

Using remote video directly observed therapy (v-DOT) for optimising asthma therapy

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Conflicts of Interest

Prior to retirement

1] I gave talks on Asthma and Cough in children at educational meetings from which I received honorariums from Pharma' companies (GSK, Novartis, AZ,)

2] In order to increase the impact of our research and to make vDOT more accessible and professional I was involved with setting up www.continga.co.uk (a QUBIS set up company)

Remote video Directly Observed Therapy (vDOT) with feedback) – is NOT NEW

vDOT: audiovideo App on Smartphone – videos submitted
e.g. twice daily to a secure repository.

Video -Time/Date stamped

Reviewed each morning by nurse, can provide
contact/immediate feedback

Conditions – where non-adherence has
potentially serious consequences

TB

HIV

Iron therapy

Especially for developing nations

Recommendations for Use of Video Directly Observed Therapy During Tuberculosis Treatment — United States, 2023

Joan M. Mangan, PhD¹; Rachel S. Woodruff, MPH¹; Carla A. Winston, PhD¹; Scott A. Nabity, MD¹; Maryam B. Haddad, PhD¹; Meredith G. Dixon, MD¹; Farah M. Parvez, MD¹; Carissa Sera-Josef, MS¹; LaTweika A. T. Salmon-Trejo, MPH¹; Chee Kin Lam, MS, MPH¹

Implementing an Electronic Directly Observed Therapy (eDOT) Program: A Toolkit for Tuberculosis (TB) Programs



National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Division of Tuberculosis Elimination



AJPH OPEN-THEMED RESEARCH

Cost of Tuberculosis Therapy Directly Observed on Video for Health Departments and Patients in New York City; San Francisco, California; and Rhode Island (2017–2018)

REMOTE VIDEO DIRECTLY OBSERVED THERAPY IN ASTHMA

Why does asthma still remain uncontrolled for so many?

The 'bedrocks' of asthma care ('basics') are not in place

1. **Children can't use their inhalers correctly after being shown - - 15 to 33% can after being shown, they need trained to mastery**
2. **Children are not taking their preventer regularly despite what the parents claim - 30-50% adherence is the norm.**
 - *Handing child/parent a written **Personal Asthma Action Plan (PAAP)** does NOT mean they can carry out its instructions*
 - *On-going triggers --- often not addressed*

ACTA PÆDIATRICA
NURTURING THE CHILD

Acta Paediatrica ISSN 0803-5253

REGULAR ARTICLE

Getting the basics right resolves most cases of uncontrolled and problematic asthma

Eric P. de Groot (e.p.de.groot@isala.nl)¹, Wendy J. Kregemeijer¹, Paul L. P. Brand^{1,2}

1. Princess Amalia Children's Centre, Isala Hospital, Zwolle, The Netherlands

2. UMCG Postgraduate School of Medicine, University Medical Centre and University of Groningen, Groningen, The Netherlands

School-based supervised therapy programs to improve asthma outcomes: current perspectives

This article was published in the following Dove Press journal:
Journal of Asthma and Allergy

Guadalupe Salazar
Geeta Tarwala
Marina Reznik

Division of Academic General
Pediatrics, Children's Hospital at
Montefiore, Albert Einstein College of
Medicine, Bronx, NY, USA

Background: Asthma is one of the most common chronic diseases of childhood affecting 6.2 million (8.4%) children (<18 years old) in the USA. Asthma is also a leading cause of school absenteeism. Daily administration of preventive asthma medications improves asthma control. However, poor medication adherence is one of the barriers in achieving improved asthma outcomes. School-based supervised asthma therapy programs have been implemented to address this barrier.

Conclusion: Our literature review demonstrated that school-based supervised asthma therapy improves asthma outcomes in urban children with persistent asthma. Schools are an ideal setting for implementation of asthma interventions for children and adolescents.

Directly Observed Asthma therapy works - for asthma

Anti-IgE therapy - very expensive.

DHSS NI wanted only those known to have failed optimised asthma therapy to be treated

We were made the gatekeepers for NI children with asthma - DTA clinic

RESEARCH ARTICLE

Mobile direct observation of therapy (MDOT) - A rapid systematic review and pilot study in children with asthma

Michael D. Shields¹, Fahad ALQahtani², Michael P. Rivey^{2,3}, James C. McElnay^{2*}

to evaluate the feasibility and clinical impact of v-DOT

- on the administration inhaler technique
and
- adherence to ICS

in children with partially controlled or uncontrolled asthma – on the pathway towards a ‘biological therapy’

Remote video Directly Observed Therapy (vDOT) with feedback)

vDOT: audiovideo App on Smartphone – sent in twice daily to secure Repository. Reviewed each morning by nurse

