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Latest results
FeNO@home
study

FeNO home monitoring
Paving the way to true asthma remission

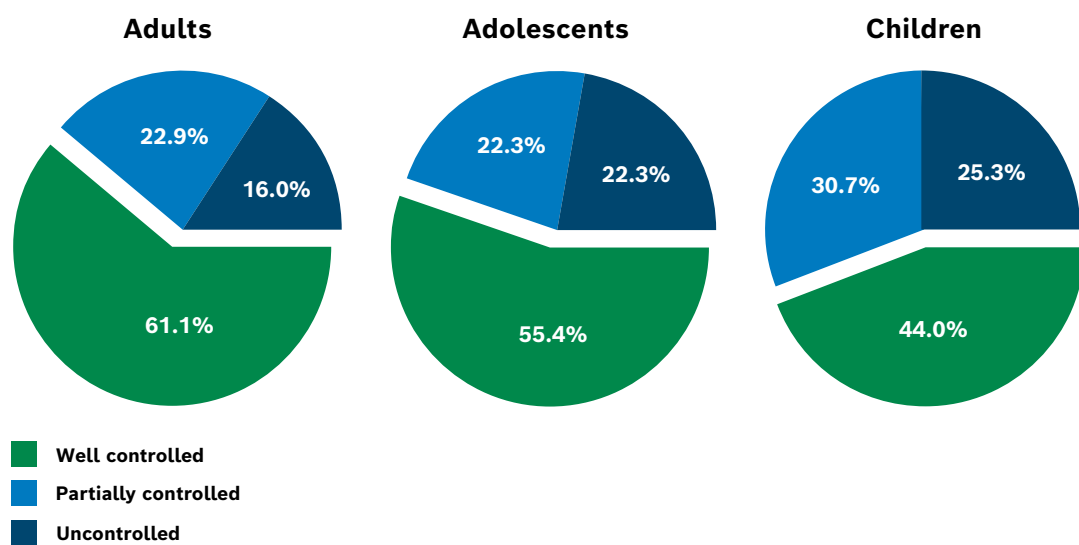
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Conventional concepts of asthma management

Many asthma patients do not reach their full therapeutic potential

Current treatment approaches with inhaled drugs and biologics aim at achieving symptomatic asthma control and preventing future risk. This concept has recently been extended by adding long-term remission as a realistic goal for many patients.¹

Despite this ambitious aim, around 40% of asthma patients are not adequately controlled according to conventional definition. A key point is that the traditional understanding of asthma control and remission does not involve any biomarker, even though airway inflammation is the main cause of symptoms.



Asthma control worldwide (Source: Global Asthma Report 2022)

Fractional exhaled Nitric Oxide (FeNO) is a well-established marker of Type 2 asthmatic inflammation with diagnostic, prognostic and predictive value. Elevated FeNO supports an asthma diagnosis in clinical routine.¹ Asthmatics with elevated FeNO levels are at higher risk of exacerbations² and progressive

lung function decline.³ FeNO levels above normal are linked to greater treatment benefits with anti-inflammatory drugs including certain biologics.⁴ Hence, FeNO is now considered by experts as an indispensable part of phenotyping and precision medicine.¹

