

# Adherence to therapy

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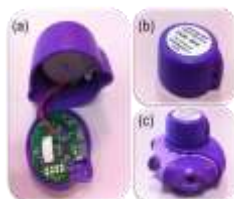
## Outline of this talk

- History of digitally enabled inhalers
- Adherence as a clinical sign
- Use in practice

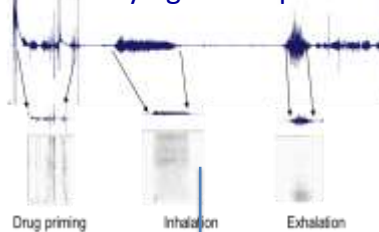
Acoustic recording device attached to diskus

## INCA Technology

Device contains audio files of each step of inhaler use, identifying technique errors



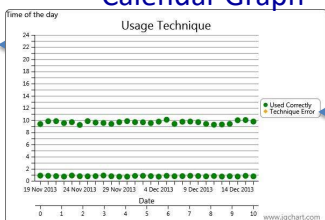
Patient "uses" inhaler



Recordings downloaded, signal processing analysis- identifies when, how regularly and how well the inhaler was used

Data used for analysis Or Clinical care

### Calendar Graph



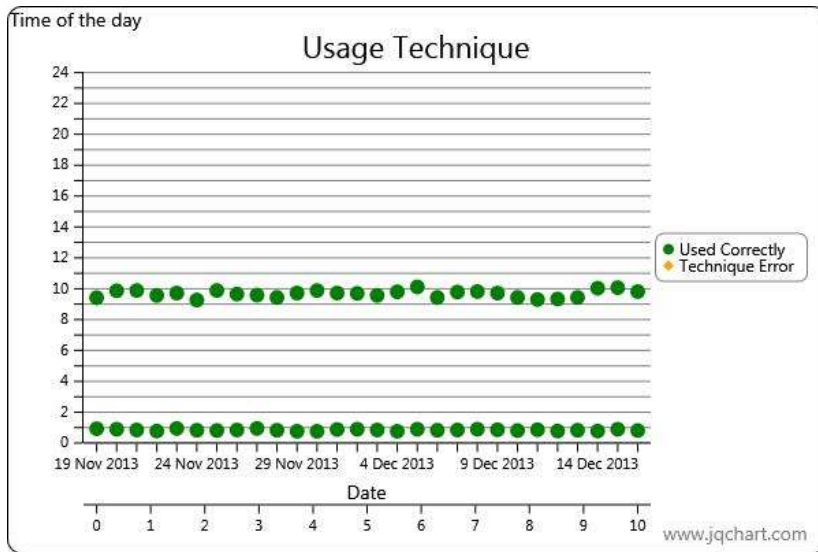
The INCA team experience

Adherence to medications is a clinical sign

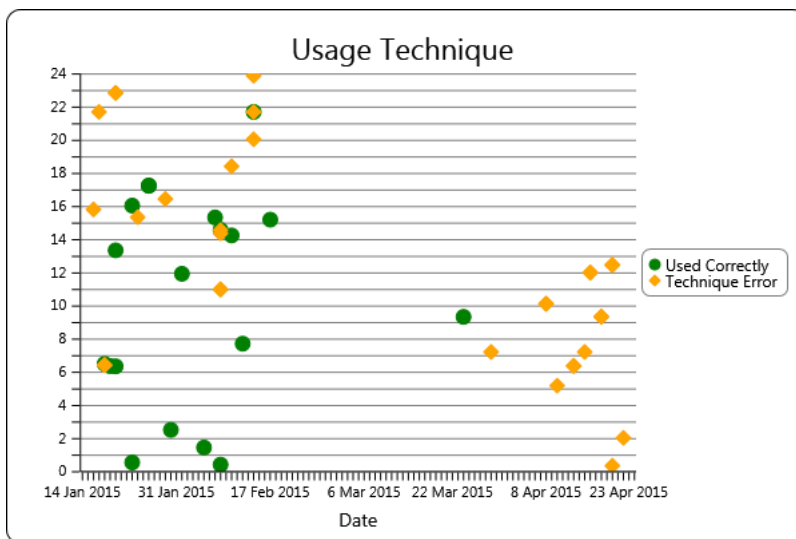
Adherence to medications is a clinical sign

Step 1 Investigating the cause of poor adherence

Adherence behaviour has diagnostic value



Erratic Inhaler use with intermittent errors– most common form of inhaler use



www.jqchart.c

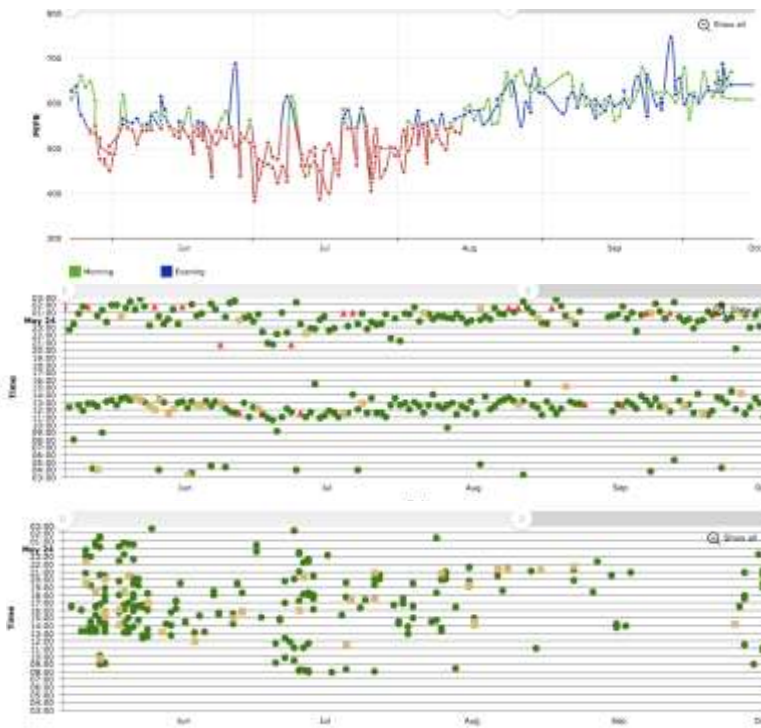
Adherence to therapy is a clinical sign

Clinicians diagnose

Then

Treat

If the diagnosis is incorrect then adherence  
and outcomes are not going to match

