Mass food challenges in a vacant COVID-19 stepdown facility: exceptional opportunity provides a model for the future

Aideen M Byrne PhD [1,2]
Juan Trujillo MD [3]
John Fitzsimons MB [1]
Tariq Mohammed MB [4]
Robert Ghent MB[1]
Cathryn O'Carroll MB[1,5]
David Coghlan MB[1,2]
Jonathan O'B Hourihane DM [1,6]

Writing group on behalf of the Children's Health Ireland (CHI) Food Challenge Initiative Team (see appendix 4)

Author's affiliations (for whole group)
1 Children's Health Ireland, Dublin, Ireland
2 Trinity College, Dublin, Ireland
3 Cork University Hospital, Cork, Ireland
4 Midlands Regional Hospital, Portlaoise, Co Laois, Ireland
5 University College Dublin, Ireland
6 Royal College of Surgeons in Ireland, Dublin, Ireland

Correspnding author
Jonathan Hourihane
RCSI Dept of Paediatrics and Child Health,
St George's Hall,
Children's Health Ireland, Temple St, Dublin 1
Emial Jonathanhourihane@rcsi.ie

Funding
National Treatment Purchase Fund.

Conflicts of interest
None to declare

Data Availability
All data are available for sharing on written contact with the corresponding author

Abstract.

Background: Internationally, the COVID-19 pandemic severely curtailed access to hospital facilities for those awaiting elective/semi elective procedures. For allergic children in Ireland, already waiting up to 4 years for an elective oral food challenge (OFC), the restrictions signified indefinite delay. At the time of the initiative there were approx 900 children on the Chidren's Health Ireland(CHI) waiting list. In July 2020, a project was facilitated by short term(6wk) access to an empty COVID stepdown facility built, in a hotel conference centre, commandeered by the Health Service Executive Ireland(HSE). The aim was to the achieve rapid rollout of an off-site OFC service, delivering high throughput of long waiting patients, while aligning with hospital existing policies and quality standards, international allergy guidelines and national social distancing standards.

Methods: The working group engaged key stakeholders to rapidly develop an offsite OFC facility. Consultant Paediatric Allergists, Consultant Paediatricians, trainees and Allergy Clinical Nurse Specialists were seconded from other duties. The facility was already equipped with hospital beds, bedside monitors (BP, Pulse, Oxygen saturation) and bedside oxygen. All medication and supplies had to be brought from the base hospital. Daily onsite consultant anaesthetic cover was resourced and a resuscitation room equipped. Standardised food challenge protocols were created. Access to onsite hotel chef facilitated food preparation. A risk register was established.

Results: After 6 weeks planning, the remote centre became operational on 7/9/2020, with the capacity of 27 OFC/day. 474 challenges were commenced, 465 (98%) were completed, 9(2%) were inconclusive. 135(29.03%) OFC were positive, 25(5%) causing anaphylaxis. No child required advanced airway intervention. 8

children were transferred to the base hospital. The CHI allergy waiting list was reduced by almost 60% in only 24 days.

Conclusions: OFCs remain a vital tool in the care of allergic children, with their cost saving and quality of life benefits negatively affected by delay in their delivery. This project has shown it is possible to have huge impacts on a waiting list efficiently, effectively and safely with good planning and staff buy in – even in a pandemic. Adoption of new, flexible and efficient models of service delivery will be important for healthcare delivery in the post-COVID-19 era.

Key words: Food allergy; food challenge; COVID-19; health care delivery

Abbreviations

CNS	Clinical Nurse Specialist
HSE	Health Service Executive
NTPF	National Treatment Purchase Fund
OFC	Oral Food Challenge
QoL	Quality of Life
SOP	Standard Operating Procedure
RTI	Respiratory Tract Infection

Introduction

Health services around the world have had to adapt to the massive additional demands of the SARS-COV-2/COVID-19 pandemic. They had to change working practices and cultures, adapt existing facilities, build new ones and develop new ways to meet the needs of COVID-19 patients, while balancing support for other aspects of healthcare. Some changes have become embedded but some developed contingencies were unused.

The oral food challenge (OFC), the bedrock of allergy diagnostics, is a resource intensive, lengthy procedure, necessitating, in every case, experienced staff and immediately available facilities to manage anaphylaxis. Despite evidence of quality of Life (QoL) benefits[1] and cost savings to health services[2], access to adequate, dedicated facilities is unusual. Most hospital based allergy departments compete with other disciplines for shared dayward facilites resulting in long waiting times. Office based allergists in the US and Canada report similar limitations of space and staffing[3,4] . In 2020 these universal barriers were raised further due to the unique service demands imposed by the pandemic,

During the early stages of COVID-19 preparedness planning, Ireland's Health Service Executive (HSE) commissioned the construction of a 350-bed stepdown facility to cope with the expected surge of convalescent cases of COVID, to be used after admission to acute hospital. It was built in a Convention Centre more than 10km from the base hospital services. It opened in May 2020 but the surge of cases

did not materialise. In July 2020 HSE advertised for projects that might avail of the facility before its planned decommissioning in October 2020.

