinjector (ideally two) and non-sedating antihistamines (Figure E1b). On the second visit, caregivers were instructed to feed their child increasing amounts of the chosen food every 10-15 minutes (as tolerated) over a period of 45-60 minutes. The target dose of allergenic food protein was 2g, or an age-appropriate serving size.^[7] During this process, the allergist was available at all times to assist caregivers virtually in the event of a reaction. Surveys were given to caregivers before and after the virtual encounter to evaluate their satisfaction with virtually-supported food introduction measured on a numerical scale from 1-100 as well as to assess potential reasons for food introduction hesitancy. Surveys were given to

allergists following the encounter to document outcome of the procedure and to evaluate their satisfaction with virtually-supported food introduction measured on a numerical scale from 1-100. The University of British Columbia/BC Children's Hospital Research Ethics Board waives quality improvement projects from formal REB application processes.

Between May 14th and October 31st, 2020, 40 infants underwent virtually-supported food introduction. 28 of 40 participants completed the baseline survey; the median age of the child was 9 months (interquartile range [IQR] = 7-11 months), and 12 infants (43%) had pre-existing food allergies, of whom 83% had been diagnosed by a pediatric allergist (Table 1). The most frequent reasons for food introduction hesitancy were fear of a potential allergic reaction (57%, n=16) and an existing food allergy in the child (39%, n=11). Caregivers were most hesitant to introduce tree nuts (46%, n=13), shellfish (46%, n=13) and peanut (36%, n=10) with many caregivers concerned about introducing multiple foods.

Allergists completed post-visit surveys on 40 patients who underwent virtually-supported allergenic food introductions, of whom 32 (75%) had a history of eczema. The most common foods introduced through the virtual encounter were peanuts (50%, n=20) followed by tree nuts (40%, n=16). Thirty-five (88%) patients passed the virtually-supported food introduction, and five patients (13%) had a reaction during the virtually-supported food introduction, with one patient requiring 1 dose of epinephrine. Of the five patients who reacted, three (60%) reacted to peanut. Four (80%) had a history of eczema, and three (60%) had completed skin prick testing (SPT) before virtually-supported food introduction.

Out of the 20 virtually-supported peanut introductions, 15 (75%) patients were less than 12 months of age and considered at high risk of developing peanut allergy based on the National Institute of Allergy and Infectious Diseases (NIAID) guidelines on early allergenic food

introduction.^[8] In this infant group, 8 (53%) had egg allergy, 11 (73%) had eczema and 7 (47%) had both eczema and egg allergy. Only one infant in this group had a reaction during the virtually-supported peanut introduction. This patient did not have SPT prior and only had a mild reaction during virtually-supported food introduction requiring no treatment (Table E1).

A total of 18 of 28 caregivers completed the post-visit survey. Compared to the baseline surveys, the post-visit surveys demonstrated that the caregivers had increased confidence in introducing allergenic foods, recognizing signs and symptoms of allergic reactions, and treating allergic reactions (Table 2). Following the virtual encounter, 12 caregivers (67%) planned to introduce new foods to their infant that they otherwise would not have, with tree nuts most likely to be introduced (67%; n=12). The median caregiver satisfaction of virtually-supported food introduction was 99/100, with 15 caregivers (83%) opting into this method in the future if it meant shorter wait times. The median allergist satisfaction score of virtually-supported food introduction was 99/100 on a satisfaction scale, and 98% (n=39) stated they would continue to offer virtually-supported food introduction even when in-person visits become fully available.

Our QI initiative demonstrated the safety and feasibility of virtual food introduction in high-risk infants, with caregivers and allergists reporting high levels of satisfaction. A small sample size is a limitation of this initiative, but we have provided proof of concept in the context of the current pandemic where improving access to care is important for high-risk infants in a critical window of time where food introduction can help prevent the development of food allergies.^[3, 6-8] Virtual care allows flexibility from the perspective of patients and their families, minimizing travel and improving access to patients living in remote communities. Virtual care also allows procedures to be performed in a more comfortable, familiar, and relaxing environment for the patient and caregiver. In addition, virtual care can minimize the risk of acquiring COVID-19, reduce unnecessary patient backlog and reduce long-term cost to the health care system. Virtually-

175 supported food introduction is an innovative and practical method for food introduction, which
176 should be encouraged both during the COVID-19 pandemic and beyond.