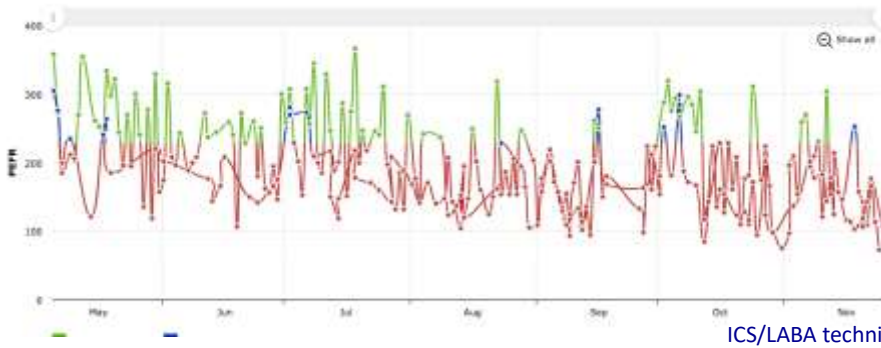


PEF

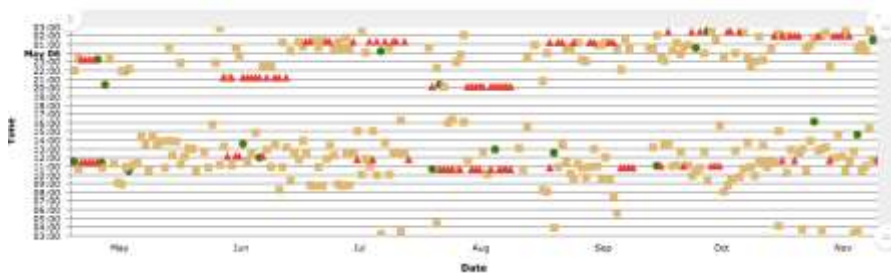
ICS/LABA

Beta agonist

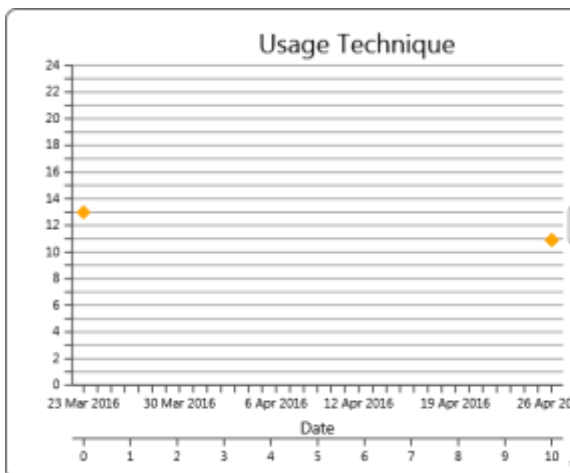
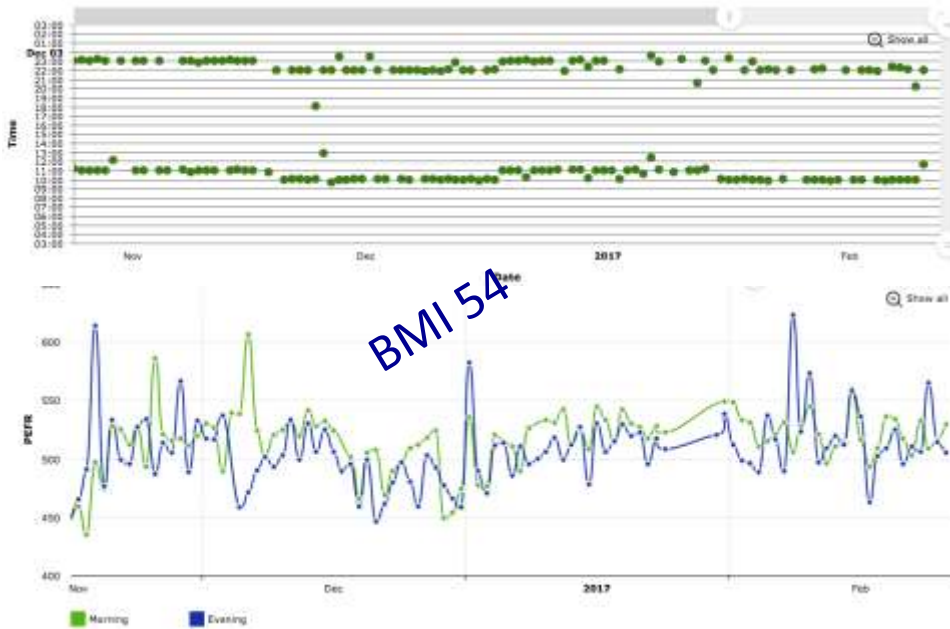
Peak Flow