¹ Lommatzsch et al. *Pneumologie* 2023;77:461-543

² Busse et al. *Lancet Respir Med* 2021;9:1165-73

³ van Veen et al. *Eur Respir J* 2008; 32: 344-49

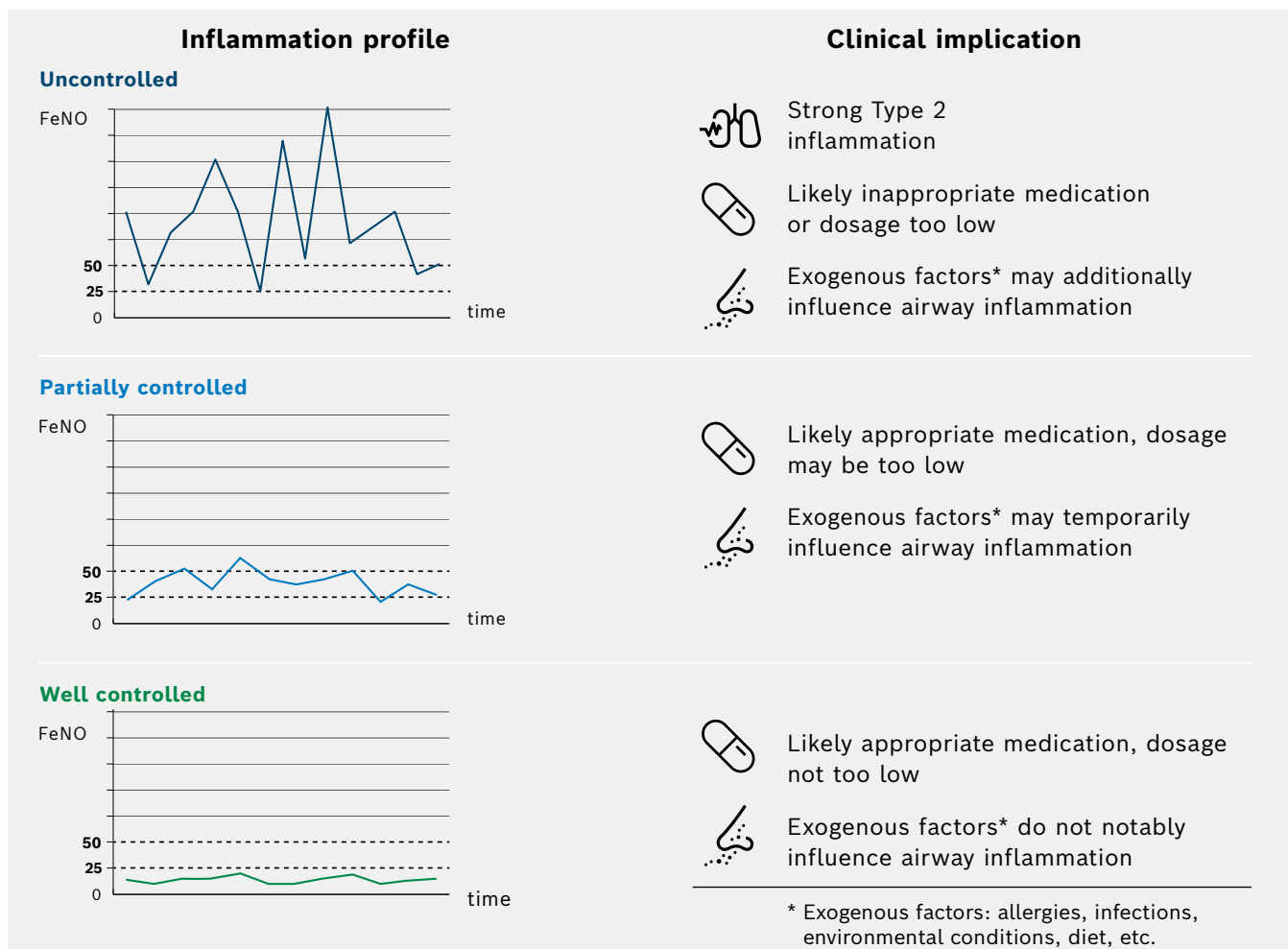
⁴ Price et al. *Lancet Respir Med* 2018;6:29-39; Lee et al. *Lancet Respir Med* 2021;9:69-84; Pavord et al. *JACI Pract* 2023;11:1213-20

Going beyond the traditional understanding of asthma control

FeNO home monitoring reveals true inflammation patterns

A major challenge in clinical asthma management is the existing lack of robust, objective, longitudinal data on the individual disease course. Cross-sectional data gathered at individual time points during practice visits may suffer from the inherent variability of asthma and therefore are not fully representative.

As a consequence, diagnosis and treatment may not be appropriately adapted to the patient's individual inflammatory profile. Thus, patients may receive inappropriate medication, such as inhaled corticosteroids (ICS) in unsuitable doses, or they may seem ineligible for certain biologics.