We report here the planning, rapid implementation and results of an initiative to use the fully commissioned but hitherto unused 350-bed COVID stepdown facility/Nightingale hospital for a blitz of OFCs to address a long waiting list for OFC. At the time of the initiative there were approx 900 children on a waiting list for OFC. In the other allergy centre in Cork University Hospital, 250 km away from Dublin, 250 other children were awaiting OFC.

Methods

Planning

A planning committee was established including operationmal management, paediatric allergists, general paediatricians, anaesthesiologists, nurses, pharmacists, biomedical engineering, and clerical staff. This committee met weekly for 5 weeks, before the planned 6-week blitz. Inputs were sought ad hoc from other groups, such as resuscitation training teams and infection control.

Funding

Waiting list initiative funding was obtained from Ireland's Health Service Executive's (HSE) National Treatment Purchase Fund (www.ntpf.ie), established to fund access to health care as determined by national priorities. NTPF funding usually facilitates access accessing private health care facilities to address waiting lists for uninsured patients awaiting procedures in Ireland's public hospitals.

Critical risk assessment

A key decision made in the first planning meeting was to fund and fully resource attendance of a Consultant Paediatric Anaesthesiologist for each day of the activity. This was decided as the facility was not close to the base hospitals, so it was necessary to ensure on site advanced airway support in case it was needed during the expected cases of anaphylaxis, despite anaphylaxis being a relatively unusual event during food challenge - 3-5% of OFCs.[5] A further key enabler was a decision made later in planning to reduce the initiative from 5 working days each week to 4 days to allow Consultant staff attend to other responsibilities on the 5th day and to

avoid overworking other staff with 5 working days starting at 7am, often lasting 1 2 hours.

Simulation

A dry run of patient flow from registration to discharge was attended by most staff, led by the resuscitation team and lead anesthesiologist, to include initial challenge assessment, beside treatment and stabilization.

Documentation

A prepopulated prescription chart was developed which only needed patient-specific, weight-based doses to be individually charted. A COVID health checklist was developed with questions about the attending child and the attending parent (only 1 parent was allowed to attend) and each family was telephoned the day before OFC attendance to ensure there were no emerging concerns re COVID. A standardized proforma was used for the clerking of patients and recording of outcomes irrespective of hospital of origin.

Staffing

Colleagues working in regional allergy departments were invited to take part, providing a supervisory team of 3 Consultant Paediatric Allergists, and 4 Consultant Paediatricians with a special interest in Allergy. Similarly, trainee pediatricians with previous allergy experience were offered the opportunity to join the initiative creating a pool of 9 trainees. Allergy Clinical Nurse Specialists (CNS) already employed by the base hospitals were made available as needed for the duration of the initiative. A retired Allergy CNS, 2 Allergy Research Fellows and a family doctor with experience

in OFC were paid per diem to participate. Consultant anaesthesiologists attended during their resting time from their ordinary shift system; no elective peri-operative or other work was compromised or delayed. Staff and patients travelling from Cork to Dublin were given free accommodation in a nearby hotel the night before their scheduled attendance for OFC. For most of the time 2-4 senior cycle medical students were available to support nursing and medical staff, although they were principally there to take clinical histories and practice clinical examinations, which were then assessed by the trainees and Consultants. The Convention Centre's full time chef and kitchen staff received instruction from clinical staff on food preparation for OFCs, risks of cross contamination, appropriate foods and condiments to provide. A standard operating procedure (SOP) was developed for the preparation of each type of food challenge. A senior member of the medical team liaised with the kitchen staff daily.

Staff wellbeing

All staff work masks at all times, adhered to hospital hand sanitising policy and wore gloves to handle food and during patient contacts. A huddle occurred at the start of each day to focus on staff wellbeing (COVID-19 health in particular) and to disseminate lessons or "pearls" and feedback on issues that had occurred during the initiative. A flip chart was used for information and motivational messaging. Free coffee, snacks and lunch were provided and staff were rigorously rostered for breaks in an adjacent suite of clinical rooms, where they could rest, eat and support each other.

218

219 **Waiting list validation**

220 Long waiters from 3-4 years were reviewed in additional clinics during the planning
221 phase to validate their ongoing need for OFC. This might have changed due to
222 natural resolution of their allergy or due to repeated exposures/reactions in the field,
223 which would have negated the need for supervised OFC.

224

225 **Adaptation of OFC conduct to the facility**

226 Open, not double-blind, challenges were performed, following the standard
227 PRACTALL guidelines of incremental dosing, separated by 20-30 minutes with pre-
228 dose clinical assessments by the general nurse and doctor as needed.[6] To shorten
229 the duration of each challenge, the usual first dose, of 10 mg of allergen protein, to
230 which around only approximately 5% of children react [6] was omitted. Each
231 challenge meal was prepared by the Convention Centre's full time chef and kitchen
232 staff and was visually screened, signed and labelled by at least one doctor and
233 nurse before being used at the bedside. The Allergy CNS or doctor in each pod
234 supervised and signed for each administered dose. Families arrived at the facility at
235 7.30 with all challenges commenced by 8.30am. Children had to stay on their bed,
236 and no toys/media were provided, to prevent sharing. All children were brought to
237 the bathroom in wheelchairs by staff/students, to prevent potential augmentation of
238 emerging allergic reactions by exercise. Parents were not allowed circulate or
239 socialize with each other but could singly access refreshments and the bathroom.