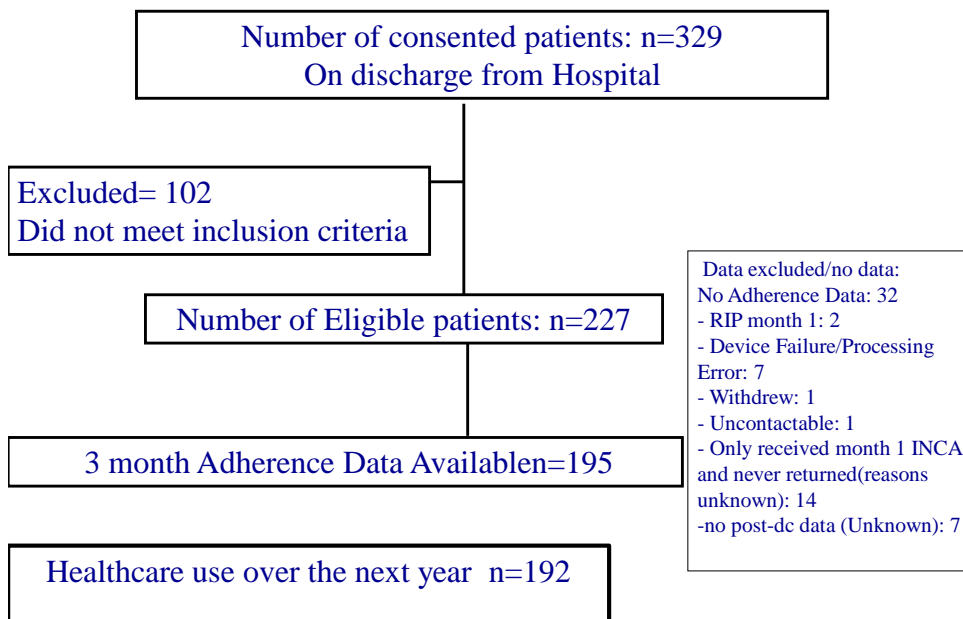
ICS/LABA technique



## Monitored adherence and monitored lung function

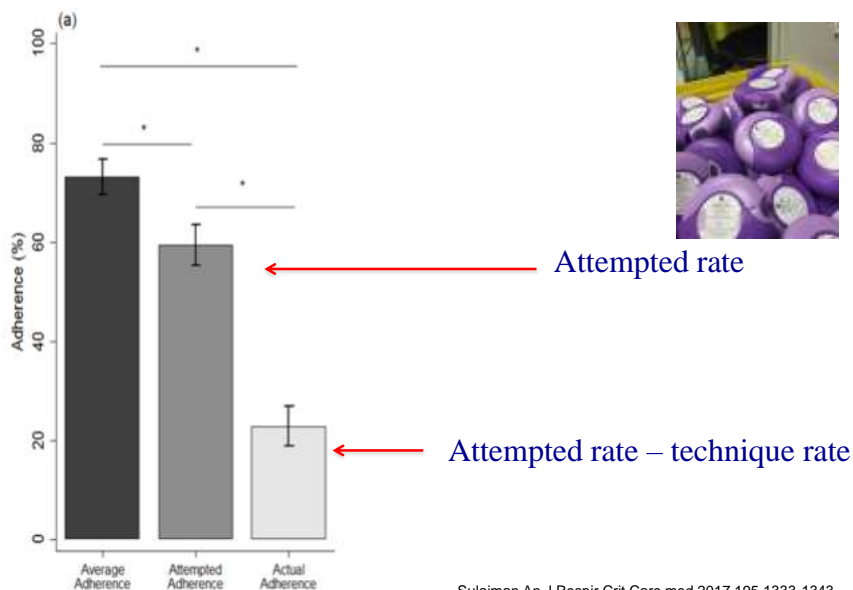


## A study of adherence by patients with severe COPD



Sulaiman Am J Respir Crit Care Med 2017

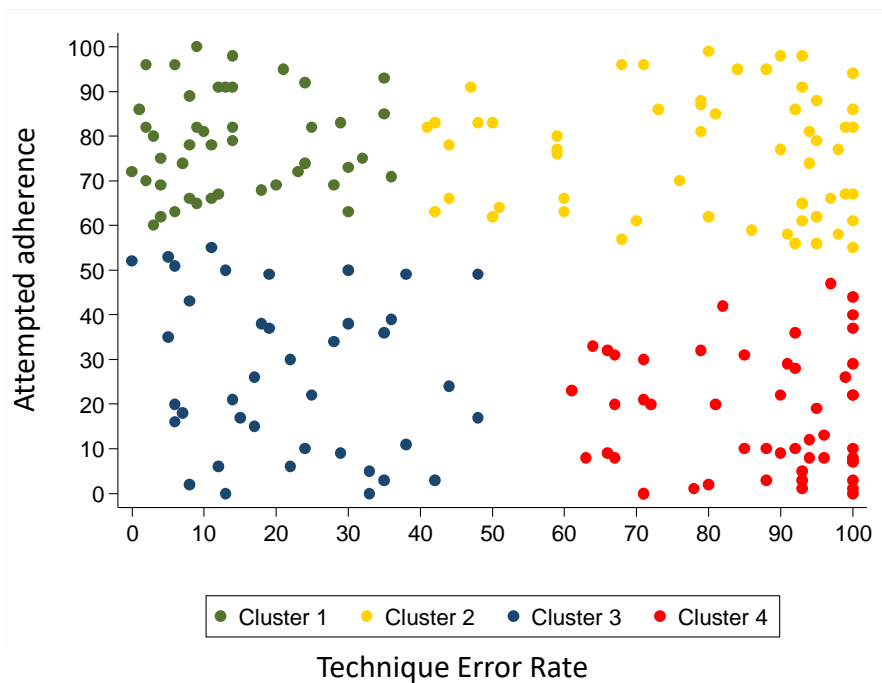
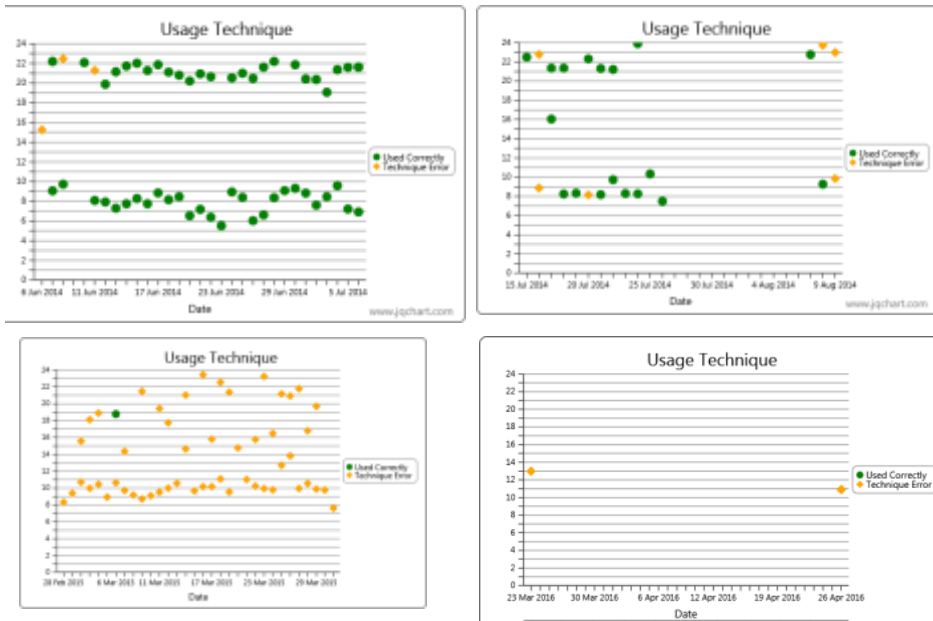
## Both attempting to use and technique of use are poor in COPD after hospital discharge