Stylized illustration of different inflammation patterns based on continuous FeNO measuring (Source: FeNO@home)

FeNO home monitoring helps to solve this problem, according to *FeNO@home* – a 12-week multicenter observational study on 85 asthma patients.⁵ Compared to sporadic FeNO tests in the doctor's office, continuous home monitoring provides additional advantages, as the course of inflammation creates a more holistic clinical picture. *FeNO@home* has revealed recurring patterns of inflammation – characterized by FeNO variability, median, and extremes. Ideally, FeNO is recorded together with other

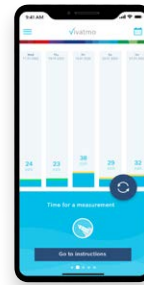
context data to enable optimal analyses of the patterns and cause-effect relationships – for example in conjunction with infections, medication, adherence, or allergen exposure. Patients' individual FeNO profiles can be used for trigger identification and clinical decision-making to optimize personalized asthma management. Evidence suggests that a *treat-to-target* approach adding FeNO to the management strategy can improve asthma control.⁶

Quick and reliable home testing

The world's first and only patient device for FeNO home monitoring



Vivatmo me



Vivatmo app

+

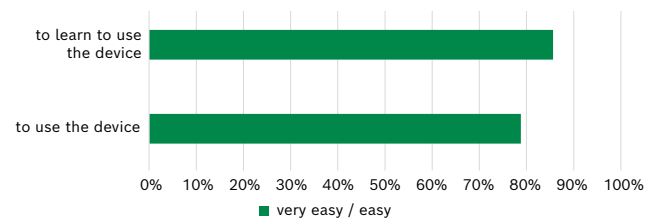
There is only one system in the world that is approved for FeNO monitoring at home: Bosch Vivatmo *me* accompanied by the Vivatmo *app*. The patient device enables quick, easy and non-invasive FeNO testing anywhere and at any time. FeNO values are transferred to the app via Bluetooth. In their digital asthma diary,

patients can also document other relevant data such as pollen count or medication. The app's monthly reports can be shared with doctors. In the *FeNO@home* study, doctors and patients confirmed the excellent usability, high adherence, and therapeutic benefits of the Vivatmo system.⁷

Patients' adherence and device handling

Patients were instructed to measure FeNO once a day using the Vivatmo *me*. Similar to drug trials, good adherence was defined as following the instructions on at least 80% of days. 71% of the participants had good adherence according to this definition. Around 80% of all patients rated the device as easy or very easy to learn and use.⁷

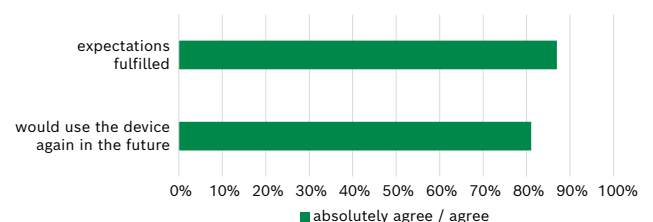
Patients: handling of the device



Doctors' expectations and willingness to use

In 87% of the cases the global expectations of the physicians were either absolutely fulfilled or fulfilled. One of the key expectations from daily FeNO measurements was to assess the suitability of the therapy. 81% of all doctors stated that they would continue to use the device in the future for comparable patients.⁷

Doctors: expectations and willingness to use



⁵ Beeh et al. 2022: Options to control asthma by means of a newly developed FeNO device for use at home [FeNO@home study]. German Clinical Trials Register: DRKS00029118