240

241 To perform multi person food challenges simultaneously, while maximizing human
242 resource efficiency, an 18-bed bay with piped oxygen available, was divided into

3X6-bed pods with movable screens placed between the pods to discourage “inter-pod” staff movement. (Appendix 1). Each pod had a similar staff quota: 1 Allergy CNS to oversee a total of 6 challenges, supported by 1 general pediatric nurse, 1 paediatric medical trainee, to clerk, examine each patient, take written parental consent and child assent and to prescribe emergency medication as appropriate, and 1-2 medical students. Staff were to stay in their pod, except when needed to support emergency care elsewhere, while the 2 supervising Consultants moved between the 3 pods, assessing each of up to 18 simultaneous challenge’s progress and evaluating emerging allergic reactions.

Our local published experience is that up to 50% of challenges are positive[5] and need medical attention for up to 2 hours after any reaction is complete. The other 50% of OFCs are negative and need no treatment after the final dose. Therefore, a further 9 children were booked to arrive at 11.30 am in a further 2 pods. These were staffed by moving staff away from children with negative challenges, whose lower level of care was delegated to other staff for continuous observation. A total of 27 OFCs would be completed each day If every bed was used as projected.

The first day of the programme scheduled only 10 patients to allow for a smooth launch and necessarys trouble shooting. A few days had lower planned numbers of challenges than 18, for operational reasons that predated the initiative.

Timeline

The first meeting took place on July 17th 2020, the first patients attended on September 6th 2020 and the last patient was challenged on October 15th 2020.

Ethical permission

Ethical permission was not sought for this quality improvement intitiative. All parents and patients as aproariate gave written consent for the food challenge procedure, using standard, approved HSE forms.

Results

COVID-19 safety

No parent or child presented to the site with symptoms suggestive of COVID. Eight children did arrive at site with mild respiratory symptoms but none was febrile, all 8 were isolated, medically assessed and discharged without starting OFC. Increasing COVID levels across Dublin, and escalation of pandemic national controls to level 3 (of 5) [6] in Dublin in the 4th week, led to cancellation of patients travelling from Cork. Cork staff also stopped travelling in the 6th, final week. One staff member developed COVID-19 infection through a community contact. No close contact action in the field hospital was deemed necessary by Occupational Health.

Challenge outcomes

482 patients were admitted for OFC (Figure 1). Their age range was 2-18 with a median age of 8yr. Six patients were admitted for two separate challenges on different days. 474 OFCs were performed over 24 days. 396 (84%) of the OFC were to peanut, single tree nuts or sesame seed. The other 78 OFC included challenges to wheat, baked and whole egg and milk, fish, shellfish, kiwi and pulses.

Reactions

135 (28.5%) of 474 children reacted during OFC (Table 1). The majority were advised to continue to avoid the food used in OFC but 14 were discharged on graded introduction protocols. 9 (2%) OFCs were inconclusive and those patients were advised to continue to avoid their index food. Reactions were witnessed to all allergens except white fish. The highest rate of reactions were seen with sesame,

wheat and walnut.25 (5%) patients were treated as per anaphylaxis protocol with 7 of these (1.5% of total OFCs, 28% of those who got any adrenaline) receiving a second dose of adrenaline. No child received advanced airway interventions. The 7 children who received two doses of IM adrenaline and a further child, with sustained tachycardia after 1 dose of adrenaline, were transferred to a base hospital. All were stable before transfer and were discharged home the following day. These cases are being reported in detail separately. 61 (13%) of patients were discharged from any follow up on the day of the OFC.

Delayed reactions

One patient returned to the facility with ocular swelling, 2 hours post discharge after a negative pistachio challenge. This was considered a delayed allergic reaction and pistachio avoidance was advised. One child who had reacted to baked egg continued to experience abdominal symptoms after discharge, which settled by the next day without further medical intervention. Nine (2%) families contacted the base hospital's allergy department within 2 weeks of food challenge with concerns regarding tolerance of the introduced food. One child was experiencing diarrhoea associated with increased exposure to baked egg and 1 reported perioral reaction associated with peanut ingestion. On subsequent rechallenge, the latter patient reacted on the 3rd dose of peanut. The other 7 chidlren's reported symptoms were assessed as unrelated to the introduction of the allergen into their diet and were able to maintain it in their diet.

Productivity:

The maximum daily number of OFCs performed was 25. Late cancellations due to COVID infection, close contact status, other illness, work commitments (these were not all formally recorded) prevented the full quota of 27 being achieved on any day. The average number of challenges performed was 20 per 8 hour day under the supervision of 2 consultants. This is equivalent to 1.25 OFC/allergist work hour. This compares with the traditional in-hospital supervision of average 3 food challenges/consultant at one time (5 hour) equivalent to 0.6 OFC/per allergist work hr. Review showed specific adaptations or enabling resources that had been made available that made available could be retained in our allergy services and others could be discontinued (Table 2).

Impact on waiting list.