Video -Time/Date stamped

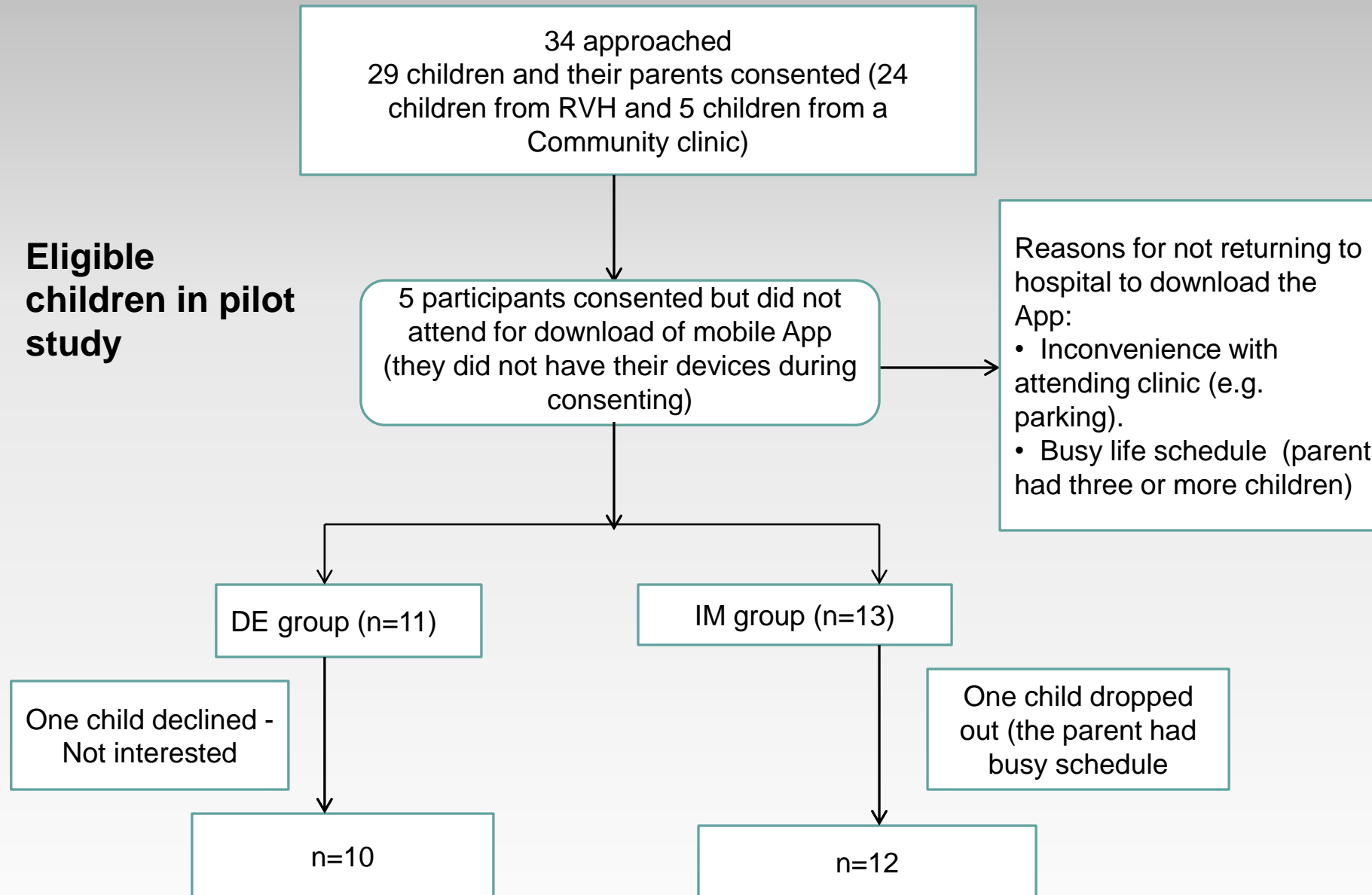
Can **see** and **hear** how well inhaler taken

Inclusion / exclusion criteria

Inclusion criteria:

- aged 2-15 years with partially controlled or uncontrolled asthma.
- symptomatic despite max. dose ICS plus either LAB2A and /or LTA
- able to show (*3) good inhaler technique at clinic (Teach Back +ve)
Received standard asthma education and management
- submitting an audio-video twice per day, time/date stamped.

Eligible children in pilot study



All children able to demo good inhaler tech. at clinic



Inhaler technique over time

Child ID	1st week	2nd Week	3rd week	4th Week	5th Week	6th Week
DE39	P. effective	Effective	Effective	P. effective	Effective	Effective
DE04	Poor	P. effective	Effective	Effective	Effective	Effective
DE20*	P. effective	P. effective	Effective	Effective		
DE69	Effective	Effective	Effective	Effective	Effective	Effective
DE25	Effective	Effective			Effective	Effective
DE15	Poor	P. effective	P. effective	Effective	Effective	Effective
DE34	Effective	Effective	Effective	Effective	Effective	Effective
DE70	Poor	Effective	Effective	Effective	Effective	Effective
DE26	Effective	Effective	Effective	Effective	Effective	Effective
DE47*	P. effective	P. effective				
IM53	P. effective	Effective	P. effective	Effective	Effective	Effective
IM39	P. effective	Effective	Effective	Effective	Effective	Effective
IM63	P. effective	P. effective	Effective	Effective	Effective	Effective
IM66	P. effective	P. effective	Effective	P. effective	Effective	Effective
IM13	P. effective	P. effective	Effective	Effective	Effective	Effective
IM19*	P. effective					
IM50	P. effective	P. effective	P. effective	Effective	Effective	Effective
Im09	P. effective	P. effective	Effective	Effective	Effective	Effective
IM07	P. effective	P. effective	Effective	Effective	Effective	Effective
IM57	P. effective	Effective	Effective	Effective	Effective	Effective
IM61	P. effective	Effective	P. effective	Effective	Effective	Effective
IM24*	Effective	Effective	Effective			
				P. effective= partially effective		

P.Effective = partially correct inhaler technique

Reasons for not recording / uploading video

82% of participants completed the video uploads over the period of six weeks

Reasons for not uploading video of inhaler use	Frequency
Lost smart phone	2
No space in the mobile storage	2
Child was unwell (e.g. tummy bug)	2
Busy schedule (i.e. school exams, shift work)	5
Forgot	3
Big video size, change in Samsung mobile's resolution	2
Mum was admitted to hospital	2
Child visits father's home at the weekend	2
Travelling outside the country	1

ACT	mean	
Baseline	13.9	
Post intervention (6 wks)	16.5	
post intervention (12wks)	17.7	

Parent QOL	median	
Baseline	4.03	
Overall PAQOLQ score (6 wk)	4.14	
Overall PAQOLQ score (12 wk)	5.7	

FeNO	median	
Baseline	39.2	
post intervention (6 wks)	26	
post intervention (12wks)	19.1	

Children HRQOL	Median	
Baseline	3.97	
6 weeks post MDOT	5.24	
12 weeks post MDOT	6.24	

Conclusions

➤ **vDOT in children with DTA**

- inhalation and adherence monitoring is feasible and convenient to use
- allows timely corrective feedback
- is affordable and easy to use, with little training and
- can be used with any type of inhaler, nasal sprays and/or tablets

➤ **Despite being able to demonstrate correct inhaler technique at clinic only 20% had correct technique when used at home**

- **v-DOT** allows assessment & correction poor adherence / inhaler technique.
Confirming that optimized asthma care has been delivered

One parent said – ‘it (vDOT) made him take his time to use his inhaler correctly’

N Ireland children's regional DTA service

In the 5 years before using **optimised therapy with 6-8 weeks vDOT**

16 children were placed on anti-IgE therapy

In the 5 years after using **optimised therapy with 6-8 weeks vDOT**

3 children were placed on a biologic (anti-IgE or anti-iL5)

ERJ Open Res. 2021 Oct; 7(4): 00463-2021.