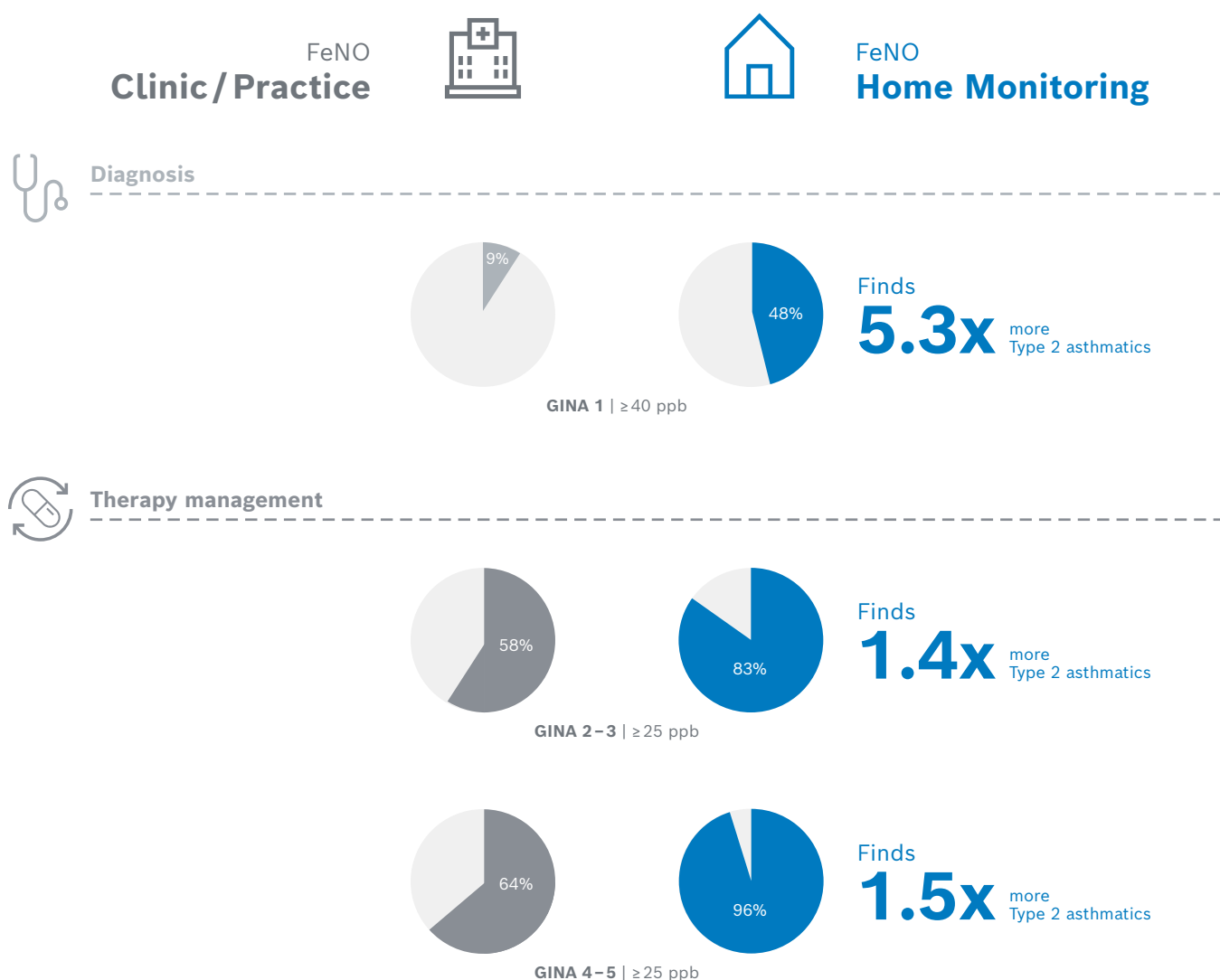
⁶ Powell et al. Lancet 2011; 378:983-990

Improved detection of Type 2 inflammation

FeNO home monitoring provides higher sensitivity

The main cause of asthma is *Type 2 inflammation*. New guidelines underline the value of FeNO levels ≥ 40 – 50 ppb to support an asthma diagnosis.⁸ Once the diagnosis is established, FeNO levels ≥ 25 ppb are indicative of persistent *Type 2 inflammation*. This can usually be well treated with modern anti-inflammatory medication such as ICS and biologics. To use

these drugs effectively, doctors need to know if and to what extent the *Type 2 inflammation* is present. The *FeNO@home* study proves: With regular home monitoring, the sensitivity for detecting both diagnostic FeNO signals (≥ 40 ppb) as well as Type 2 “high” asthmatics (≥ 25 ppb) is significantly better than with sporadic measurement in the doctor’s office.⁷



Sensitivity for Type 2 FeNO “high” as defined in the *FeNO@home* study: Share of patients that exceeded the FeNO thresholds in an office measurement or at least two times in home measurements. Treatment steps according to Global Initiative for Asthma (GINA).