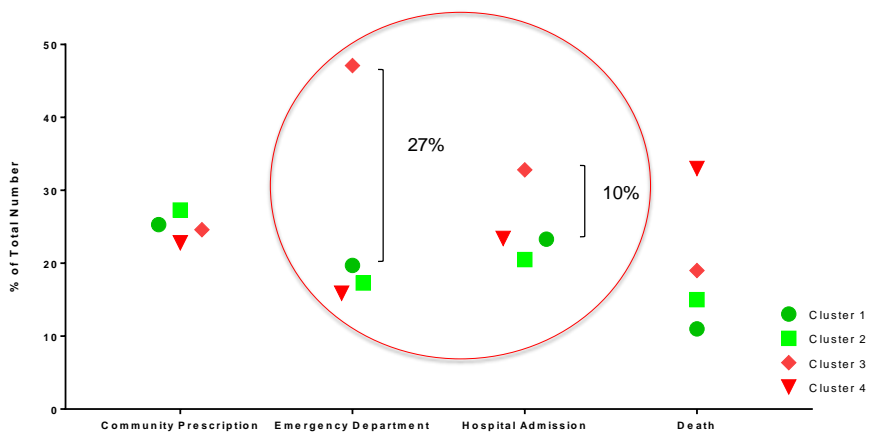
Sulaiman An J Respir Crit Care med 2017 195 1333-1343



## Patterns of inhaler use by patients with COPD



### Patient outcomes vary according to Adherence Behaviour



**Cluster 1:** Regular Use; Good Technique

**Cluster 3:** Irregular Use; Good Technique

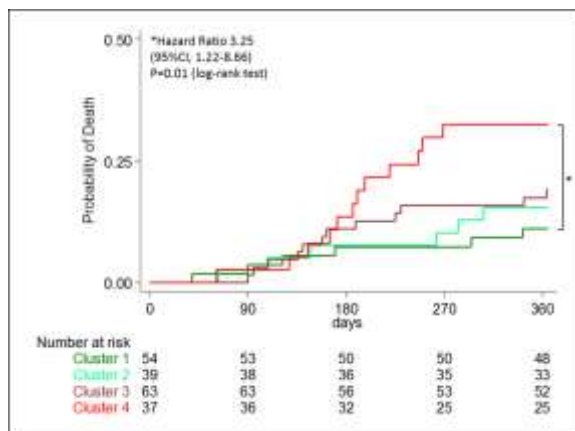
**Cluster 2:** Irregular Use; Frequent Technique Errors

**Cluster 4:** Irregular Use; Frequent Technique Errors

Cushen et al, *AJRCCM*, (2018) DOI: 10.1164/rccm.201712-2469LE  
 Van Boven, Cushen et al, *NPJ Primary Care Respiratory Medicine*, (2018)  
 DOI: 10.1038/s41533-018-0092-8



### Patients with poorest adherence had the poorest survival



Cushen et al, *AJRCCM*, (2018) DOI: 10.1164/rccm.201712-2469LE



Adherence to treatment is a clinical sign

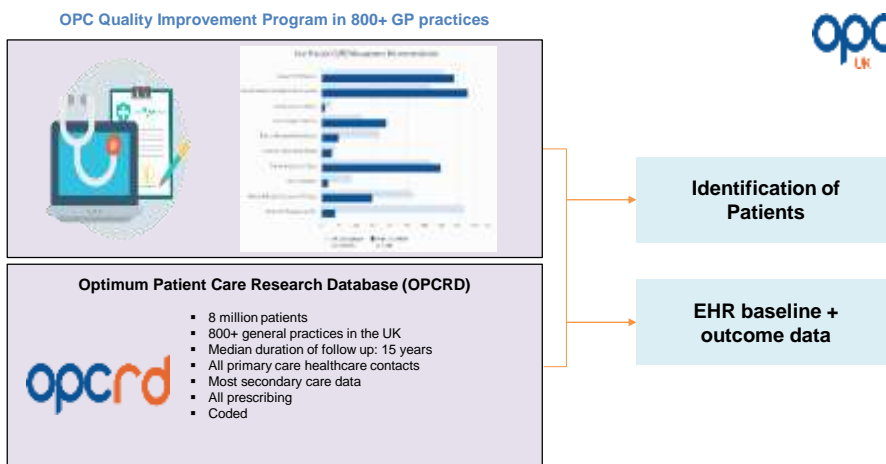
Aligning adherence with objective measures gives insight to the patient's diagnosis