Published online 2021 Oct 4. doi: 10.1183/23120541.00463-2021

Mobile video directly observed therapy can be used to improve at-home inhaler technique in children with asthma

Michael D. Shields and James McElnay

Important points

Download and install App – for patient

Explain WHY you are doing vDOT -- eg You need to know inhaler taken correctly before giving expensive therapies ie not spying on them.

eg to help with correcting inhaler technique

Show patient how to set up the SmartPhone to allow an adequate audiovideo to be taken.

The videos – are securely sent and stored AND leave the patients phone (not using up storage space)

We ask parents to fill in a Consent form for vDOT, with a section on whether we can store the videos for education & research (otherwise they are permanently removed/destroyed)

How the clinician will contact the patient – should this be needed eg within App chat, text, email and /or phone call

Needs to be accepted by the Hospital Governance (IT): meets the NHS 'Cyber- Essentials' and Data Protection



Setting up v-DOT

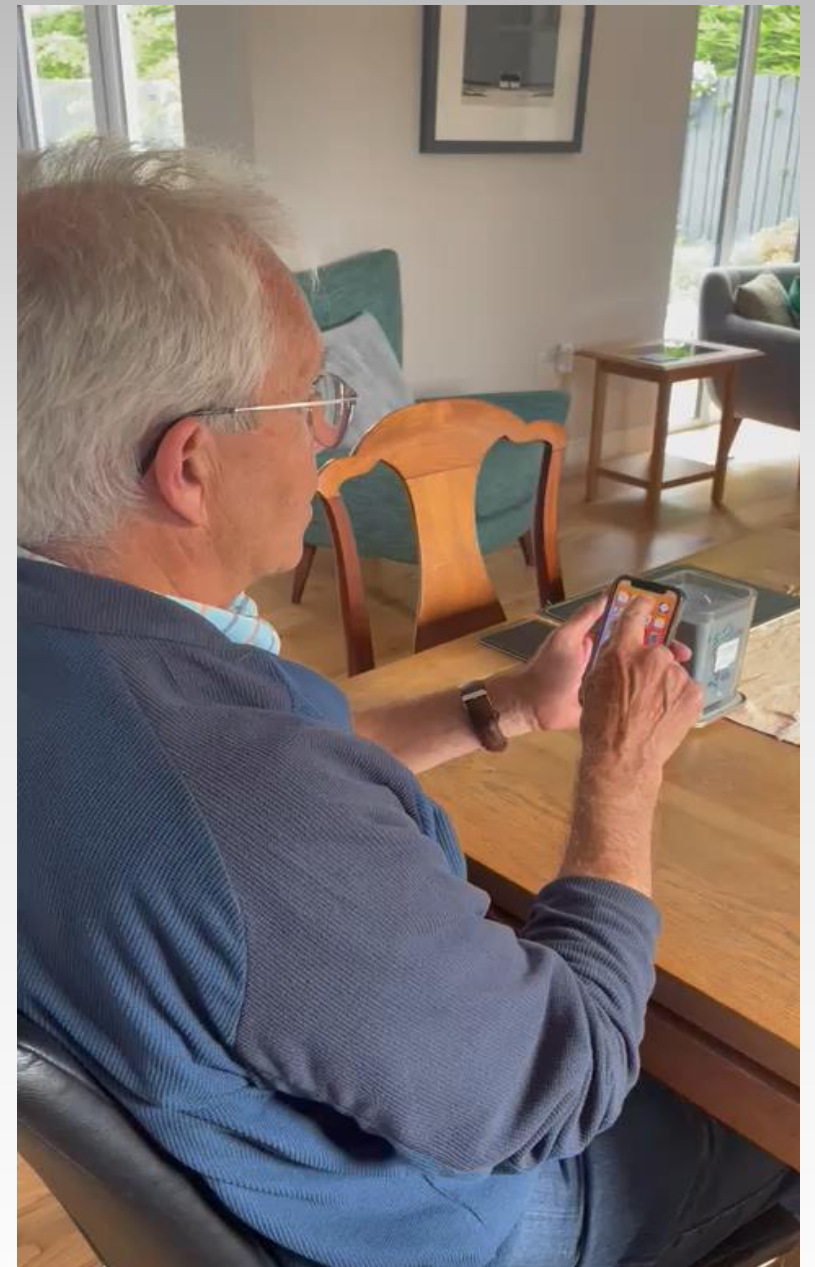


Now

The v-DOT audio-videos are optimised for file size/resolution
Android & Apple devices

Once 'Send' button pressed – the video is submitted and not left on the phone

If in an area of 'no signal' the file leaves when signal next accessed




Other v-DOT studies



ORIGINAL ARTICLE
ASTHMA

Comparison of inhalation technique with the Diskus and Autohaler in asthmatic children at home

Annelies van der Kolk¹, Natasja Lammers ², Marjolein Brusse-Keizer³, Job van der Palen^{3,4}, Joyce Faber¹, Reina Spenkelink-Visser⁵ and Bernard J. Thio^{2,3}

On-line 2021

Inhalers are frequently used incorrectly when demonstrated in the hospital, suggesting poor technique at home.

We aimed to 1) compare daily inhalation technique with the Diskus and Autohaler in asthmatic children by filming inhalations at home and 2) compare daily inhalation technique with technique demonstrated in the hospital.

Children received inhalation instructions for the Diskus and Autohaler and were randomised to use one device in the morning and the other in the evening. During the 28-day study period, inhalations were filmed at home and subsequently demonstrated in the hospital. All inhalations were checked for seven critical errors per device.

Percentage of correct days using the Diskus was 44%, compared to 96% with the Autohaler ($p < 0.001$). The two most common errors with the Diskus were made at least twice as often at home than in the hospital.

Paediatricians should be aware that hospital-based demonstrations can overestimate daily inhalation technique with the Diskus.

TABLE 1 List of critical errors used for the scoring of inhalation technique[#]

	Diskus	Autohaler
Preparation		
1	Device is not opened correctly until a “click” is heard	Inhaler cap is not removed before use
2	Device is not held horizontally with counter facing up while preparing (45° tolerance)	Inhaler is not held upright with lever on top (45° tolerance)
3	Lever is not pushed back until another “click” is heard	Lever is not pushed up before inhalation
Inhalation		
4	Exhales into the device	After fully exhaling, teeth and lips are not sealed around mouthpiece
5	Mouthpiece is not correctly sealed between teeth and lips	Inhalation stops directly after firing the inhaler
6	Insufficiently deep inhalation	Insufficiently deep inhalation
7	No breath-hold for ≥ 10 s	No breath-hold for ≥ 10 s

[#]: partly adopted from the standardised inhalation protocols distributed by the Lung Alliance Netherlands [9].