60% of the overall challenges performed came from the major centre (CHI). Clinical revalidation and 279 challenges reduced the total waiting list there from 502 to 172, a 57% reduction. 31% of CHI patients had been on the waiting list for over 2yr, 13% over 3yr and 0.6% over 4yr. At the end, only 14% were waiting over 2years, 4% were waiting more than 3yr and there was only 1 patient waiting (for a drug challenge) more than 4yr. The “long waiters” that remained had either been unable to attend or had medical or behavioral requirements considered unsuitable to attend the field hospital environment.

Staff satisfaction:

Feedback from the clinical staff involved was overwhelmingly positive about the episode, mentioning team building, interdisciplinary working, and the unique setting for immersive training of junior doctors, with constant Consultant presence.

Consultant Paediatricans commented on the high volume of exposure to OFC. Feedback from other sectors was also largely positive about the concept but also commented on lack of time and poor consultation, being up against an imposed not agreed deadline (Appendix 2). The intitiative was reported to have created a strong and visible identity for participitating paediatric Allergy units and nationally; it was a "good news story during COVID".

Family satisfaction

A single family opted not to avail of the offsite OFC, requesting a future, hospital based option. 2 patients of CHI were reluctant to attend due to COVID concerns. 178 carers completed satisfaction surveys before discharge. Patient experience was scored as "excellent" by 83% of respondents with a further 12% reporting it as above average. 81% were highly satisfied with ease of use of a non-hospital facility. 81% reported that the site was "child friendly". Communication was effective with 89% reporting good understanding of the results of the OFC. 95% stated that their questions were answered adequately by the Allergy Team (Appendix 3).

Discussion

The extra demands and limitations on existing capacity imposed by the COVID pandemic have challenged all clinical services to critically examine service delivery and to rapidly introduce new models of care. Allergy services have redesigned approaches to numerous facets of care including allergy prevention[9] tolerance promotion[10], clinic models and training.[9,10] All of these changes in practice were born out of necessity. However, as the world embarks on the COVID vaccination phase, it is important to reflect on how these novel approaches inform future thinking on service planning.

This report describes the rapid deployment of a time-limited mass OFC initiative achieved through the mobilisation of trained paediatric allergy staff from across an entire country. The motivation was the loss of access to daybeds due to COVID-19. The opportunity was a step down COVID-19 facility lying empty. However, despite the apparent uniqueness of the situation, there are clear take-home messages for all involved in provision of ambulatory allergy services.

This project presents as the successful bringing together of variable clinic processes to rapidly create a unified model with long lasting learning across all involved units. Specific adaptations or enabling resources made available could be retained in our allergy services and others could be discontinued (Table 3). The deployment of

general nurses and the decreased ratio of patients per consultant and per Allergy Clinical Nurse Specialist were safe adaptations, with no related adverse outcomes.

In the hospital setting, allergy departments run with minimal day to day interaction with services such as infection control, clinical engineering, anaesthesiology/resuscitation and clinical risk. However, in this off site venture, safety was ensured by the early engagement with these key stakeholders.

This model could act as a blueprint for transforming the limitations of multiple small independent allergy services into a highly effective collective. The initiative delivered 474 OFC in 6 weeks by combining staff from 4 separate allergy units. Collectively these 4 units would normally only deliver 900 challenges across 46 weeks, using a 1:1 nurse to patient ratio. The increased efficiency required a degree of short term sacrifice/suspension of other aspects of clinical practice by clinical leads. Thus, this initiative challenges the more traditional model of allergy practice, where OFC are factored into/limited by complex schedules and shared facilities.

Oral food challenge is a safe and reliable diagnostic tool when used by an experienced and trained physician. It is essential that trainees are provided with hands on experience of all aspects of OFC management including anaphylaxis. A recent publication by AAAAI reports that 56% of fellows reported performing 10 or less OFCs during their fellowship, and 29% had done none at all[4] . This high volume model has the added advantage of giving doctors in training an intensive fully supervised experience with almost quaranteed exposure to anaphylaxis.

Lack of space is a universal limiting factor to the delivery of OFC. Allergists in the US and Canada, surveyed in separate studies.[3,4] All reported it as a major barrier. 54.8% of Canadian allergists were in favour of creating dedicated OFC centres. This initiative establishes that OFC delivery is extremely portable, requiring very little in terms of specialist equipment. Even pumped oxygen is not necessarily required; although available at the bedsides, the resuscitation room was supplied only with tanked oxygen. Thus, OFC is a procedure that lends itself to offsite spaces, not just COVID-19 step down facilities. Agreeing for a child to partake in an OFC is stressful for parents. It could be anticipated that being asked to attend at an offsite venue, during a pandemic, would dissuade many candidate families. In contrast, uptake was almost 100%. Families were not surveyed regarding their enthusiasm specifically, but it likely reflects a trust in the clinicians and in the institutions behind the initiative. Impariment of good communication and supportive behaviours due to high throughput, rotaing staff and social distancing had been a concern. However, the post OFC survey revealed extremely high rates of satisfaction with overall experience and communication. This contrasts reassuringly with publishes qualitative data reporting parents feeling overwhelmed and in need of psychology support pre and post OFC[4].