Digital health behavior gives insight into the individual patient's cause of poor adherence

Adherence to medications is a clinical sign to be detected in a consultation

Step 2 Treating the cause of poor adherence

## MAGNIFY: Recruitment of 1,312 patients to the trial will be from a unique database of GP practices (176)



EHR: electronic health record  
 Optimum Patient Care Research Database (OPCRD): <https://opcrd.co.uk/> [accessed Oct 2019]; Optimum Patient Care: <https://optimumpatientcare.org/> [accessed Oct 2019]

## New technology available – the Propeller<sup>®</sup> sensor for the Breezhaler<sup>®</sup> device



### Can be used to

Provide inhalation confirmation, medication reminders and access to real data to support treatment decisions

\*Sensor is available for use only with the indicatero/glycopyrronium Breezhaler™ medicinal product for the treatment of COPD. Breezhaler™ is property of Novartis Pharma AG. Consult the SmPC for information on the indicatero/glycopyrronium Breezhaler™. †The Propeller® Sensor for the Breezhaler® device and the Propeller® mobile app are property of Propeller Health® <https://www.propellerhealth.com/>

## A randomised trial of adherence biofeedback on adherence in Severe Asthma



### Study population

Asthma

GINA Step  $\geq 3$  / +  
 $\geq 1$  exacerbations in prior year

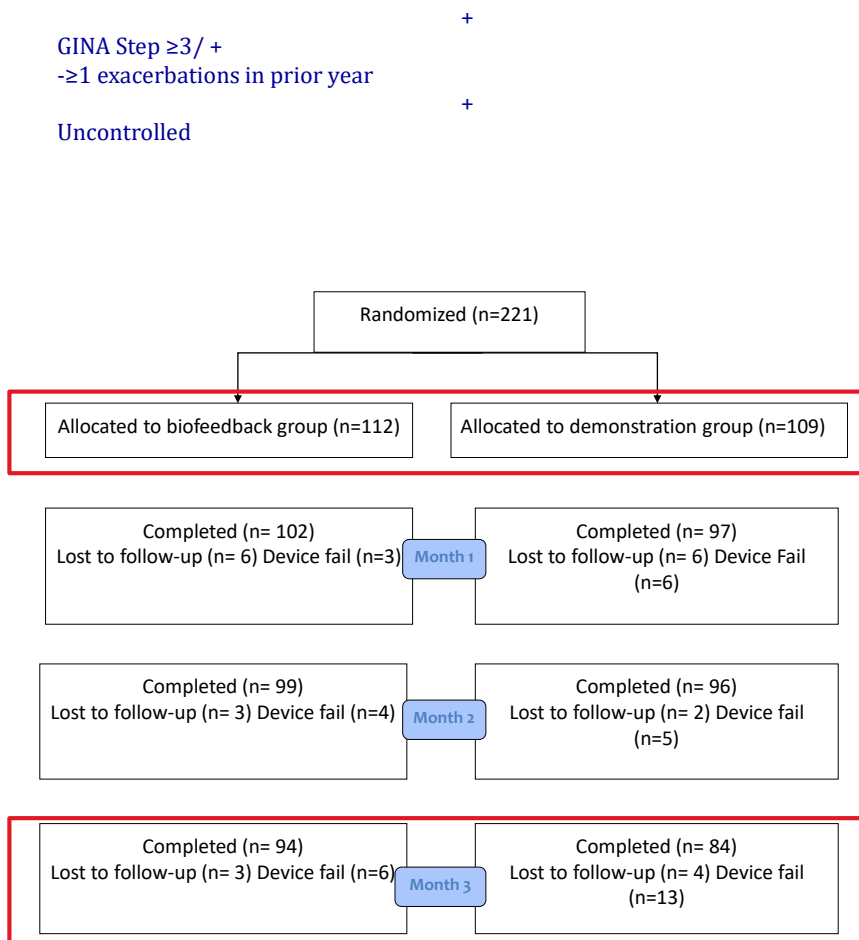
Uncontrolled

### Active intervention - biofeedback

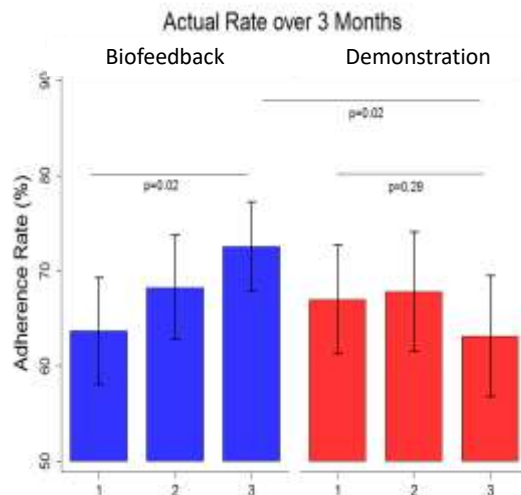
Monthly Technique and adherence education based on issues identified by the INCA device

### Control intervention-demonstration

Monthly Inhaler training, asthma education, adherence advice no feedback



## Personalised feedback significantly improves adherence compared to repeated demonstration



## Evaluation of pharmacist-led provision of digitally supported inhaler training

- A cluster randomized trial of inhaler training in 74 community pharmacies throughout Ireland

