The Use of FeNO in Children: Aligning with BTS/NICE/SIGN & GINA Asthma Guidelines NHS Surrey Heartlands ICB

Suzanne Bailey, ICS CYP Clinical Respiratory Lead/Senior Specialist CYP Asthma Practitioner

Lisa Cook, Specialist CYP Asthma Practitioner

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Introduction

- We are:

Surrey Heartlands CYP Asthma Team
'Beating Asthma Together'

Team members are:

Suzanne Bailey – ICS CYP Clinical Respiratory Lead/Senior Specialist CYP Asthma Practitioner – suzanne.bailey5@nhs.net

Specialist CYP Asthma Practitioner – Lisa Cook – lisa.cook40@nhs.net

Charlotte Arnold and Julia Newman – CYP Long Term Conditions Transformation Leads

Project Manager: Kayode Arokodare – kay.arokodare@nhs.net

Keeping an eye on us and the budget are Fiona Whitaker and Kylie Langridge, and we also have support from Nicola Mundy from Surrey County Council

Team email address: syheartlands.childrensasthma@nhs.net

Introduction

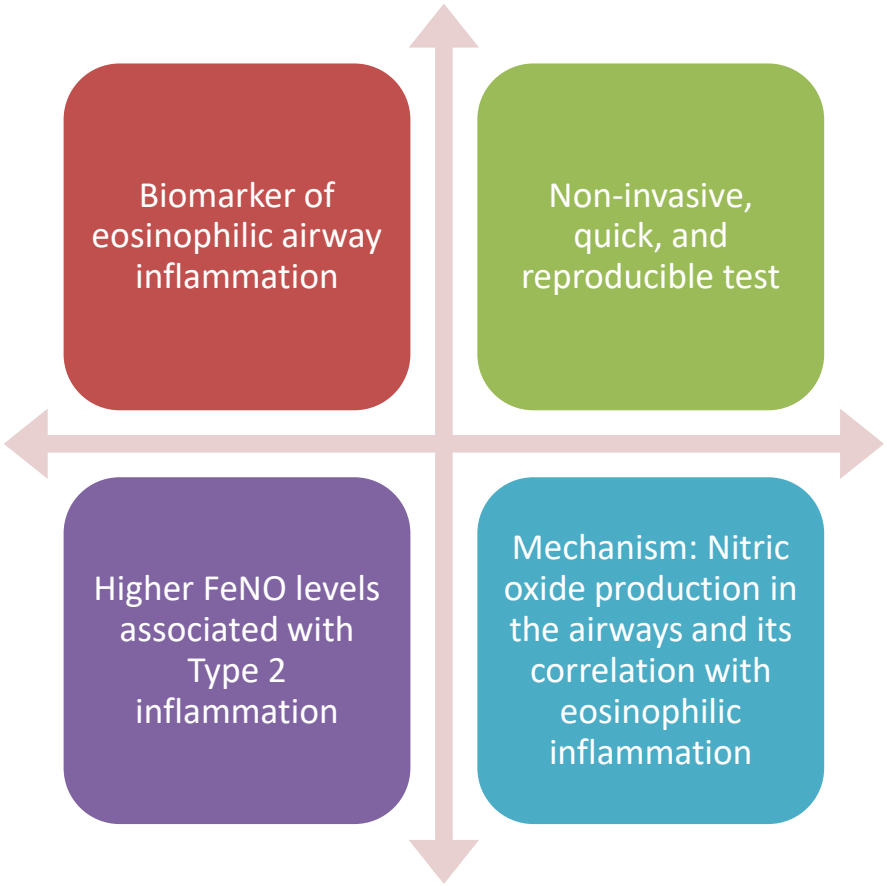
Overview of FeNO (Fractional Exhaled Nitric Oxide)

Importance in paediatric asthma diagnosis and management

Purpose of the session: Understanding FeNO's role and aligning with new guidelines

Comparative perspectives from BTS/NICE/SIGN and GINA guidelines

What is FeNO? (Fractional Exhaled Nitric Oxide)



Types of Asthma (Extrinsic- type 2 and Intrinsic – type 1)

Type 1 inflammation in asthma is characterized by an immune response that involves the activation of T-helper cells (specifically Th1 cells) and the release of pro-inflammatory cytokines like interferon-gamma (IFN-γ). This type of inflammation tends to be more associated with non-allergic asthma, where the immune system reacts to infections or irritants in the airways, leading to airway constriction, increased mucus production, and inflammation. More common in adults.