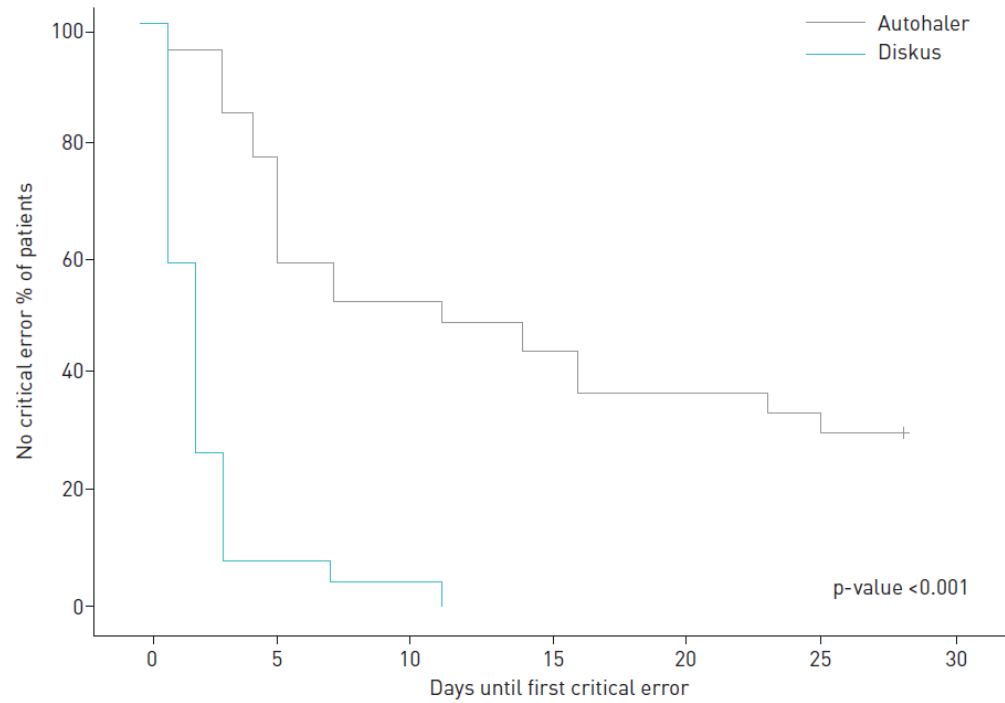


FIGURE 1 Survival function of percentage of patients without a critical error during the study period of 28 days, using the Diskus and Autohaler.

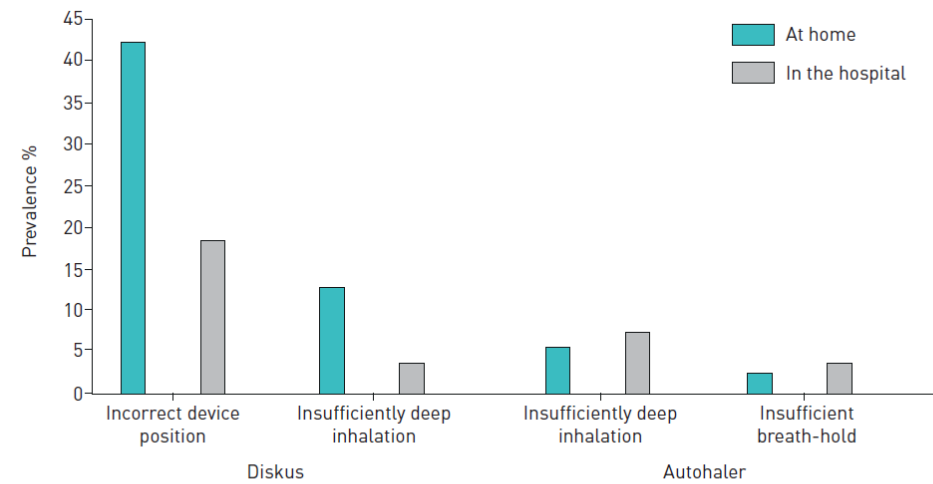


FIGURE 2 Prevalence of the two most common critical errors at home using the Diskus and Autohaler, compared to the prevalence at demonstration in the hospital, expressed as percentage of total observations (n=636 for Diskus at home; n=663 for Autohaler at home; n=27 for both devices in the hospital).



Journal of Asthma



ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/ijas20>

Feasibility of video observed therapy to support controller inhaler use among children in West Baltimore

K. McIntire, B. Weis, L. Litwin Ye & S. D. Krugman

To cite this article: K. McIntire, B. Weis, L. Litwin Ye & S. D. Krugman (2022) Feasibility of video observed therapy to support controller inhaler use among children in West Baltimore, Journal of Asthma, 59:10, 1961-1972, DOI: [10.1080/02770903.2021.1984525](https://doi.org/10.1080/02770903.2021.1984525)

To link to this article: <https://doi.org/10.1080/02770903.2021.1984525>



Figure 1. Intervention schematic. Automated dose reminders prompt patients to check in to the mobile application and submit