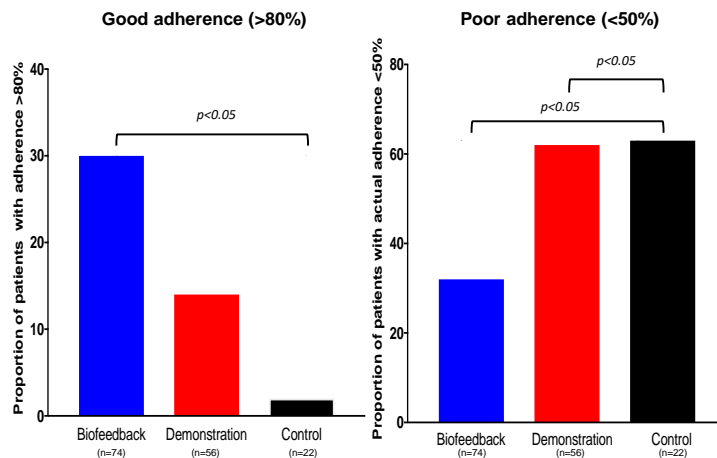


**Biofeedback group:** personalized inhaler training informed by data recorded by the INCA device

**Demonstration group:** inhaler training (physical demonstration with a placebo inhaler)

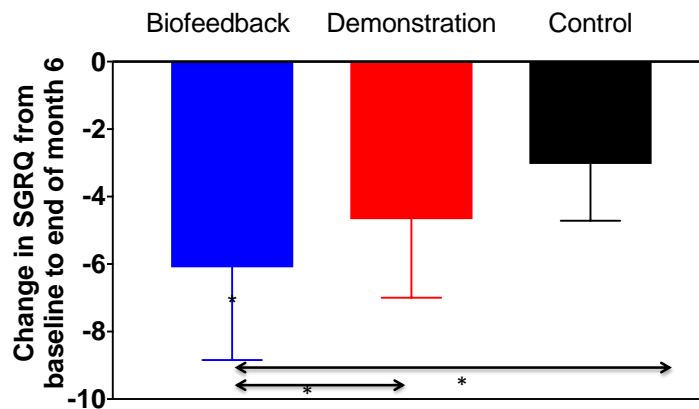
**Control group:** usual care

## Adherence was better in the biofeedback group



Cluster randomized, parallel-group, multisite pharmacy study conducted over 6 months; 152 participants.  
 O'Dwyer S, et al. *J Allergy Clin Immunol Pract*. 2019 Sep 27 [Epub ahead of print]

## There was a fall (improvement) in St George's Respiratory Questionnaire score in the biofeedback group



## Real world perspective

- Poor adherence is someone else's problem
- Health payers don't want to pay for adherence
- Clinical workplace is really stressful and cluttered

### Time is limited in most patient consultations

- Average consultation length ranges from **48 seconds** in **Bangladesh** to **22.5 minutes** in **Sweden**<sup>1</sup>

EHR: electronic health record

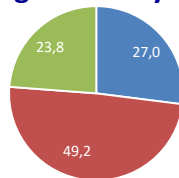
1. Irving G, et al. *BMJ Open* 2017;7:e017902; 2. Sinsky C, et al. *Ann Intern Med.* 2016;165(11):753-760.



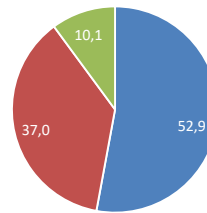
## The electronic health record; a prototype example of poor user experience

HCPs spend a large proportion of time writing in the **electronic health record**<sup>2</sup>

**Division of time  
during office days (%)**



**Division of time  
in the room with patients (%)**



- EHR/desk-work
- Face to face with patients
- Other

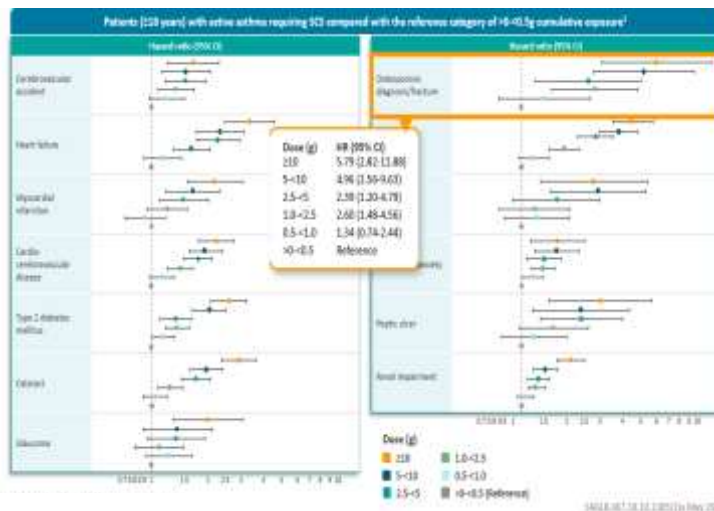
EHR: electronic health record

1. Irving G, et al. *BMJ Open* 2017;7:e017902; 2. Sinsky C, et al. *Ann Intern Med.* 2016;165(11):753-760.

## Treating the Adherence as a clinical sign-

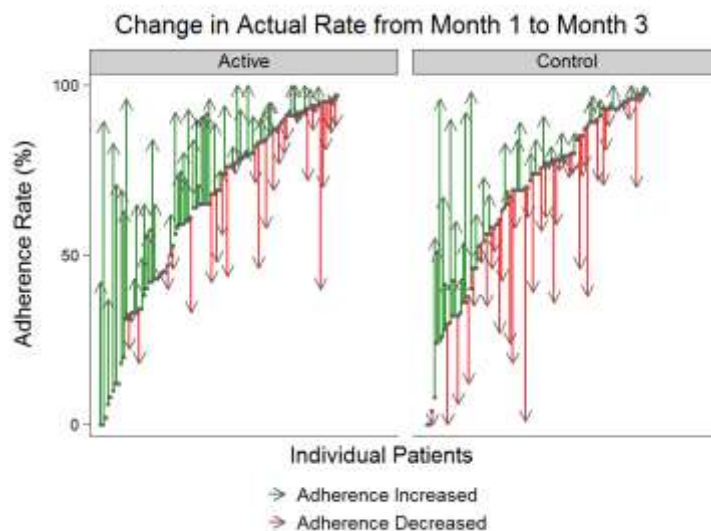
Addressing poor adherence and poor inhaler technique  
can save money in the short and longterm

