

Use of the lung flute for sputum induction in children with cystic fibrosis: a pilot study

Introduction

It is important to obtain sputum samples from children with cystic fibrosis (CF) on a regular basis

The majority of children that attend outpatient CF clinics are non-productive of sputum

The lung flute is designed to mobilise sputum from the airways by transmitting acoustic waves (16-22Hz) and PEP (1-2.5cmH₂O) through the tracheobronchial tree on exhalation

The lung flute has been shown to be useful in obtaining sputum samples in non-expectorating adults with suspected pulmonary tuberculosis

Aim

To assess the effectiveness of the lung flute in obtaining a sputum sample from children with cystic fibrosis (CF) that are unable to produce a sample with coughing alone

To assess ease of use of the lung flute

Method

Consecutive children with CF attending an outpatient clinic

Known ability to expectorate sputum

Unable to provide a sputum sample with vigorous coughing alone on day of study

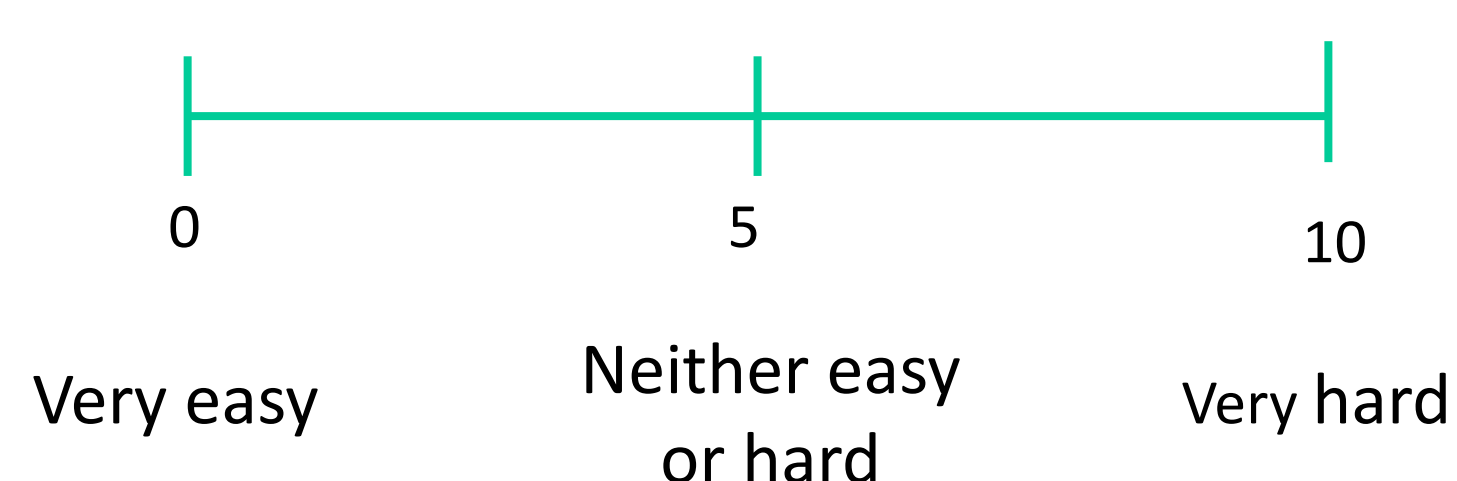
Outcomes

Production of a sputum sample as assessed by presence of a macroscopic sputum plug