It is important to note that not all patients' clinical needs can be served by a mass OFC practice. Patients likely to require more individual care by nursing such as infants <2 years and those with extreme anxiety or those who may need extra support by play specialists, including those with autism spectrum disorder, were all offered alternate appointments in the hospital setting. Similarly, the model did not

lend itself to the care of patients with known specific infection control needs such as MRSA.

Only 13% of subjects were able to be fully discharged from the Allergy service, as the remainder had ongoing care needs relating to existing food allergies or still needed OFC with other foods. The use of combined food/multi-nut challenges[13] could increase the discharge rate.

The allergy team has been available to advise other services that are similarly limited by access to high volume clinical areas and some have followed them in using the COVID-19 facility for their activities. Two COVID-19 era mantras that the Allergy team adopted were “Perfect is the enemy of good” and “Good enough is the new perfect”. These are unprecedented times with widespread curtailment of nonessential medical services worldwide.

Project success is a balance between over- and under-preparation. This project was delivered after 5 weeks planning because the opportunity/availability of the facility was time sensitive. Post-event feedback revealed that, although overall satisfaction was high, it was lower amongst non-clinical stakeholders who advocated greater inclusion and time to plan. Medical supply chain economics to only receive supplies “just in time”, that might work for fresh food in supermarkets, was shown in the early stages of the pandemic to leave health care short of critical supplies such as PPE and even ventilators. While being cautious about using metaphors of war on COVID-19, we propose that medical institutions need to establish the principle of “readiness”, a military tool that enables adequate planning and preparation in order

to achieve rapid responses in the face of sudden opportunity/need. This report shows that using the vacant COVID-19 stepdown facility changed the way elective allergy care can be delivered. The retention and use of facilities built to meet the challenges of COVID-19 in 2020-2022 must be considered as they can be adapted to many services' needs, while remaining available for any further public health emergencies.

One of the greatest demands on international health services in the post COVID era will be the delivery of semi-elective services cancelled or deferred due to COVID restrictions. We have shown here how critical it is for those who advocate for these patients to aggressively chase any opportunity offered, as it is surely experienced clinicians and their partners in frontline healthcare who are best suited to reinventing models of care.

Acknowledgements

Patients and families, Consultant Anaesthesiologists and other colleagues in Children's Health Ireland and Cork University Hospital (Resuscitation Officers, Nursing, Health Care Assistants, Medical Records, Admissions and Waiting List Office, ICT, Infection Control, Pharmacy, Risk, Clinical Engineering, Human Resources, Communications), Bumbulance Ambulance service, Senior Cycle 1 medical students from Royal College of Surgeons in Ireland, Staff of Citywest Hotel Dublin.

References

1. Kansen HM, Le TM, Meijer Y, Flokstra-de Blok B, Welsing P, van der Ent C, Knulst A, van Erp F. The impact of oral food challenges for food allergy on quality of life: A systematic review. Pediatr Allergy Immunol 2018 Aug;29(5):527-537.

2. Couch C, Franxman T, Greenhawt M. The economic effect and outcome of delaying oral food challenges. *Ann Allergy Asthma Immunol* 2016 May;116(5):420-4.

3. Greiwe J, Oppenheimer J, Bird AJ, Fleischer DM, Pongracic JA, Greenhawt M. AAAAI Work Group Report: Trends in Oral Food Challenge Practices Among Allergists in the United States. *J Allergy Clin Immunol Pract Nov-Dec 2020;8(10):3348-3355.*

4. Hsu E, Soller L, Abrams EM, Protudjer JLP, Mill C, Chan ES.Oral Food Challenge Implementation: The First Mixed-Methods Study Exploring Barriers and Solutions. *J Allergy Clin Immunol Pract. 2020 Jan;8(1):149-156..*

5. Yanishevsky Y, Daly D, Cullinane C, Hourihane JO'B. Differences in treatment of food challenge-induced reactions reflect physicians' protocols more than reaction severity. Journal of Allergy and Clinical Immunology 2010; 126 (1):182. doi:10.1016/j.jaci.2010.03.038

6. Sampson HA,Gerth van Wijk R, Bindslev-Jensen C et al . Standardizing double-blind, placebo-controlled oral food challenges: American Academy of Allergy, Asthma & Immunology–European Academy of Allergy and Clinical Immunology PRACTALL consensus report J All Clin Immunol 2012:130(6): 1260-1274 doi.org/10.1016/j.jaci.2012.10.017

7. Remington B., J. Westerhout, A. Dubois, W. Blom, A. Kruizinga, S. Taylor, G. Houben, J. Baumert. Suitability of low-dose, open food challenge data to supplement double-blind, placebo-controlled data in generation of food allergen threshold dose. Clin Exp Allergy. 2020 Oct 8. doi: 10.1111/cea.13753. Epub ahead of print. PMID: 33030225.

8. https://www.gov.ie/en/campaigns/resilience-recovery-2020-2021-plan-for-living-with-covid-19 accessed February 1st 2021

9. Mack DP, Hanna MA, Abrams EM, Wong T, Soller L, Erdle SC, Jeimy S, Protudjer JLP, Chan ES. Virtually supported home peanut introduction during COVID-19 for at-risk infants. J Allergy Clin Immunol Pract. 2020 Sep;8(8):2780-2783.