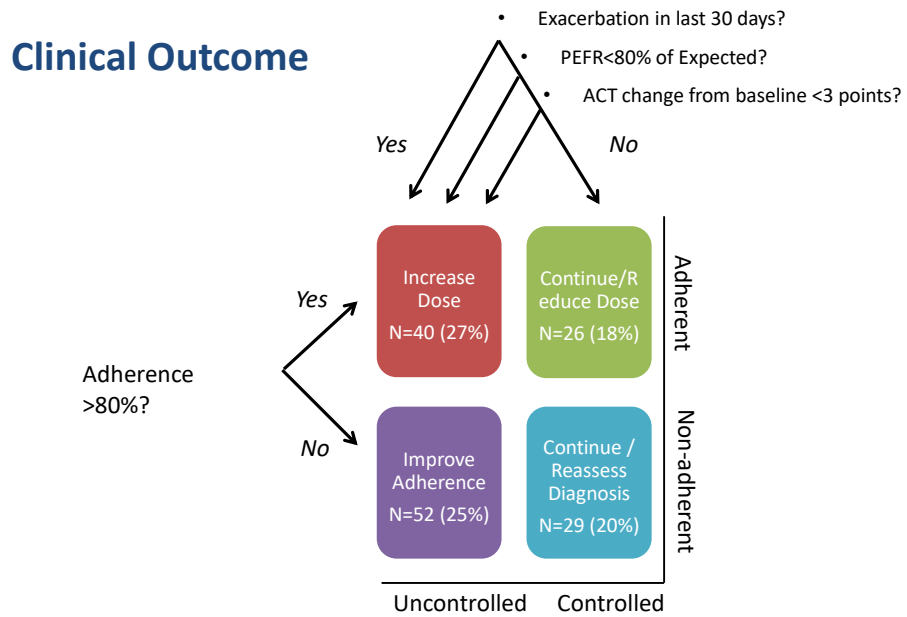
## Cumulative Exposure to short courses of steroid Increases the Risk of Comorbidity in a Dose-Dependent Manner



