Paediatric Respiratory Physiology Service Development: Implementation of Multiple Breath Washout (MBW) Service

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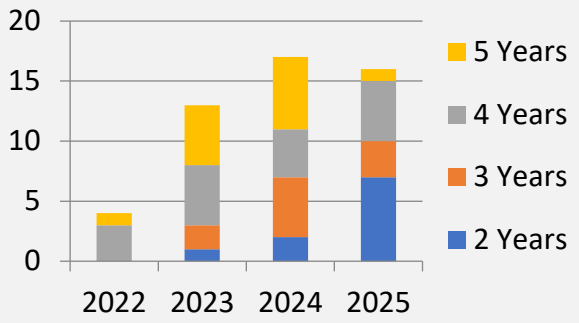
BACKGROUND

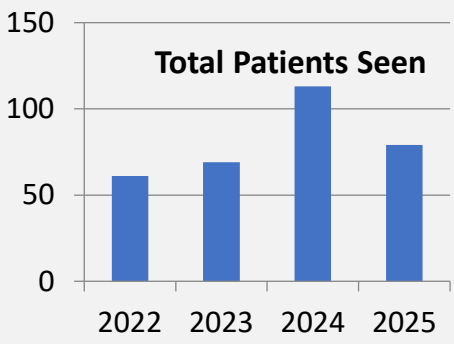
Multiple Breath Washout (MBW) is a sensitive lung function test that assesses ventilation inhomogeneity through measurement of the Lung Clearance Index (LCI). Widely used in research, its use in routine clinical practice remains limited. Through charitable funding from Edinburgh Children's Hospital Charity, our service became the first paediatric centre in Scotland to introduce MBW as a clinical diagnostic tool. LCI can detect early airway disease before abnormalities are evident on spirometry and is particularly suited to young children as it requires only tidal breathing, making it largely effort-independent unlike spirometry.

SERVICE DEVELOPMENT

2022: Service launched (6–16 years)
2023: Expanded to ≥3 years
Late 2023: Expanded to ≥2 years
2024: Added to CF annual review.
Expanded to use in Asthma, Bronchiectasis & Primary Ciliary Dyskinesia

MBW Pre-School Expansion in 2-5 years





Expansion has enabled objective assessment of lung function in a population for whom spirometry is often not feasible or reliable.

What Next?
Use LCI to monitor patients by trending data
Monitor LCI in in CF patients without modulator access
To produce a local reference range

CLINICAL IMPACT

Early Detection
Normal Spirometry → Elevated LCI
→ Clinical Review → Targeted Intervention

Monitoring ETI (elexacaftor/tezacaftor/ivacaftor) CFTR Modulator Response
Pre-ETI LCI → ETI → Post-ETI LCI → Objective Response

Benefits
- Earlier assessment
- Response monitoring
- Reduced uncertainty
- Better treatment decisions
- Reduced treatment burden

MBW has transformed respiratory surveillance by enabling earlier detection of lung disease, objective assessment of treatment response and evidence-based clinical decision making in children with CF and other chronic respiratory diseases.

CASE STUDY 1: ETI RESPONSE MONITORING

3-year-old girl with CF
- Elevated baseline LCI despite clinical stability.
- Significant improvement following ETI therapy
- Further improvement after 12 months
- Objective longitudinal monitoring

CASE STUDY 2: AVOIDING TREATMENT ESCALATION

5-year-old boy with CF
- Elevated LCI with unreliable spirometry
- Nebulised therapy considered
- Significant improvement following ETI
- Treatment escalation avoided
- Reduced treatment burden