10. MacMahon J, Hourihane J O'B, Byrne A. A virtual management approach to infant egg allergy developed in response to pandemic-imposed restrictions Clin Exp Allergy. 2020 Nov 26;10.

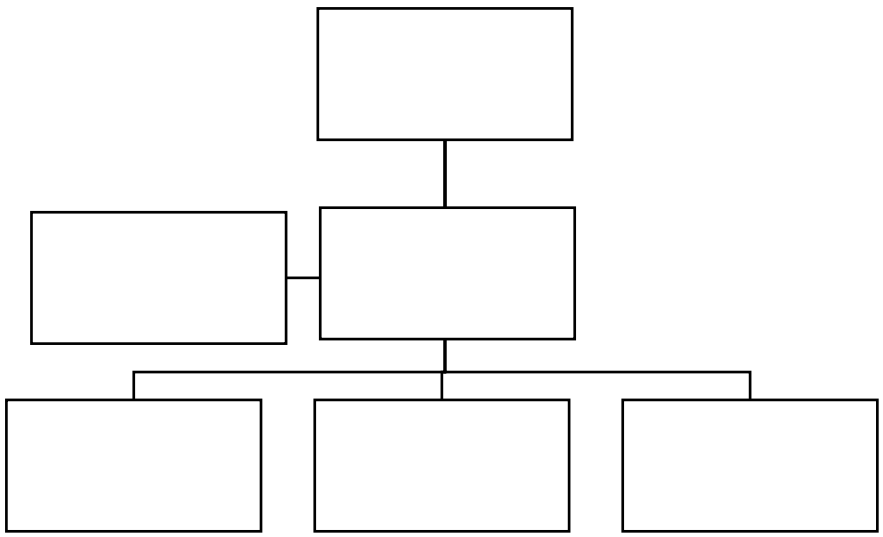
11. Codispoti CD, Bandi S, Moy JN, Mahdavinia M. Running a virtual allergy division and training program in the time of COVID-19 pandemic. J Allergy Clin Immunol. 2020 May;145(5):1357-1359.

12. MacMahon J, Byrne A. New Ways of Working. J Allergy Clin Immunol Pract. 2020 Jul 28;S2213-2198(20)

13. Van Erp FC, Knust Ac, Kok IL et al . Usefulness of open mixed nut challenge to exclude tree nut allergy in children. Clin Transl Allergy 2015; 5:19. Doi 10.1186/s13601-015-0062-y.

Tables and figures

Figure 1. Flow diagram of oral food challenge outcomes



650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666 **Table 1** Oral food challenges performed by food type and outcome.
667

	No. of OFC performed (not completed)	Percentage of total OFC performed	No. of +ve OFC (% of completed OFC)
Peanut	161(3)	34%	61(39)
Tree nut	196(4)	41.35%	40 (21)
Sesame	39(1)	8.23%	21 (55)
Fish	14(1)	3%	0 (0)
Shellfish	8	1.7%	1 (12.5)
Kiwi	4	0.8%	1 (25)
Wheat	5	1%	4(80)
Milk or baked milk	12	2.5%	2 (17)
Egg or baked egg	27	5.7%	3 (11)
Pulses	4	0.8%	1 (25)
Other	4	0.8%	1 (25)
Total	474(9)		135 (29)

668
669
670

671

672

673

674

675

676

677

678

679

680

682

683

684

	Things we need to “drop or stop”	Things we need to “grow” or pick up again
Things we started in the initiative	Anaesthesiologists on site The “2 adrenaline injections=admission” rule Starting too many challenges simultaneously Patients from multiple hospital sites on the same day	Use of multi-patient pods/rooms Use of general nurses in OFC Prefilled prescription charts Huddles and wellbeing/team support exercises Medical students as essential workers Food challenge adminc/coordinator role Dedicated professional food preparation Empowering parents to administer food challenge dos

		instead of nurses
Things we stopped in the initiative	1:1 specialist nurse:patient ratio for OFC Food challenge protocol variation across partner sites First dose of challenge (10mg protein)	Routine clinics Other professional activities