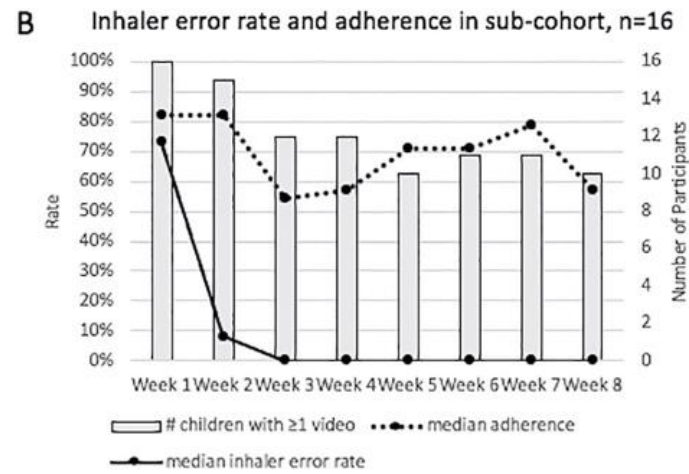
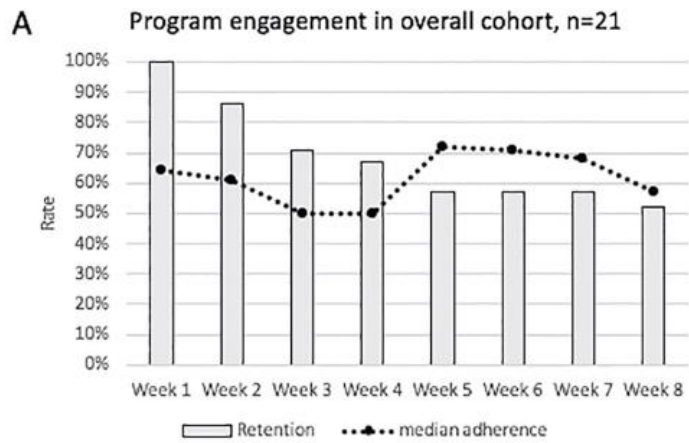
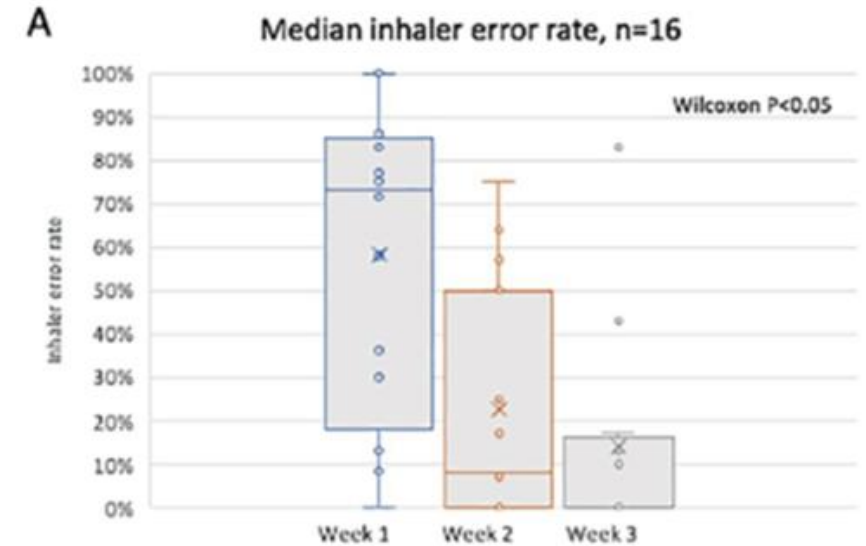
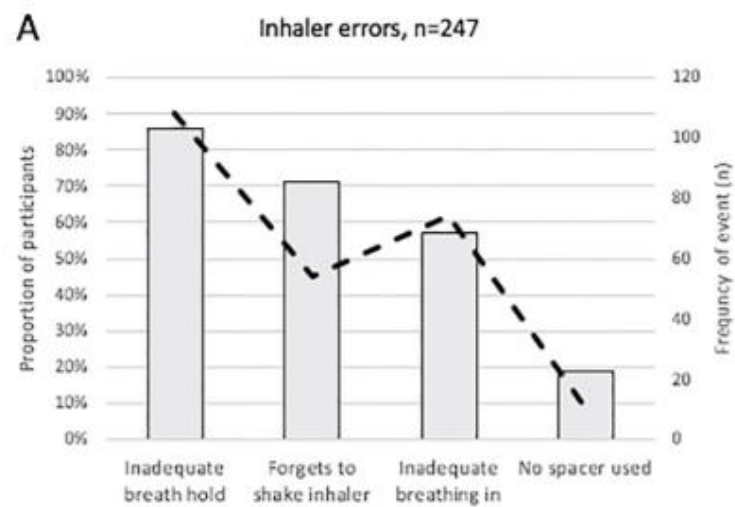


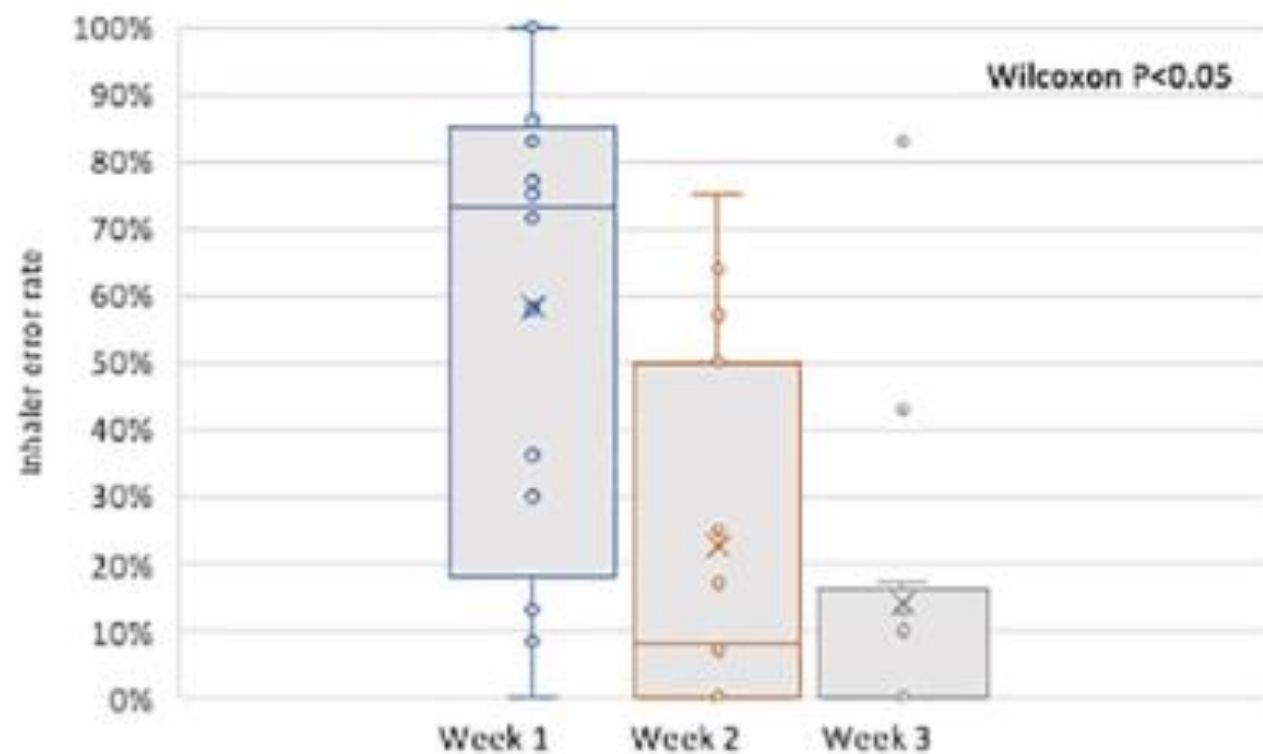
Figure 3. Descriptive trends in (A) primary and (B) secondary outcomes by program week. Feasibility (A), as measured by program engagement, decreased over the first four weeks; 57% of enrolled children remained engaged at week 5, and median program adherence decreased from 64% to 50% over the first three weeks. Those that remained engaged past week 4 tended to complete the program and maintain higher program adherence. (B) During the first two weeks, over 90% of patients with adequate engagement submitted videos (grey bars), median inhaled corticosteroid adherence remained above 80% (dashed line) and inhaler technique improved with resolution of most errors (solid line).