Unlike type 2 inflammation, which is driven by eosinophils and is more commonly seen in allergic asthma, type 1 inflammation is more typically seen in conditions like viral infections and can contribute to airway remodeling and persistent symptoms in asthma.

Understanding Type 2 Inflammation in Asthma

Type 2 inflammation is a key driver of asthma in many children

Characterised by elevated eosinophils, IL-4, IL-5, and IL-13 cytokines

Leads to airway hyperresponsiveness, mucus production, and inflammation

Associated with corticosteroid responsiveness and targeted biologic therapies

The New BTS/NICE/SIGN Asthma Guidelines

OVERVIEW OF THE UPDATED RECOMMENDATIONS (2024)

EMPHASIS ON OBJECTIVE TESTING, INCLUDING FENO, FOR ASTHMA DIAGNOSIS

INTEGRATION OF FENO WITH SPIROMETRY AND BRONCHODILATOR REVERSIBILITY

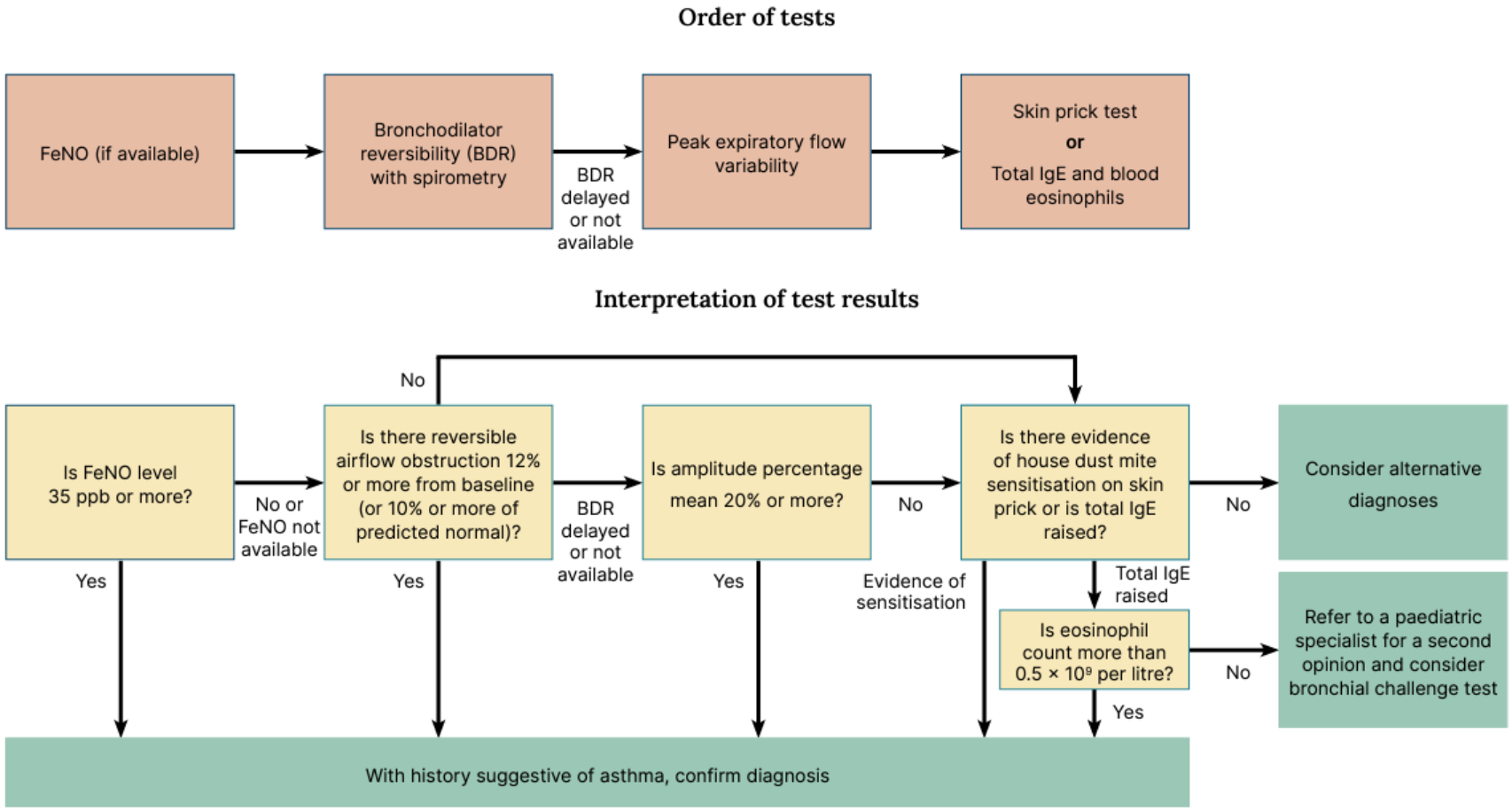
POSITIONING FENO WITHIN PRIMARY AND SECONDARY CARE SETTINGS

Summary of Asthma Diagnosis in Children Aged 5 to 16

- **Objective tests for diagnosing asthma (BTS/NICE/SIGN 2024):**
- **FeNO Testing** – Diagnose asthma if FeNO level **≥ 35 ppb**.
- **Spirometry with Bronchodilator Reversibility (BDR)** – If FeNO is not raised or unavailable, diagnose asthma if:
  - **FEV1 increases by ≥ 12% from baseline** or
  - **FEV1 increases by ≥ 10% of predicted normal FEV1**.
- **Peak Expiratory Flow (PEF) Variability** – If spirometry is unavailable or delayed, diagnose asthma if **PEF variability ≥ 20% over 2 weeks**.
- **Additional Tests if Asthma is Still Suspected**:
  - Perform **skin prick test** for house dust mite OR
  - Measure **total IgE and blood eosinophil count**.
  - **Diagnose asthma** if there is sensitisation OR total IgE is raised AND eosinophils **> 0.5 x 10^9/L**.
  - **Exclude asthma** if no sensitisation and total IgE is normal.
- **Referral to Specialist** – If uncertainty remains, refer to a paediatric specialist for further assessment (e.g., bronchial challenge test).

Algorithm B: Objective tests for diagnosing asthma in children aged 5 to 16 with a history suggesting asthma