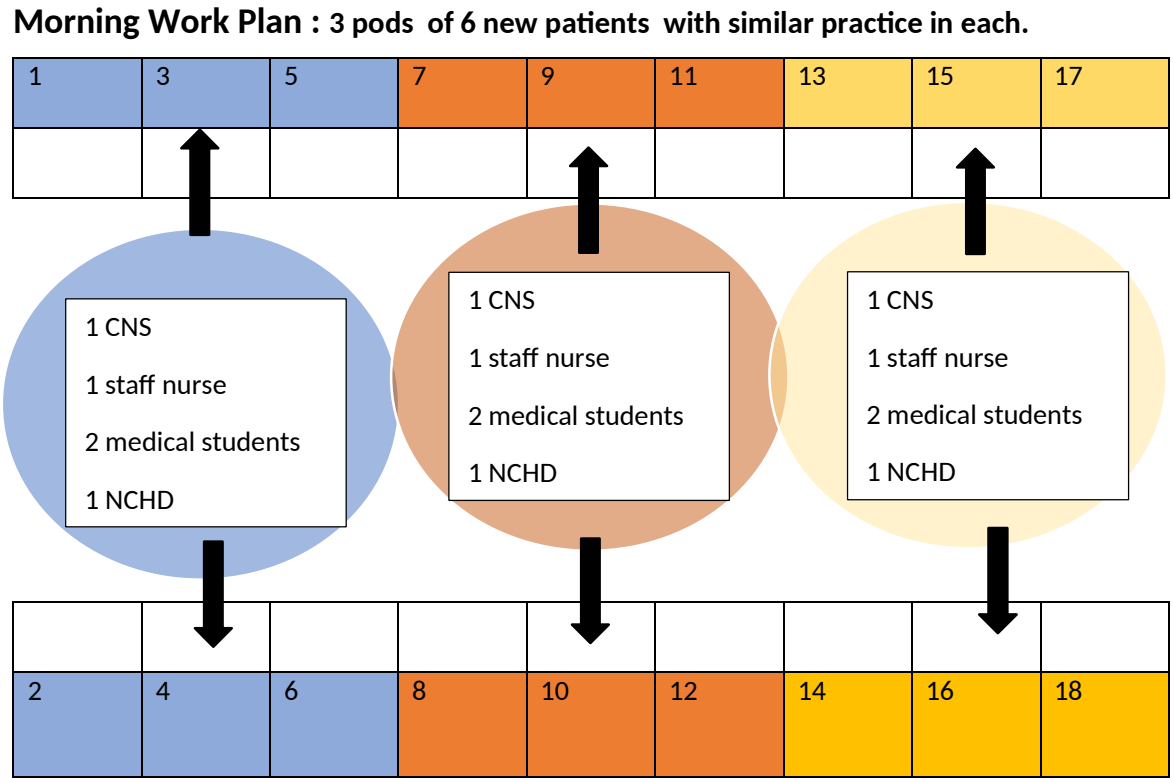
685

686

687

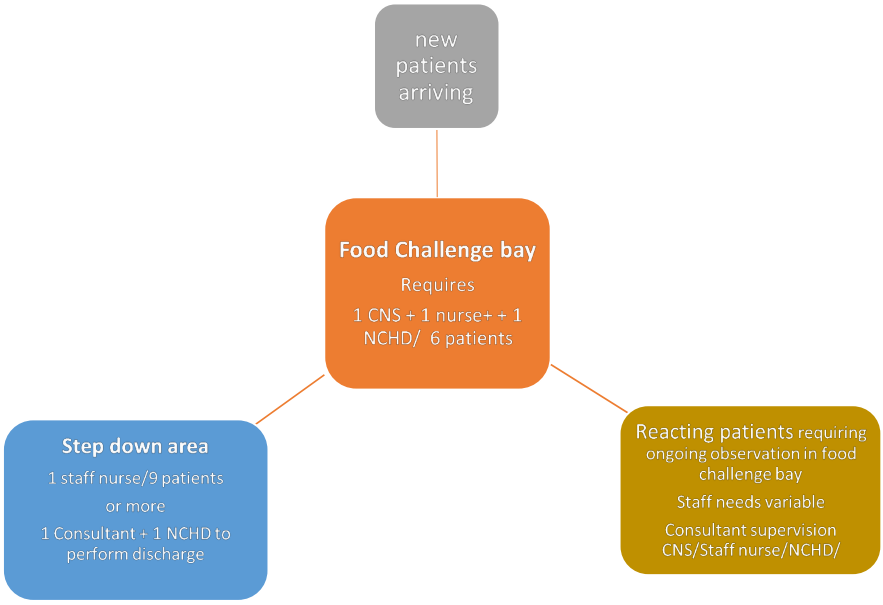
688

689 Appendix 1 Plan of bed and workforce distribution



690

Afternoon Work Plan : 3 separate models of care



691

692

693

694

695 Appendix 2

696 Samples of feedback from staff

Q1. How would you rate your overall experience of participating in the Citywest Allergy Clinic?

Rating	What was the reason for this score?
9	Novel, innovative and inspiring goal. Opportunity to develop into a team by working together
10	teamwork, patient experience, efficiency and overall can do attitude
10	I consider it quite the privilege to have been part of this venture. This experience fundamentally changed the allergy service for the better. It allowed us provide our patients with the food challenge that they needed. This not only helped the patients but also removed an emotional burden weighing down the momentum and wellbeing of the team. It completed the journey to full clinical integration of the CHI allergy team. It challenged all of us allowing for rapid growth and development as individuals and as a team. It provided a unique opportunity for training of NCHDs and students and staff nurses. It showcased CHI staff (both clinical and nonclinical) for what they are: tireless, brave, committed to high quality care.
9	The teams from all hospitals worked very well together. I went home every day feeling we achieved a lot and the knowledge that we had made a great difference to many children's and parents lives.
10	Run very efficiently
10	Excellent set up, ran v smoothly
9	innovative, well organised, positive work environment, professionally challenging
9	well organised and conducted in a safe environment
9	A smooth running clinic, very organised and nice environment
8	people worked very well together and understood each others roles and responsibilities
8	The clinic had a huge impact on waiting times/lists. Positive experience for patients and reduction in wait times for future patients.
10	well organised, good communication, everyone felt like valued member of the team
9	Efficient, patient focused and a service that had no other avenue. City west worked well for all
9	It was a great experience for staff and patients with multiple learning opportunities for all involved. There was great teamwork and a very positive attitude from all involved.