⁷ Beeh et al.: Benefit of daily FeNO measurement in asthmatics over 12 weeks. Poster presented at ERS 2024

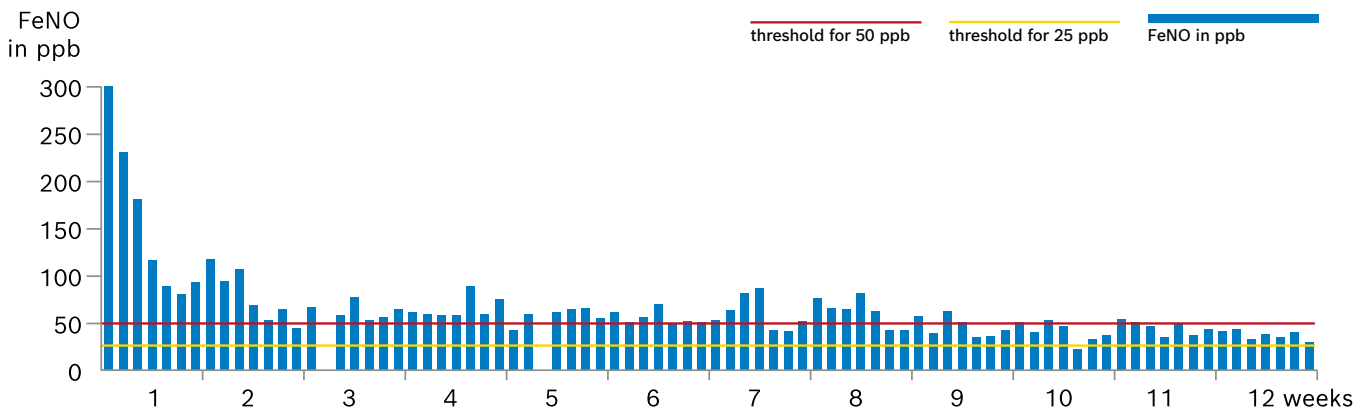
⁸ Louis et al. Eur Respir J 2022 60: 2101585

State-of-the-art monitoring of drug response

FeNO home monitoring quickly shows whether medication is effective

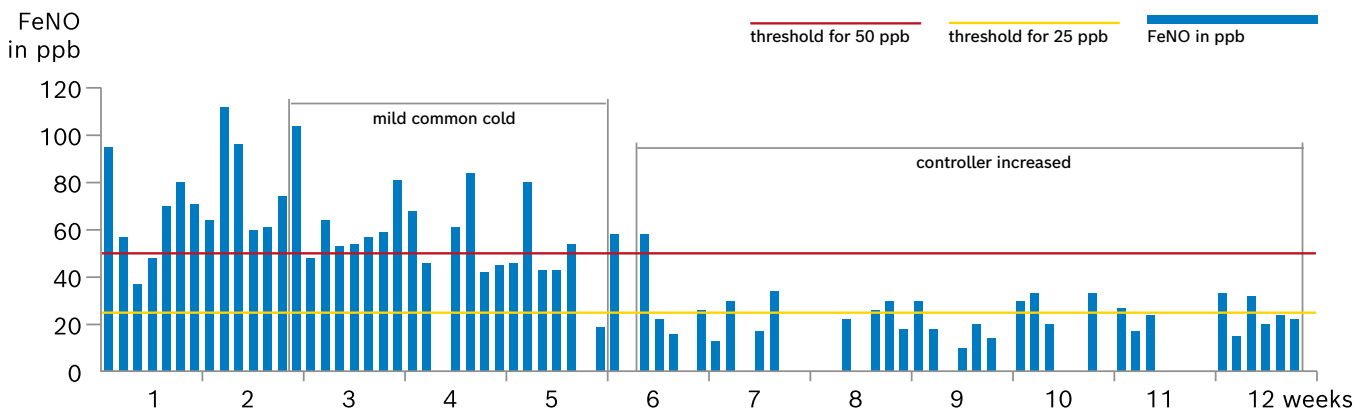
After prescription of ICS or biologics, it is crucial to check whether the patient is responding as intended. FeNO monitoring at home can usually indicate the response to anti-inflammatory drugs in almost real-time.