A

Median inhaler error rate, n=16



Comparison v-DOT with SmartInhalers

Electronic measuring devices on inhalers


SMART Inhalers



Figure 3 Electronic monitoring devices manufactured by Adherium Ltd.
(www.adherium.com)

Novel electronic adherence monitoring devices in children with asthma: a mixed-methods study

2020

Sukeshi Makhecha ¹, Amy Chan,^{2,3} Christina Pearce,³ Angela Jamalzadeh,¹ Louise Fleming^{1,4}



Hailie®



Remote Directly
Observed Therapy:

R-DOT®

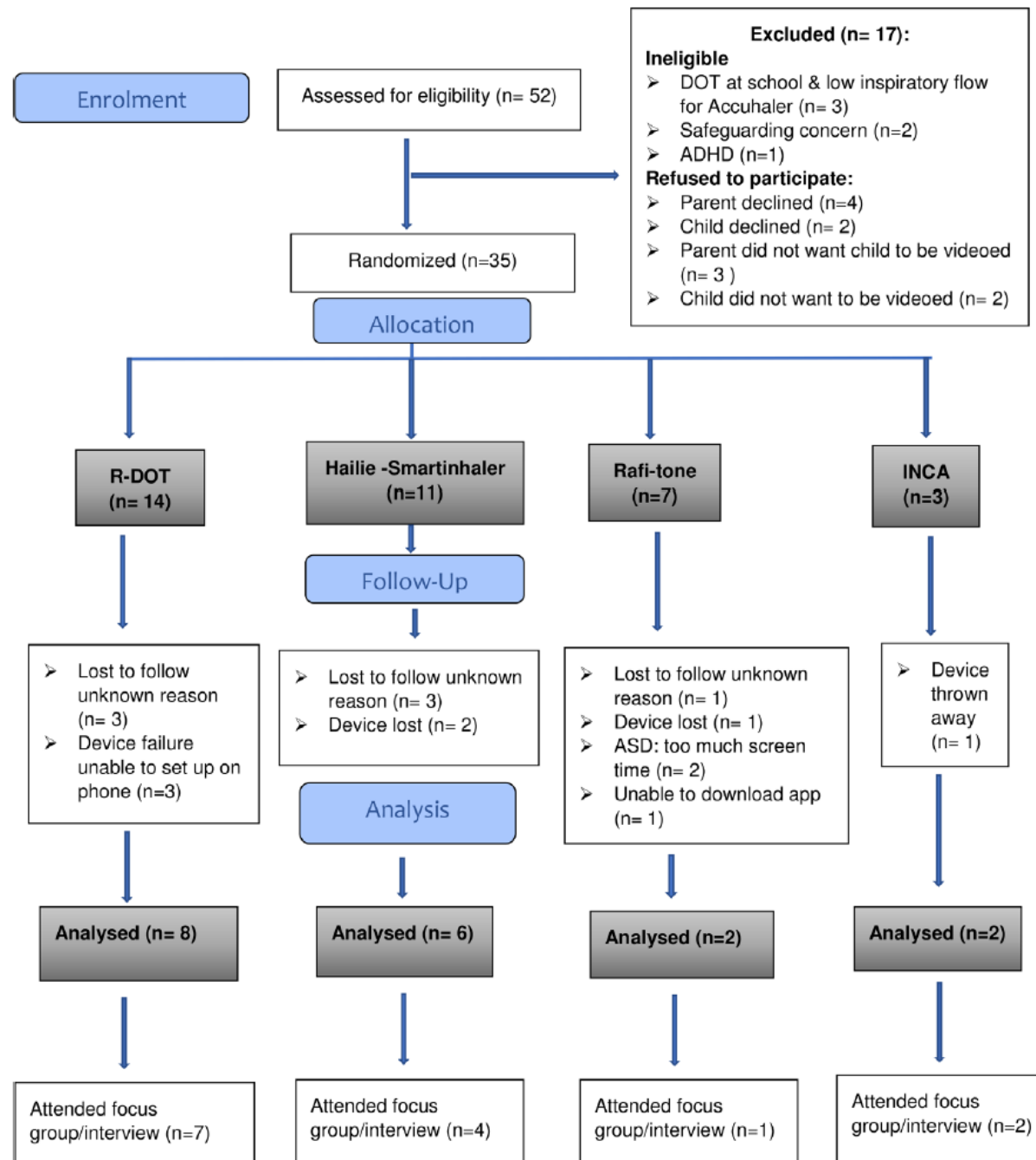


INCA®



Rafi-tone®

Figure 1 Novel Electronic Monitoring Devices used in the study
INCA, inhaler compliance assessment; R-DOT, remote directly observed therapy.



The INCA and Hailie were considered by both patients and CNS, the most accurate and reliable followed by R-DOT as it only records adherence to video uploads.

Both R-DOT and Rafi-tone were perceived to help with improving technique. Although Hailie and INCA assessed technique, interventions could not be implemented until the patient returned to clinic and the data downloaded.

An adolescent reflected: *'one good thing about the R-DOT was the technique thing, which for me was important'* (NEMD1).