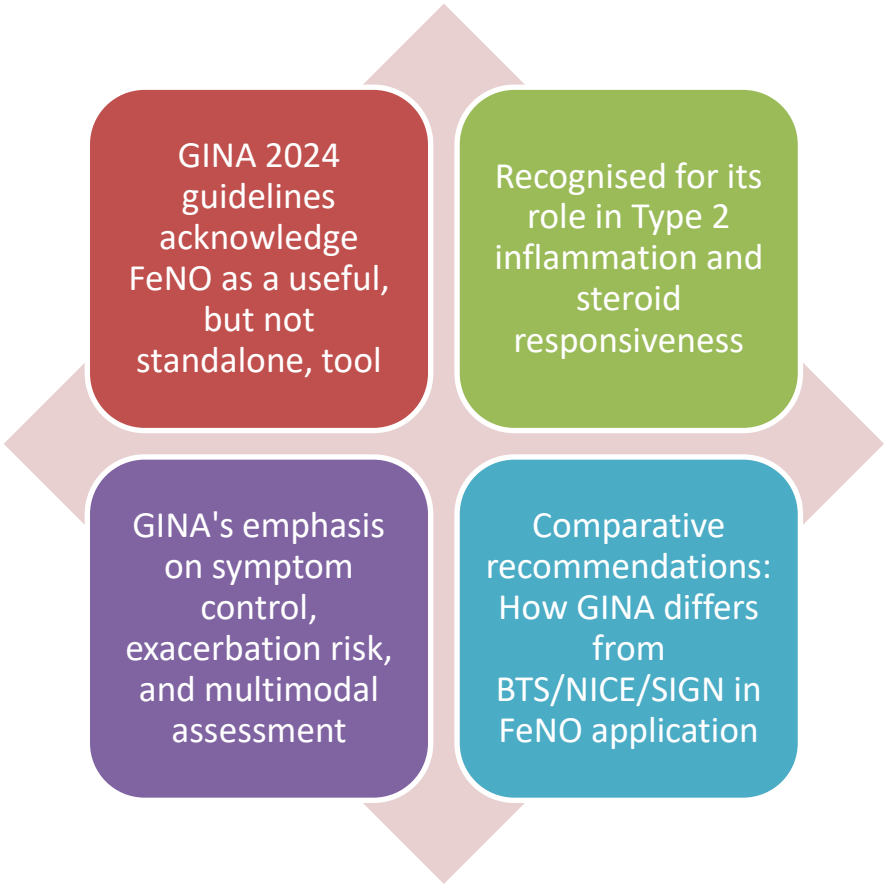
BTS, NICE and SIGN guideline on asthma



British Thoracic Society NICE National Institute for Health and Care Excellence Healthcare Improvement Scotland SIGN

BTS ISBN: 978-1-917619-27-1. NICE ISBN: 978-1-4731-6638-7. SIGN ISBN: 978-1-909103-96-2.

The GINA Perspective on FeNO



GINA & FeNO

The document discusses the role of fractional concentration of exhaled nitric oxide (FeNO) in asthma management. [1] FeNO is modestly associated with levels of sputum and blood eosinophils, but this association is lost in obesity. [2] It has not been established as useful for ruling in or ruling out a diagnosis of asthma because it is elevated in some asthma phenotypes and non-asthma conditions, and it is not elevated in others. [3] FeNO is lower in smokers and during bronchoconstriction and the early phases of allergic response. [2] The main role of FeNO in clinical practice is to help guide treatment decisions in patients with severe asthma, with mixed results in studies regarding its effectiveness in reducing exacerbations. [4] Additionally, FeNO is a useful biomarker for assessing airway inflammation in asthma and can be measured in young children with tidal breathing. [5] Elevated FeNO levels in preschool children with recurrent coughing and wheezing can predict physician-diagnosed asthma at school age and increase the odds for wheezing, asthma, and ICS use by school age. [5] However, FeNO measurement is not widely available for most children in this age group and remains primarily a research tool. [6]

When to Use FeNO in Children

Recommended for children (aged 5+) when asthma is suspected

Part of a comprehensive diagnostic pathway alongside history, symptoms, and lung function tests

Used to support diagnosis in uncertain cases

FeNO in differential diagnosis: distinguishing asthma from other respiratory conditions

FeNO Cut-off Values and Interpretation

- Normal FeNO levels (<20 ppb) – Low probability of eosinophilic inflammation
- Intermediate levels (20–35 ppb) – Consider in clinical context
- High levels (>35 ppb) – Suggestive of Type 2 inflammation and steroid responsiveness
- GINA's approach to FeNO thresholds and interpretation