The *FeNO@home* study provides an illustrative example of a 58-year-old patient with severe asthma: the FeNO values indicate how quickly the newly prescribed biologic (Dupilumab) reduced the inflammation – from over 300 ppb down to the 50 ppb range.⁹



Another case shows a 44-year-old patient with normal lung function. FeNO home monitoring confirmed persistent Type 2 inflammation with elevated FeNO values.

Therefore, the ICS dose was doubled in the middle of the observation period, after which the FeNO values stabilized to within the normal range.⁹



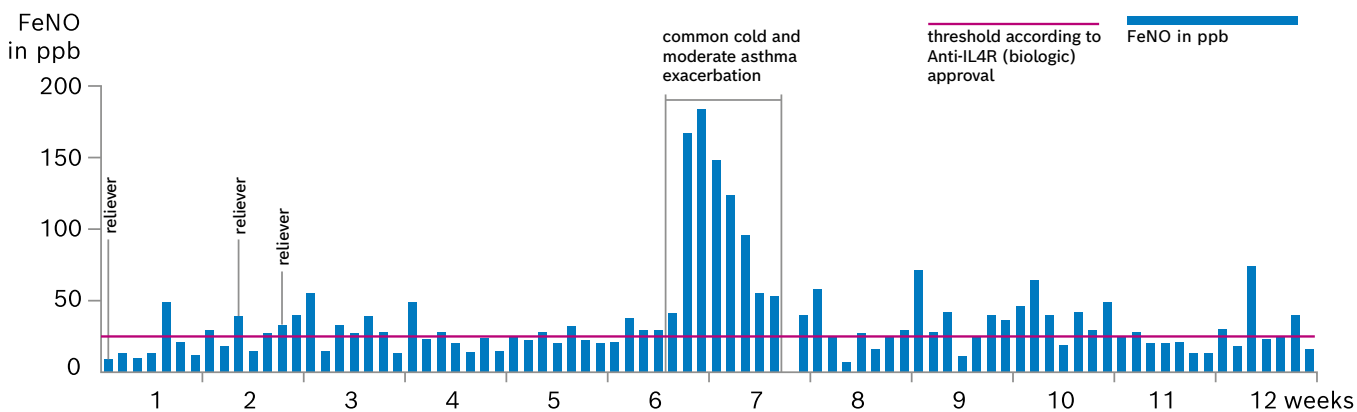
⁹ Individual case report (publication in preparation) from Beeh et al. 2022: Options to control asthma by means of a newly developed FeNO device for use at home [FeNO@home study]. German Clinical Trials Register: DRKS00029118

More precision in biologics selection

FeNO home monitoring supports indication for certain biologics

Home monitoring helps to determine the patient's *Type 2 inflammation* signature. This is relevant for the indication of biologics. In this case of a 55-year-old non-allergic severe asthma patient, no elevated Type 2 inflammatory values were measured in the doctor's

office. These were only revealed during the study through continuous FeNO home monitoring. The evaluation of the results prompted the doctor to select a biologic (Dupilumab) in order to provide the patient with better asthma control in the future.⁹



12-week FeNO course of a study participant (Source: FeNO@home, individual case report)

“ I regard FeNO home monitoring as an invaluable tool in asthma diagnosis, phenotyping, and treatment optimization. It also empowers patients by providing a holistic, objective assessment and enabling trigger identification.

PD Dr. Kai-Michael Beeh

Pulmonologist and asthma expert

Conclusion: FeNO@home study

Clinical benefits of FeNO home monitoring

- ✓ Individual inflammation profile refines diagnosis & therapy
- ✓ Higher sensitivity for Type 2 inflammation
- ✓ Enhanced monitoring of drug response
- ✓ More precision in biologics selection

Practicality of Vivatmo *me*

- ✓ The world's only system for FeNO home monitoring
- ✓ Quick, easy, and non-invasive testing
- ✓ Participants confirmed excellent usability with high adherence



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