An adolescent commented on R-DOT *'you can't film yourself, that's the issue. So, mum had to film me'* (NEMD1). The participant's mum commented *'It wasn't the fact that it took time, it was the fact that we had to coordinate'*. The

Emotions such as embarrassment due to personal or domestic appearance were expressed by some participants using R-DOT. A child said *'I don't feel I look nice, and I don't want to be videoed. Sometimes, oh my hair is*

However, R-DOT provided physical evidence to parents/carers/healthcare providers that the medication was actually taken correctly as commented by one of the participant's parent: *'For me, recording, it's better because I can see how [the participant] doing. Sometimes [the participant] doesn't do it properly when [the participant] doesn't have time. But if I record [the participant] I can see how [the participant's] doing it properly'* (Parent of NEMD2).

Remote video DOT in asthma

1. device independent – any asthma inhaler, nasal spray and oral tablets
2. feasible – has been ‘tested’ to allow accurate assessment of Inhaler technique as per ‘in-person’
3. If patient engages - can allow the clinician to ‘know’ whether optimised therapy has been delivered
4. the platform allows the clinician to provide timely feedback – via the App, both to encourage adherence and correct inhaler errors
5. vDOT platform – needs to conform to Cyber Essentials certifications, meeting all NHS codes of practice for the transfer & storage of sensitive data.

Uses: Difficult asthma – how can we prevent adherence decay over time?

- **New children with asthma**
- **Confirming ‘FeNO suppression’ adherence test**



Patient Enrolment

Enrol patients into directly observed therapy, creating a personalised care plan.

Features of rDOT



Patient Review

Review patient treatment administration, and provide feedback and corrections remotely.



Medication Reminders

Patients receive automated reminders of medications, as defined by their care plan.

For Healthcare Providers

- Reduced number of medical staff needed for observation
- Saves staff time on transport to visit patients at home
- Cost effective approach compared with traditional DOT
- Can be used to observe patients taking medication at the weekend and public holidays

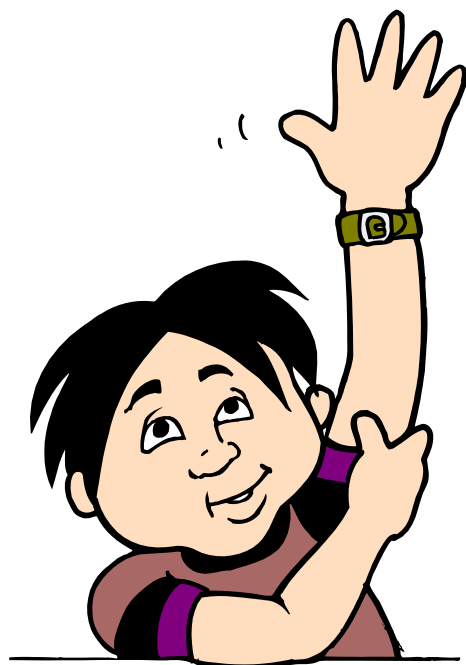
For Patients

- Flexible and convenient
- Can be used to improve or maintain treatment adherence
- Reduce travel burden for patients who live in rural areas with restricted access to medical staff and resources
- Can be used as communication tool between patient and medical staff e.g. discussion on medication side effects
- Can be used for monitoring adherence of immobile and disabled patients



Feedback

Patients receive notifications of feedback when reviewed by their healthcare provider.



Personal Experience of R-DOT

- Gets a good habit established with all medication
- Consistently correct inhaler technique
- Improved lung functions – increased PFTs and decreased FENO
- Improved ACT (Asthma Control Test) scores
- Improved PAQLQ (Paediatric Asthma Quality of Life) Scores
- Feel so much better and want to stay that way

“I can now run on the treadmill at the gym”

“My friends notice a real difference in me”

“I am not using as much blue inhaler”

“I feel much better now”

“I can play football now without having to sit out as much”

Realistically – there are some issues?

Pressure from family to fail – excuses made once they realise this will reduce asthma symptoms – financial

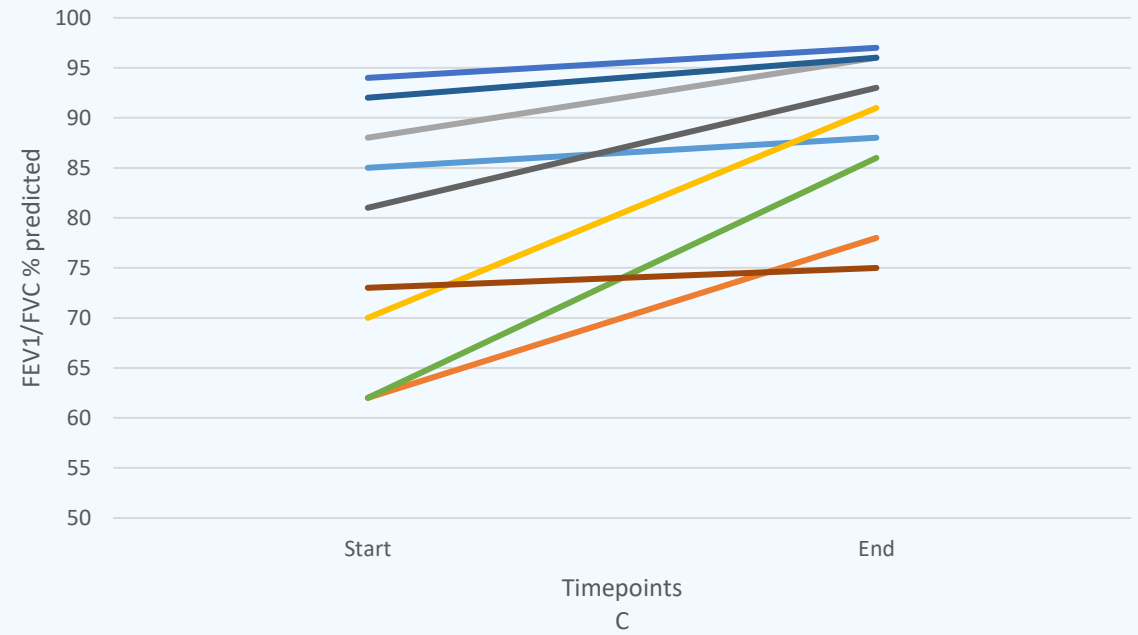
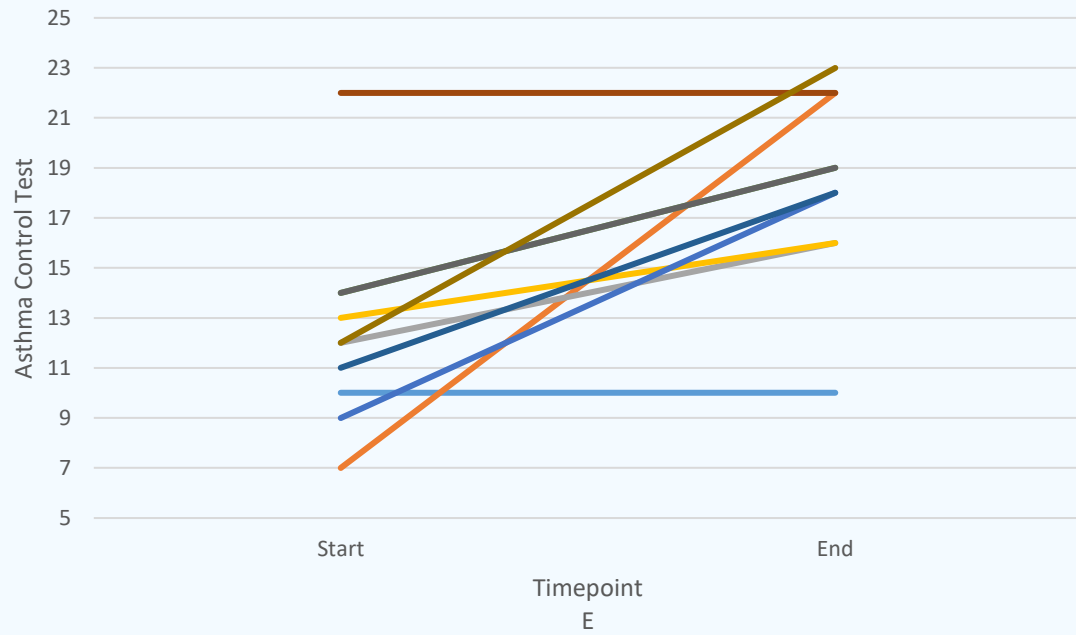
- App wouldn't work
- Phone broken or lost or both!
- Left inhalers on the bus and the GP won't prescribe more
- Poor quality videos sent



