# Improved self-management and therapy under exacerbations

## Optimization of therapy and adherence based on daily FeNO home measurement

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## Summary

The case study refers to a participant of the ongoing FeNO@home study. The patient with asthma known since childhood had reported asthma exacerbations in the past. She performed FeNO home measurements over a period of 12 weeks under her usual medication. She was instructed to double her ICS dose in the case of elevated FeNO values and was able to adapt her medication early through FeNO monitoring. **The case illustrates how frequent FeNO home measurements can lead to improved self-management and better individualized asthma treatment.**

## Case history

A 46-year-old woman was diagnosed with asthma in childhood. She is considered as a non-smoker. She has moderate asthma and is allergic to grass and tree pollen, house dust mites and cats. She has known arterial hypertension and atopic dermatitis. Her Asthma Control Test (ACT) score was 22 and her lung function was classified as normal (FEV1 94%). In medical practice, Fractional exhaled Nitric Oxide (FeNO) was found to be low (18 ppb). She received GINA (Global Initiative for Asthma) treatment step 2-3 with Budesonid, Formoterol, and Salbutamol.

**Problem statement**

The patient reported fluctuations and exacerbations in the last year with long-lasting cough after exacerbations despite Maintainer and Reliever Therapy (MART). Regular FeNO measurement could offer the possibility to shorten exacerbations by following the course of the inflammation in the case of an exacerbation, especially in combination with an early increase in medication.

## Investigation

The patient was included in the FeNO@home study[1] outside pollen season. The aim of the study was to investigate whether regular FeNO home measurements had an impact on patient compliance or behavior, variability of FeNO values over a longer period, correlation of FeNO values with symptoms, identification of asthma triggers, and treatment decisions. In this multicenter study, adult patients with diagnosed asthma performed FeNO measurements over a period of 12 weeks using the Vivatmo *me* measurement device for home use. They continued to take their currently prescribed asthma treatment, which could also be adapted. Daily symptoms, use of asthma medication, potential exacerbations, and Peak Expiratory Flow (PEF) were recorded in the device-associated Vivatmo *app*. After 12 weeks, the study ended with a final assessment of asthma control, symptoms, and lung function.

## Results and treatment

During the study, the FeNO levels were considered as relatively low outside exacerbation periods according to the 25-ppb-threshold from the ATS guideline[2]. During exacerbations, the medication was adjusted by the patient according to the instructions of the treating physician. The regular FeNO measurements made it possible to observe an increase in the inflammation marker at the beginning of an exacerbation. After increasing anti-inflammatory medication, the patient was able to observe a decrease in the marker under the care of the treating physician. The lung function at the end of the study period was normal (FEV1: 2,53 l, 83%; FVC: 3,40 l) so was the ACT score (20). Expectations were nevertheless met due to improved self-management by the patient and therapy optimization thanks to regular measurement of FeNO.