FeNO in Ongoing Asthma Management

FeNO as a predictor of corticosteroid response

Role in monitoring adherence and disease control

Utility in step-up and step-down treatment decisions

BTS/NICE/SIGN vs GINA: How guidelines use FeNO to guide therapy

Advantages and Limitations of FeNO

- Advantages: Quick, non-invasive, useful in diagnosis and management
- Limitations: Affected by age, atopy, infections, and environmental factors
- Should not be used in isolation but as part of a broader assessment
- GINA's cautionary approach: Situations where FeNO should not be relied upon

FeNO in Primary vs Secondary Care

FeNO access in different healthcare settings

Primary care: FeNO as an additional tool where available

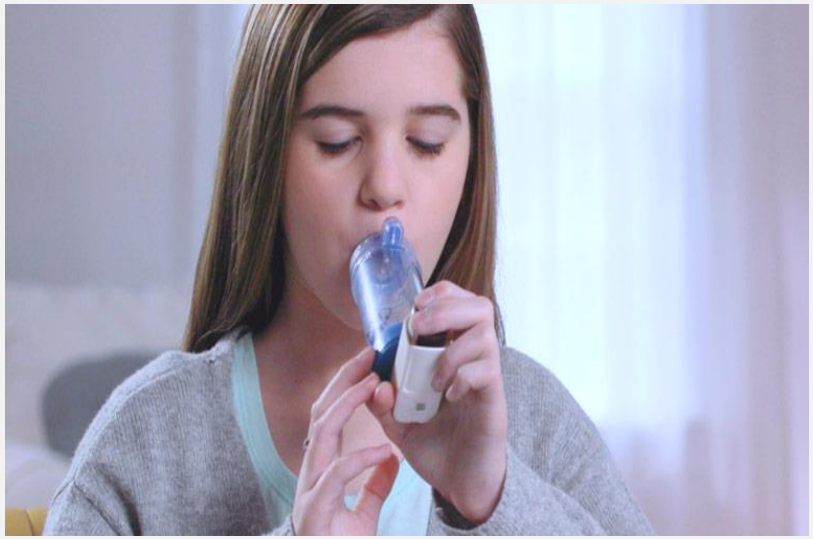
Secondary care: More routine use in complex cases

Practical implementation in NHS settings

Practical Demonstration

15-year-old girl

- Asthma diagnosis
- Currently mild symptoms of intermittent wheeze, coughing at night which keeps her awake *(high risk of asthma attack)*
- Significant eczema *(atopic – high risk)*
- Hay fever and triggered by respiratory infections, dust, exercise, cold air, pollution, emotion.
- Has gastro symptoms when eating seafood such as prawns *(needs further investigation, ? At risk of anaphylaxis)*
- No hospital admissions
- Prescribed with preventer (clenil) but has not used since Jan as mum said lost when they moved house *(increased risk of asthma attack)*
- Uses salbutamol frequently with *poor technique* – no spacer
- Occasional anti-histamines