Some poor technique but refused to correct it

- Poor inspiration
- Nasal spray sprayed anywhere but not up the nose
- use of inhaler without aerochamber

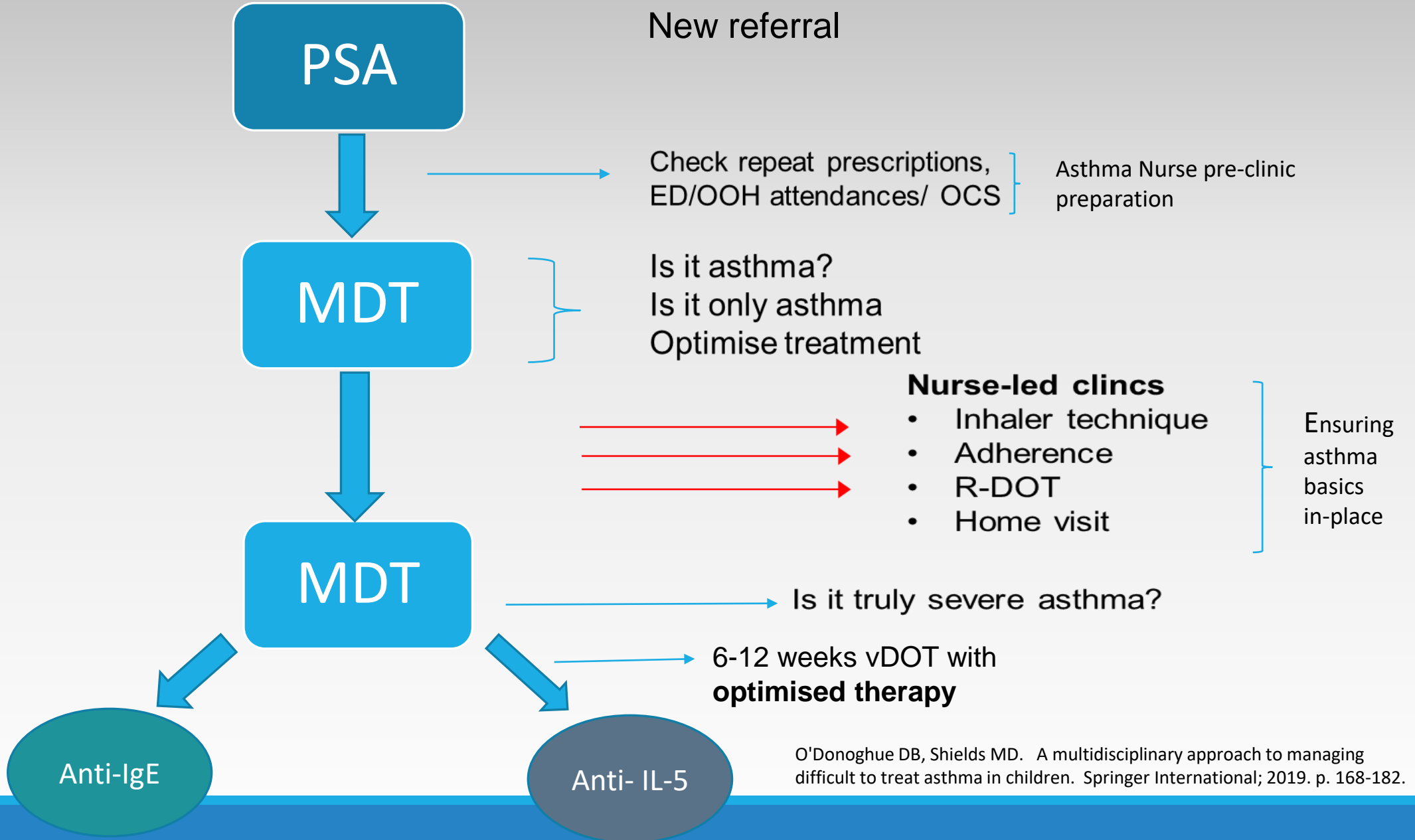




9 adults with DTA – undertook 6 weeks vDOT while continuing usual therapy

Unpublished data, from Medicines Optimisation Innovations Centre, MOIC N Ireland, service development

**RBHSC Difficult to Treat
Asthma clinic**



O'Donoghue DB, Shields MD. A multidisciplinary approach to managing difficult to treat asthma in children. Springer International; 2019. p. 168-182.