177 **Table 1.** Patient Demographics and Allergist-Reported Patient Characteristics

Patient demographics (n=28)	
Age	
Median	9 months (IQR 7-11 months)
Range	5-18 months
Gender, n (%)	
Male	16 (57)
Female	11 (39)
Prefer Not to Answer	1 (4)
Caregiver reported food allergy diagnosis (can select more than one option), n (%)	
Egg	8 (67)
Peanut	6 (50)
Tree nuts	4 (33)
Sesame	2 (17)
Milk	1 (8)
Other	1 (8)
Wheat	0 (0)
Soy	0 (0)
Fish	0 (0)
Shellfish	0 (0)
Allergist reported patient characteristics n=40, n (%)	
History of food allergy in patient	29 (73)
History of food allergy in sibling	8 (20)
History of food allergy in parent	8 (20)
History of anaphylaxis	4 (10)
History of eczema	32 (80)
Median severity of eczema (1-10), n=32	2.5

History of asthma	2 (60)
Family history of atopy (defined as asthma, eczema, food allergies and/or allergic rhinitis)	36 (90)
Prior skin testing to food being introduced	3 (8)
Prior sIgE blood testing to food being introduced	2 (5)

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180 **Table 2.** Characteristics of Virtually-Supported Food Introduction

Allergist responses (n=40)		
Foods introduced, n (%)		
Peanut	20 (50)	
Tree nuts	16 (40)	
Almond	8 (20)	
Cashew	1 (5)	
Hazelnut	5 (13)	
Walnut	2 (5)	
Baked Eggs	1 (3)	
Baked Milk	1 (3)	
Shellfish	1 (3)	
Coconut	1 (3)	
Food Introduction Results, n (%)		
Successful introduction	35 (88)	
Would continue to offer virtually-supported food introduction when in-person visits are fully available	39 (98)	
Median allergist satisfaction score (1-100)	99	
Median caregiver satisfaction score (1-100), n=18	99	
Caregiver Reported Responses (n=18), n (%)		
Confidence in introducing allergenic foods to infant	Baseline	Post-Visit
No confidence	0 (0)	1 (5.5)
Little confidence	3 (17)	0 (0)
Somewhat confident	11 (61)	4 (22)
Confident	2 (11)	10 (56)
Very confident	2 (11)	3 (17)
Confidence in ability to recognize a reaction		
No confidence	0 (0)	0 (0)
Little confidence	1 (6)	0 (0)
Somewhat confident	5 (28)	4 (22)
Confident	8 (44)	8 (44)
Very confident	4 (22)	6 (33)
Confidence in ability to treat a reaction		
No confidence	0 (0)	0 (0)
Little confidence	3 (17)	0 (0)
Somewhat confident	9 (50)	6 (33)

Confident	3 (17)	8 (44)
Very confident	3 (17)	4 (22)

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Table E1. Reactions during virtually-supported food introduction

ED, Emergency Department.

Foods that elicited reaction	Age (Months)	History of eczema	Skin-test results, if available (wheal size, mm)	Symptom(s)	Treatment(s)	Recommendation
Almond	18	Yes	≥ 3	Urticaria/emesis	Antihistamines	Food avoidance
Hazelnut	11	Yes	≥ 3	Urticaria	Observation	Food oral immunotherapy
Peanut	17	No	< 3	Emesis	Observation	Food avoidance
Peanut	11	Yes	Not done	Urticaria	Observation	Food oral immunotherapy
Peanut	14	Yes	Not done	Urticaria/Lethargy	Epinephrine Administration/ED Visit	Food oral immunotherapy

- 1 **Figure E1.** Selection Criteria and Visit Procedure for Virtually Supported Food Introduction in
2 At-Risk Infants.
- 3 **A.** At-risk infant selection criteria (modified and adapted from Mack *et al*) **B.** Virtually-supported
4 food introduction procedure (modified and adapted from Mack *et al*).
- 5 EMS, Emergency medical services; MD, Medical Doctor; SPT, skin prick test; sslgE, serum
6 specific Ig

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