
Proceedings Paper:
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Understanding longitudinal changes in %FEV1 variability and its role as an indicator of care quality among adults with cystic fibrosis

Background:

Cystic fibrosis (CF) is a long-term condition whereby regular nebulised medications are needed to maintain lung health. %FEV1 decline is traditionally used to indicate lung health, but it is relatively insensitive. %FEV1 decline tended to be preceded by %FEV1 variability, suggesting that it is potentially a more sensitive outcome measure. Given the consistent improvement in nebuliser adherence in Sheffield from 2013-2016, we hypothesised that %FEV1 variability would decrease over time.

Aim:

To determine the year-by-year change in %FEV1 variability in the Sheffield Adult CF Centre from 2013-2016

Methods:

FEV1 and other clinical data were retrospectively collected from every adult with CF receiving care in Sheffield from 2013-2016, excluding those who had lung transplantation or on ivacaftor. I-neb nebuliser data were used to calculate normative adherence.[1] %FEV1 was calculated using the GLI-2012 equation. %FEV1 variability was calculated as 'median deviation',[2] then categorised into 'high' (exceeds the ESCF 75th centile) vs 'low' (within the ESCF 75th centile). Due to non-normal distribution and presence of outliers, non-parametric methods were used for the summary measures and longitudinal comparisons.

Results:

208 unique adults with CF provided data for this analysis. Nebuliser adherence increased consistently from 2013 (median 32.8%, IQR 14.5 to 58.1%) to 2016 (median 49.6%, IQR 21.9 to 68.9%), Friedman test p-value 0.004. The rate of %FEV1 decline slowed considerably from 2014-2015 (median -0.90%, IQR -3.25 to 1.46%) to 2015-2016 (median -0.32%, IQR -2.87 to 1.76%). This was preceded by a considerable drop in the proportion of people with high %FEV1 variability from 2014 (61/162, 37.7%) to 2015 (54/174, 31.0%). Results were summarised in Table 1.

Conclusion:

These results highlight the potential of using %FEV1 variability to detect improvement in care quality before changes in %FEV1 decline are detected. Further studies are needed to better understand the factors that influence %FEV1 variability and determine the generalisability of these finding.

References:

1. Hoo ZH, et al. Patient Prefer Adherence 2016;10:887-900.
2. Morgan WJ, et al. J Pediatr 2016;169:116-21.

Table1: Summary of 2013-2016 findings

	2013 (n = 166)	**2014** (n = 170)	**2015** (n = 185)	**2016** (n = 186)	**P-value**
People on I-neb, n (%)	89 (53.6)	97 (57.1)	104 (56.2)	102 (54.8)	
% Adherence, median (IQR)	32.8 (14.5 – 58.1)	39.6 (14.6 – 65.4)	42.9 (18.6 – 73.8)	49.6 (21.9 – 68.9)	0.004 †
Annual intravenous antibiotics day, median (IQR)	14 (0 – 35)	14 (0 – 28)	14 (0 – 35)	14 (0 – 40)	0.001†
BMI in kg/m^2, median (IQR)	22.3 (19.7 – 24.6)	22.7 (20.0 – 25.0)	23.0 (20.3 – 26.0)	23.2 (20.4 – 26.0)	<0.001†
% FEV1, median (IQR)	78.7 (54.1 – 92.5)	76.6 (54.4 – 89.7)	77.8 (60.4 – 89.0)	78.5 (58.5 – 89.6)	<0.001†
% FEV_1 variability	(n = 161)	(n = 162)	(n = 174)	(n = 178)	
Median (IQR)	5.0 (2.7 – 8.5)	4.8 (2.8 – 7.5)	4.4 (2.6 – 7.1)	4.2 (2.5 – 7.0)	0.915†
People exceeding 75th centile, (%)	61 (37.9)	61 (37.7)	54 (31.0)	53 (29.8)	0.418‡
Annual %FEV_1 change		(n = 158)	(n = 162)	(n = 176)	
Median (IQR)		–1.09 (–4.58 to 1.49)	–0.90 (–3.25 to 1.46)	–0.32 (–2.87 to 1.76)	0.135†
People with decline >2%, (%)		69 (43.7)	63 (38.9)	56 (31.8)	0.139‡

† Friedman test ‡ Cochran's Q test