697

Q1. How would you rate your overall experience of participating in the Citywest Allergy Clinic?

Rating	What was the reason for this score?
9	Very well organised.
10	best working experience of my life
10	The team from CHI knew clearly what their aim was and had a plan in place to execute this
8	Efficient use of resources and involving everyone on board
8	HIPE were not involved in the initial stages of the project and we could have been better prepared for the volume of work if this had been the case.
10	This service was operated with the utmost professionalism and empathy for both children and parents.
10	Exciting, first initiative for Citywest, Removed a huge amount of patients from W/L.
9	Enjoyed being part of something positive and dynamic
7	Project very rushed and very little time to prepare
6	Planning and communication with stakeholders i.e. Materials management, Finance and operations could be improved. This is on distribution of the memorandum of understanding, budgets and process of the initiative. Consultation with nominated department staff for the NTPF initiative would mean a process is put in place per dept for remitting patients to NTPF, payment of invoices, creation of PO's and research on technical operation or finance matters etc. maybe it's time to put a formal NTPF Committee or Staffed section ?
1	No direction on the billing aspect of the charges - queries from parents
3	Insufficient notification & information provided to Procurement and Supply Chain about the clinic and the required materials required to support commission the clinic - material codes, max/min levels etc.

Appendix 3 Patient feedback

[redacted]

11th January 2021.

Re: [redacted] Allergy Clinic, Citywest.

Dear [redacted],

As you are aware, our son, [redacted] attended the pop up allergy clinic in Citywest on the 13th of October last. Both myself and my husband [redacted], would like to thank you, [redacted], and all of your team for the excellent care that [redacted] received that day.

We were delighted to be invited to take part in this well thought out initiative, which undoubtedly reduced [redacted]s time on the waiting list for a food challenge.

The scale of the venue at Citywest was perfect, facilitating social distancing and allowing for a large volume of children to attend safely, each with a parent in tow. Any apprehension that we had about attending during the pandemic was put to rest once we were admitted, assessed and became familiar with the team and our surroundings.

Watching the multi-disciplinary team function over the course of the morning was extremely impressive. We quickly became aware, that while all members of the team appeared to be always on the move, they were observing everyone, and there seemed to be eyes on each patient, all of the time. They quite literally appeared to have eyes in the back of their heads and were able to spot the slightest symptom before the parent sitting next to the child in question had the opportunity to become anxious. I do not know if the same level of observation could have been achieved on a day ward where children were attending for a variety of different interventions.

In the case of [redacted], his food challenge did not have the preferred outcome, but the response to the onset of his symptoms was immediate, calm and professional. As a parent I was very reassured by the immediate responses, and while it was not the outcome we had hoped for, we were grateful to have a definite answer regarding [redacted]'s allergy to peanut.

The process of the food challenge was a learning opportunity for us as a family. [redacted] is now aware of what peanut tastes like, he knows what it feels like to have a reaction, and to have adrenalin. He needs less reminders to carry his epipens, and he has become the household champion for checking allergen advice on food labels at home and in shops.

As a parent, I saw how quickly his symptoms progressed, how he responded to the adrenalin, and the importance of prompt hospital follow up. We have shared this knowledge with the key people outside of the home, who are a part of [redacted]'s life.

We also appreciated [redacted]s transfer to CHI [redacted] being facilitated by Bumbleance, which we believe was another well thought out detail, avoiding the requirement of a NAS vehicle, and therefore keeping it circulation. Thanks to Dr. [redacted] for keeping [redacted] calm, and for accompanying him in the Bumbleance.

To conclude, thanks once again for making a great idea happen, and for inviting [redacted] to participate in this clever initiative. You have demonstrated what can be done. It would be wonderful to see the HSE fund more initiatives like this.

We look forward to seeing you regarding the next steps for [redacted].

Kind regards,

[redacted]

707

708

709

710 Appendix 4: Children's Health Ireland Food Challenge Initiative Team

711

712 Ali Alsalemi[1] , Aoife Cassidy[1], Eva Corbet[1], Rita Creighton[1] , Yvonne d'Art[3], Linda Farren[1] ,
713 Rachel Flanagan[1], Niamh Flynn[1], Ruth Franklin[6], Claire Gray[1], Paul Harding [1], Ciara
714 Hendrick[1], Fionnuala Herraghty[1], Sadhbh Hurley[1] , Valerie Kavanagh[1], Dhanis Lad[3], Karen
715 Leddy[1], Sarah Lewis[1] , Triona McGlynn[1], Danielle O'Connor[3], Phil O Neill[1], , Orla O Shea[1],
716 Ann O Toole[1], Rachel Quinn[1], Aisling Reid[1], Alison Russell[4], Emma Ruth[1], Anne Rynne[1], P
717 Bhusan Sanneerappa[1], Mairead Sheehan[1], Claire Thompson[1] , Ciara Tobin[3], James Trayer[1],
718 Alison Wallace[1] , Nicola Walsh[1], Fiona
719 Wilson[1]

720

721