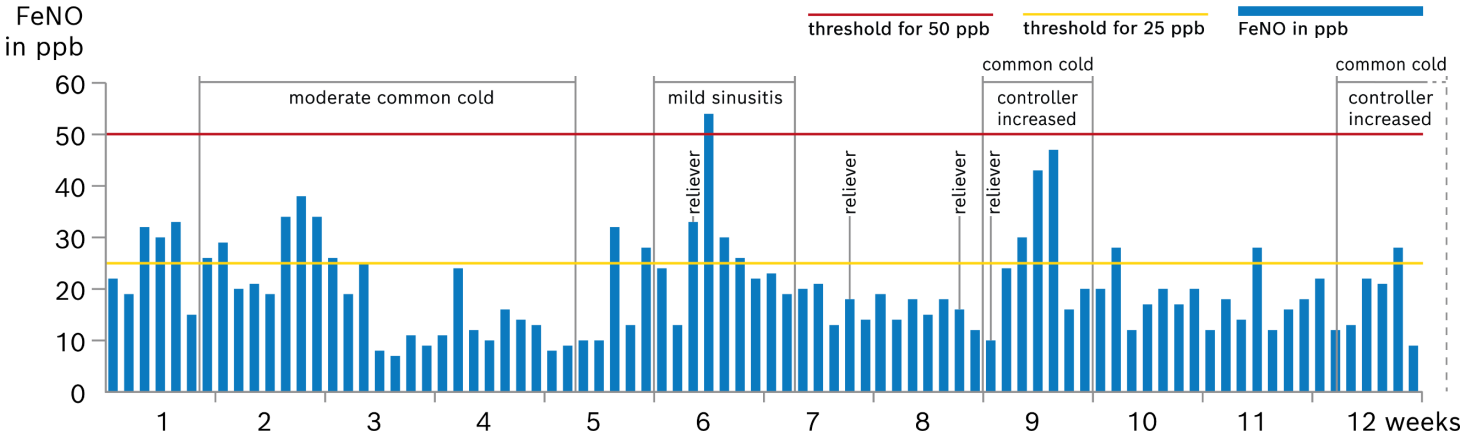


*Figure: Course of the FeNO values based on regular home measurements by patients, thresholds according to ATS guideline[2]*

## Discussion[3-9]

Asthma is known to be a heterogenous disease consisting of multiple overlapping phenotypes driven by different endotypes. Identifying these phenotypes, including the broad definition of Type 2 and Non-type 2 asthma, allows for better understanding of disease mechanisms and the personalization of treatment.[3] Elevated FeNO levels in combination with a clinical history, spirometry, and other biomarkers can aid with asthma diagnosis, predicting responsiveness to ICS, and stratifying therapies in asthma.[4]

Although eosinophil counts in induced sputum or bronchial biopsies are considered as the gold standard for the assessments of Type 2 inflammation, these tests require specific expertise, resources, and do not allow continued monitoring. Consequently, FeNO is an additional indicator of Type 2 inflammation that is noninvasive, repeatable, and safe.

In several studies of FeNO-guided treatment, problems with the design of the intervention and/or control algorithms make comparisons and conclusions difficult. Results of FeNO measurement **at a single point** in time should be interpreted with caution. In a 2016 meta-analysis, FeNO-guided treatment in children and young adults with asthma was associated with a significant reduction in the number of patients with ≥1 exacerbation and in exacerbation rate compared with guidelines-based treatment.[7] Similar differences were seen in comparisons between FeNO-guided treatment and non-guidelines-based algorithms.[7] However, a subsequent good-quality multicenter clinical trial in children with asthma in secondary and primary care centers found that the addition of FeNO to symptom-guided treatment did not reduce severe exacerbations over 12 months.[8] In non-smoking adults with asthma, no significant reduction in the risk of exacerbations and in exacerbation rates was observed with FeNO-guided treatment, compared with a treatment strategy similar to that in most guidelines.[4] In adults and in children, no significant differences were seen in symptoms or ICS dose with FeNO-guided treatment compared with other present strategies.[7,9]

The distinctive characteristic of the study is that the measurements are carried out daily at the patients' homes. The patients were trained in the use of the device upon study inclusion. The course of FeNO values was evaluated after 12 weeks based on the instructions of the treating physician. Asthma therapy could be adjusted at two intermediate contacts or as in this case by the patient herself. The use of a measurement device for home use in this clinical study allowed for continuous FeNO monitoring and may open a new possibility of personalized medicine.

These are some preliminary results since the study is still ongoing. Thus, only a single patient case is reported. The completion of the study is needed to strengthen the beneficial effects of FeNO home measurement for physicians and asthma patients.

## Conclusion

Overall, the patient can be considered as a relevant example for beneficial FeNO home measurements. Single cross-sectional practice observations may underestimate the prevalence of Type 2 inflammation in asthmatics, especially during stable disease phases. This has implications for the choice of optimal treatment. This case illustrates how frequent FeNO home measurements can help to confirm the beginning of an asthma exacerbation ultimately leading to truly individualized treatment decisions. Measured on a regular basis, FeNO can act as a visible inflammation marker for the patient. This might lead to higher compliance with medication and improved self-management for the patient. The example showcases the benefits of regular FeNO home measurements.

## References

1 This clinical trial was prospectively registered on 01.07.2022 in the German Register of Clinical Trials (DRKS: DRKS00029118); Accessed July 25, 2023 at: https://drks.de/search/de/trial/DRKS00029118
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