Sputum microbiology

Ease of use of the device on visual analogue scale

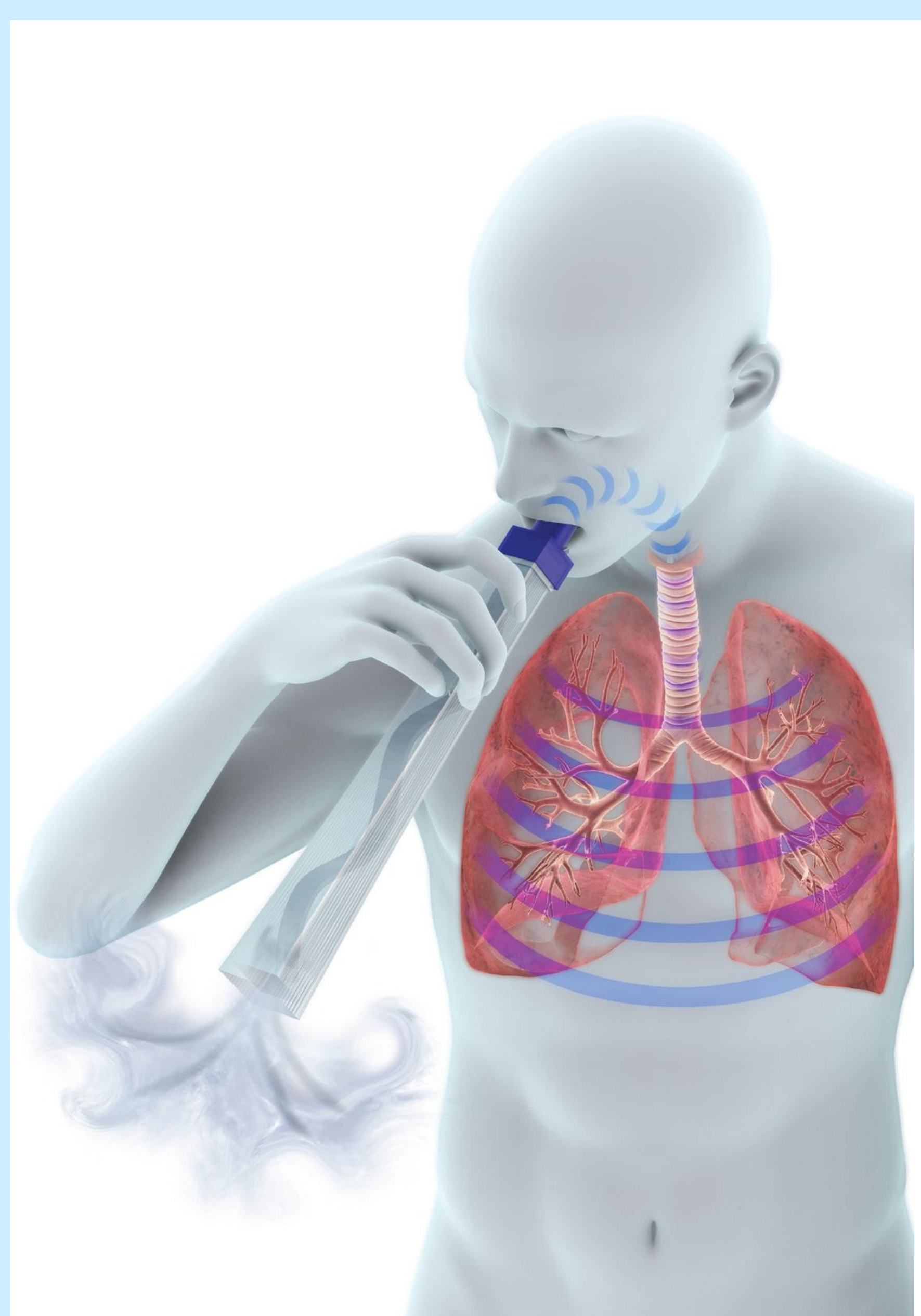
How easy was the lung flute to use – place a mark on the line



Diagnostic Lung Flute

Instructions for use

1. Sit with back straight and head tilted slightly forward
2. Inhale a little deeper than normal
3. Blow out through the Lung Flute with the same amount of force as you would use to blow out a candle
4. Remove mouthpiece and take a quick breath in
5. Replace the mouthpiece and blow out again.
6. Remove device and wait 5 seconds while taking a couple of normal breaths
7. Repeat 20 sets of two exhalations each
8. Wait 5 minutes and then start to cough vigorously and attempt to expectorate mucus



Results

25 children each used the device on two separate clinic visits

15 males, mean age 12 (range 6-17), mean FEV₁ 90% (range 61-132%)

A sputum sample was obtained on 26/50 (52%) occasions

A sample was obtained on 9/33 (27%) occasions when a child's cough was **dry** and non-productive

A sample was obtained on 17/17 (100%) occasions when a child's cough was **moist** and non-productive

24/26 samples yielded a positive culture result for at least one known CF pathogen

Bacterial pathogen	Number of samples bacteria isolated in
<i>staphylococcus aureus</i>	14
<i>pseudomonas aeruginosa</i>	13
<i>haemophilus influenzae</i>	3
<i>stentrophomonas maltophilia</i>	2
MRSA	1

Further Results:

Outcome	Median (range)
Ease of use on 10-point VAS	1 (0-5)
Sputum volume obtained	0.5ml (0.1-1.0ml)
Time taken to obtain sample	10 min (2-14min)

Conclusion

The lung flute appears to be a clinically useful and easy device to use for sputum induction in children with CF

Further research comparing the lung flute to other sputum induction methods in children with CF is warranted

Acknowledgements

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