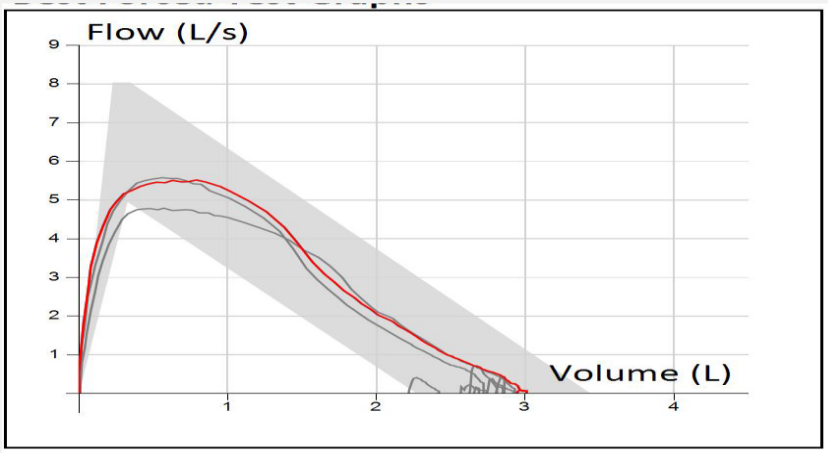


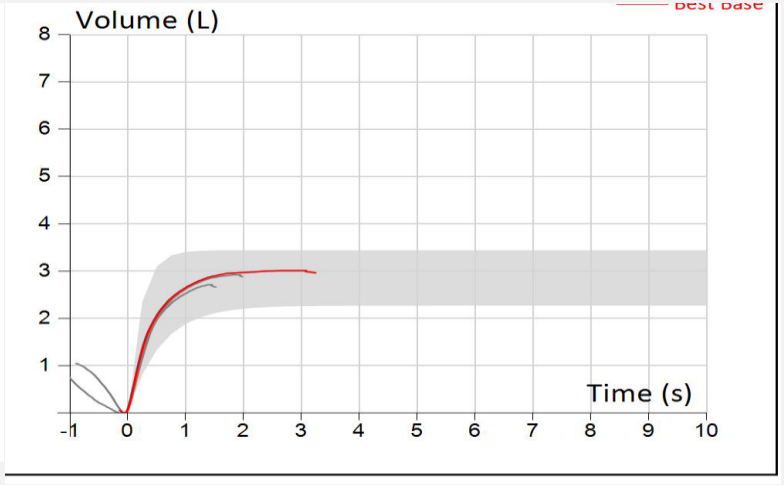
Family and Social History

Family history *(strong)*	Mum – asthma	3 siblings – asthma and eczema	**Social history**
A rabbit that lives outside *(potential trigger)*	No smokers or vapers – says she has not tried either	Good attendance at school	No concerns with damp/mould in the home
	Home air quality – 50, School – 50	Level of deprivation – 8	

Tests & Examination

- Spirometry – poor technique as could not take a big breath in probably due to symptoms
- FEV1/FVC 88, LLN 83, FVC 3.03, FEV1 2.67, PEF 332 – did not bring inhaler so could not do reversibility (inconclusive)
- FeNO – 149 (very high)
- Asthma Control Test – 14 – (shows poorly controlled asthma)
- Auscultation – Mild wheeze





Actions

- Atopic ++ Possible food allergies
- Strong family history
- Very high FeNO
- Considered oral steroids but…
- Trial of treatment with preventer (clenil 100mcg) bd via blue aerochamber – rinse mouth and spit after use.
- Education given to child on what asthma is and what each inhaler does using model airways
- Inhaler technique demonstrated, observed and understood
- Based on the education child understood why twice daily use of preventer was important even when well and why proper inhaler technique was vital.
- Asthma action plan given and explained to child in detail. Family advised to take plan to school for them to make a copy.
- Review in 6-8 weeks for repeat spirometry and FeNO, and review

Practical Considerations for Implementing FeNO

Training and Info Links

Asthma (Children and young people) - elearning for healthcare

FeNO in Asthma - elearning for healthcare

Surrey Heartlands CYP Asthma - Beating Asthma Together - FutureNHS Collaboration Platform

Summary and Key Takeaways

FeNO is a valuable tool in asthma diagnosis and management

Should be used alongside clinical assessment and other objective tests

BTS/NICE/SIGN recommend FeNO as part of a structured approach

GINA's approach acknowledges FeNO but integrates broader symptom-based management

References


BTS/SIGN/NICE ASTHMA GUIDELINE (2024)
GLOBAL INITIATIVE FOR ASTHMA (GINA) GUIDELINES (2024)
NICE GUIDELINE NG80: ASTHMA: DIAGNOSIS, MONITORING AND CHRONIC ASTHMA MANAGEMENT (UPDATED 2024)
AMERICAN THORACIC SOCIETY (ATS) GUIDELINES ON EXHALED NITRIC OXIDE

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Q&A

Email addresses:

suzanne.bailey5@nhs.net

lisa.cook40@nhs.net

syheartlandsicb.childrensasthma@nhs.net