1. Price DB, et al. J Asthma Allergy 2018;11:193-204

## LABA/ICS maintenance adherence declines in many patients

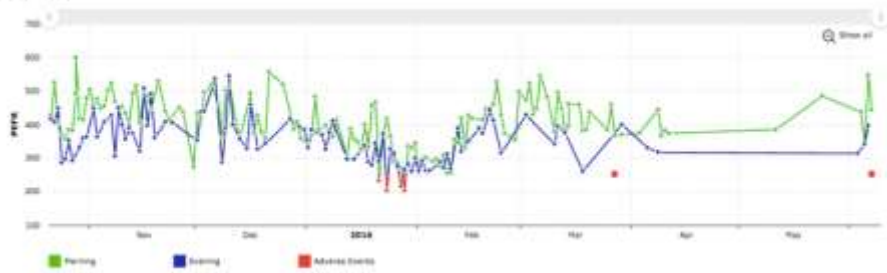




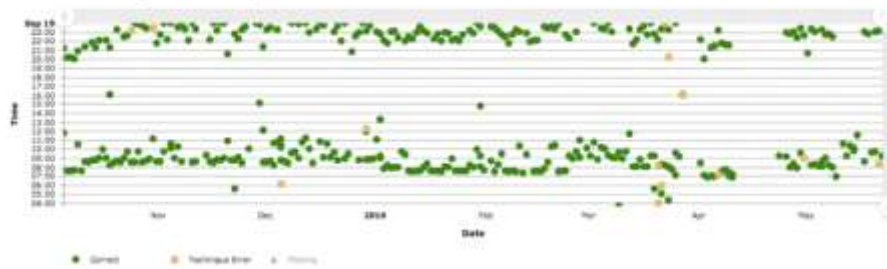
Sulaiman ERJ 2018

How much treatment a patient actually needs varies

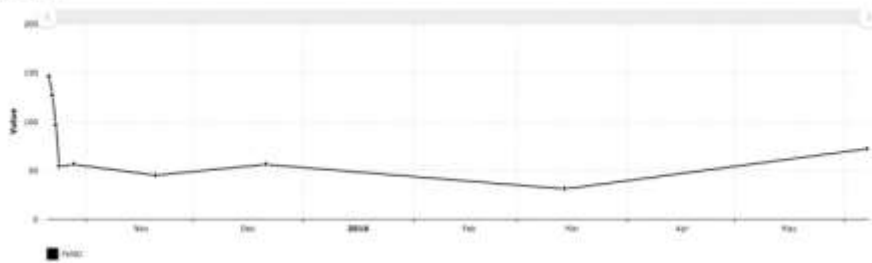
### PEFR



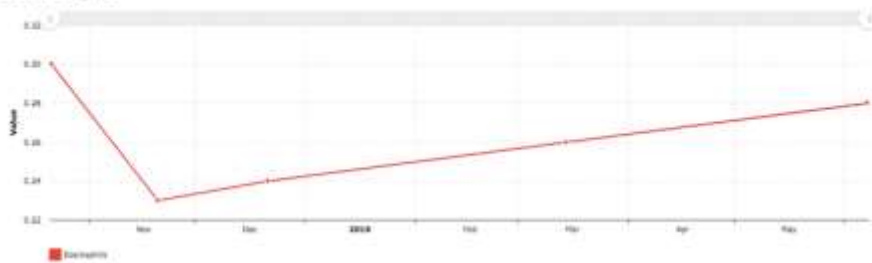
### Seretide Usage Technique



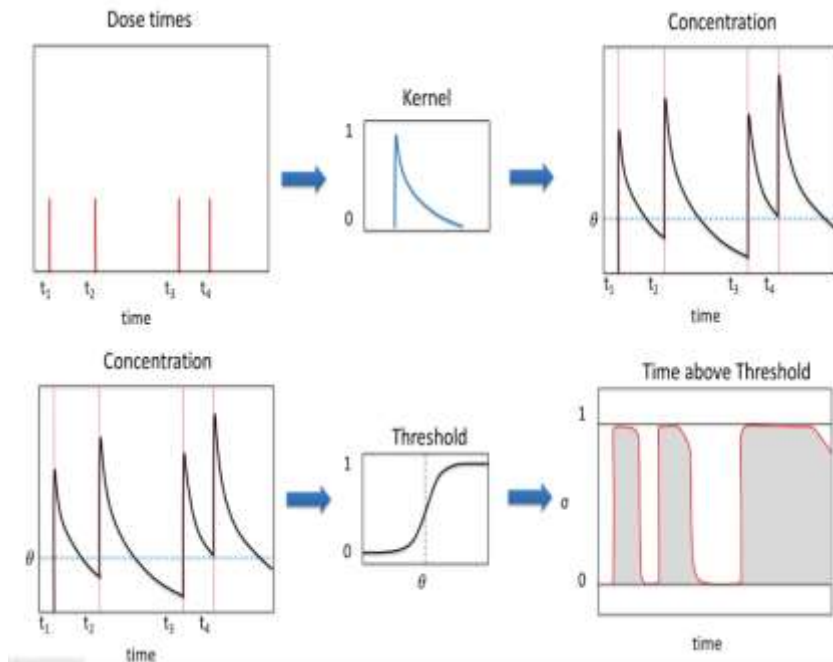
### FENO



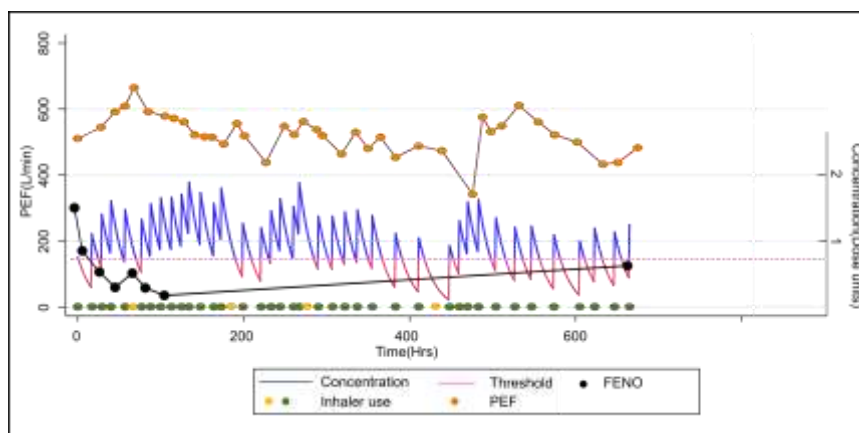
### Eosinophils



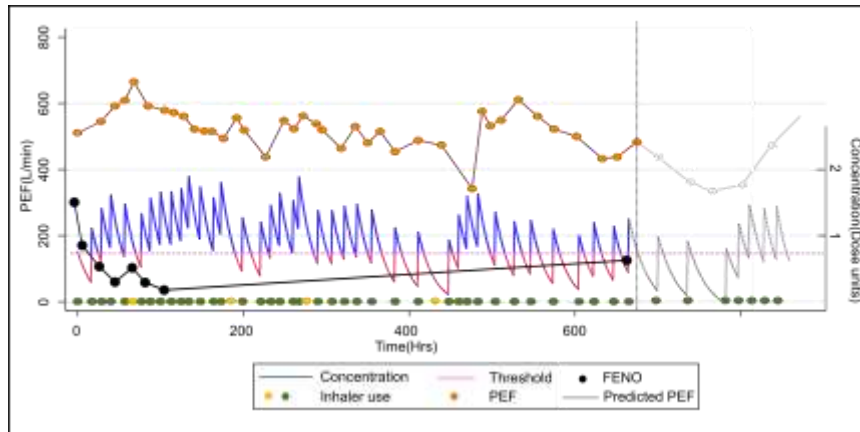
## A method to precisely assess adherence



Time below adherence threshold is strongest predictor of exacerbations



This relationship can be used to  
forecast future events



## Summary

- Adherence is a clinical sign- the cause needs to be investigated and then treated



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MAECON

### Medication Adherence Expertise Center Of the northern Netherlands

The Medication Adherence Expertise Center Of the northern Netherlands (MAECON) is a unique multidisciplinary medication adherence expertise center that brings together adherence expertise from the medical, pharmaceutical, big data, technology, psychology, sociology, health economics, health services and behavior research fields.

MAECON's mission is to optimize chronic medication use and adherence, at minimum costs, and at all levels of research, care and education.

### Symposium MAECON

The Medication Adherence Expertise Center of the northern Netherlands organizes its opening symposium on medication adherence on Monday, November 18th, 2019 at the UMCG, in Lokaal 16. The symposium will be in Dutch.

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## Education

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Professionals

Students

MAECON members play a role in raising awareness and teaching medicine and pharmacy students and healthcare professionals (in training) about adherence strategies. This will be accomplished by developing educational modules, courses and master specialization tracks. Coordinator for the education section of MAECON is prof. dr. Paul Brand, pediatrician and professor of Clinical Medical Education at the University of Groningen.

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## Clinical Team

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 Lorna Lombard RN  
 Sinead Plunkett RN

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 Imran Sulaiman MD PhD  
 Chris Mulvey MD  
 Lorraine Thomson MA  
 Susan O'Dwyer Mpharm

## Analytic Team

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Damien McCarthy MD	Data Visualisation
Jansen Seheult MD PhD	Medicine
Breda Cushan MD PhD	Medicine
Vinnie Brennan MD	Medicine

Tom McCarton MEng MD	Engineering
Frank Doyle PhD	Psychology
Terence Taylor PhD	Engineering
James Byrne MA	Programming
Shane Sullivan MA	Programming
Martin Holmes PhD	Engineering
Shona D'Arcy PhD	Engineering
Richard Reilly PhD FIEEE	Engineering