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## **Project Fizzyo: Identification of optimal pressure-length breath profiles for airway clearance techniques in children with cystic fibrosis**

**Intro** Airway clearance techniques (ACTs) are the most burdensome therapies for people with cystic fibrosis (CF). Effects of different techniques on clinical outcomes are unknown.

**Aim** Identify combinations of ACT breath pressure and length that are associated with improved FEV<sub>1</sub>%predicted in children with CF.

**Methods** Expired breaths from 145 children with CF using positive expiratory pressure (PEP) or Oscillating PEP (OPEP) devices during habitual ACTs were captured over 16 months. Treatment data were summarised into mean mid-expiratory breath pressure and breath length. ACT efficacy was investigated by iteratively comparing the effect on FEV<sub>1</sub> of all possible combinations of pressure and length against weeks with no ACTs using linear mixed effects regression models, where weekly FEV<sub>1</sub> was extrapolated for each participant using flexible polynomials fitted to observed FEV<sub>1</sub> data (n=1116).

**Results** ~45K treatments (137 people, ~4M breaths) and ~21K "no ACT" days (145 people) were analysed. Compared to no treatment, a significant positive association with FEV<sub>1</sub> was observed for 3 breath profiles (32% of treatments)(Table). Breaths outside these 3 profiles had no effect.

**Conclusions** Pressure-length breath profiles other than those normally prescribed may be facilitated by different ACT devices and may result in benefit.

Table. Breath profiles associated with improved FEV<sub>1</sub>%predicted

Profile	Pressure (cmH <sub>2</sub> O)	Length in relation to age appropriate norm	Participants/ACT treatments	Proportion of PEP/OPEP ACT devices	Mean age (y)
A (standard prescription)	5-25	slightly long	80/9353	53/47	10.9
B	10-15	very long	30/606	89/11	11.3
C	40-65	very short	40/1126	0/100	9.5