

1 **Web-only supplement**

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3 **Lessons learned from a randomized trial of airway secretion clearance techniques in cystic**

4 **fibrosis**

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6 Marci K. Sontag Ph.D. , Alexandra L. Quittner, Ph.D. , Avani C. Modi, Ph.D. , Don Giles, Joni

7 M. Koenig, B.S. , Christopher M. Oermann, M.D. , Michael W. Konstan, M.D. , Robert Castile,

8 M.D., Frank J. Accurso, M.D

1 **Methods**

2 The 17 Treatment Satisfaction Survey (TSS) questions were summarized into 4 domains:
3 effectiveness, convenience, comfort, and overall satisfaction; mean satisfaction scores were
4 derived, as described elsewhere.^{E1} Results from the 12 domains of the Cystic Fibrosis
5 Questionnaire (CFQ) Teen/Adult (48 items for teens 14 years or older) and CFQ-Child (36 items
6 for children 7 to 13 years) measures were pooled for analyses, as previously published.^{E2,3}
7 Response choices generally included ratings of frequency and difficulty on a 4-point scale
8 (1=always to 4=never; 1=a lot of difficulty to 4=no difficulty) or true/false responses (1=very
9 true to 4=very false). Scores were standardized on a 0-100-point scale, with higher scores
10 representing better quality of life.

11 The Daily Phone Diary (DPD) was administered every 4 months, and was quantified as
12 the percent of prescribed treatment time reported during each 24 hour period surveyed, limited to
13 100%.^{4,5} The DPD, an evidence-based assessment of adherence⁶, uses a cued recall procedure to
14 track participants through their activities in a 24 hour period prior to the phone call. The calls
15 were made by independent interviewers in a centralized office. Data were collected on the DPD
16 for the first 5 assessments, spaced approximately 4 months apart. Collection of data from the
17 DPD was sparse after the 5th assessment as the study was discontinued before many subjects
18 reached the 6th assessment.

1 **Training instructions provided to sites for each airway clearance technique**

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3 **PD&P**

4 Each of the six positions are to be clapped or vibrated for 4 minutes. After each position the
5 patient is to do three forced expiratory techniques (FET) and cough, continue with FET and
6 coughing until all mobilized mucus has been cleared. All nebulizer treatments will be done as
7 directed by the investigator.

8

- 9 1. Posterior apical segments of right and left upper lobes: Patient sitting up leaning forward
10 on a pillow.
- 11 2. Superior and inferior segments of lingula: Patient one quarter turn from supine with left
12 side up lying on wedge.
- 13 3. Medial and lateral segments of right middle lobe: Patient one quarter turn from supine
14 with right side up lying on wedge.
- 15 4. Lateral segment of right lower lobe: Patient directly on left side with right side up lying
16 on wedge.
- 17 5. Lateral segment of left lower lobe and medial (cardiac) segment of right lower lobe:
18 Patient directly on right side, with left side up lying on wedge.
- 19 6. Posterior basal segments of right and left lower lobes: Patient prone lying on wedge

20 **OPEP Treatment**

21 Patient is to sit in a chair with their back straight and chin slightly elevated. Proper angle
22 of the device is important. The patient should start out with the stem parallel to the floor,
23 experiment with the angle of the device, for best results use the angle that provides the strongest

1 fluttering sensation in the chest. Patients are to keep the cheeks stiff, (they may need to hold
2 their cheeks with their hands). Flutter treatments should be done for 20 minutes. All nebulizer
3 treatments will be done as directed by the investigator.

4 **Stage 1 loosening and mobilization breaths:**

5 Inhale slowly, to about 3/4 total lung capacity (TLC), hold the breath for 2-3 seconds,
6 exhale at a reasonably fast but not to forced rate (exhalation should be balanced to provide the
7 most amount of fluttering felt within the chest).

8 Repeat step one 6-12 times (depends on patient and how quickly mucus is mobilized).

9 Patients should be encouraged to suppress their need to cough until all loosening breaths
10 have been completed.

11 **Stage 2 mucus mobilization and expectoration:**

12 Inhale slowly to TLC, hold the breath for 2-3 seconds, and then forcefully exhale as
13 completely as is comfortable, repeat 1-2 times. If mucus is not coughed out following 2 breaths,
14 have the patient do 2-3 FET followed by coughing.

15 Continue with the above two steps until all loosened mucus had been cleared. Stage one
16 and two are repeated for 20 minutes.

17

18 **HFCWO**

19 Each frequency will be done for five minutes with deep breathing to total lung capacity
20 (TLC) every two minutes, pressure will remain constant at 6. After each cycle three FET will be
21 done followed by a cough, continue with FET and coughing until all mobilized mucus has been
22 cleared. The patient may be in semi-fowlers, sitting, or standing throughout the entire vest
23 treatment. Bronchodilator treatments may be started with the first cycle and continued (turning

1 off nebulizer while coughing) until finished, all other nebulizer treatments will be done as
2 directed by the investigator.

3 1. Frequency 10 for 5 minutes with TLC breaths every 2 minutes, followed by 3 FET and
4 coughing, continue with FET and coughing until clear.

5 2. Frequency 12 for 5 minutes with TLC breaths every 2 minutes. followed by 3 FET and
6 coughing, continue with FET and coughing until clear.

7 3. Frequency 13 for 5 minutes with TLC breaths every 2 minutes. followed by 3 FET and
8 coughing, continue with FET and coughing until clear.

9 4. Frequency 14 for 5 minutes with TLC breaths every 2 minutes. followed by 3 FET and
10 coughing, continue with FET and coughing until clear.

11 Alternative settings to be used if patients report that no mucus is expectorated at the end
12 of the 5 minute settings.

13 Frequency 12 for 10 minutes with TLC breathing every 2 minutes, followed by 3 FETs
14 and coughing, continue with FETs and coughing until clear.

15 Frequency 14 for 10 minutes with TLC breathing every 2 minutes, followed by 3 FETs
16 and coughing, continue with FETs and coughing until clear.

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18 **Forced Expiratory Technique (FET)**

19 The subject may be in the semi-Fowlers, sitting, or standing position while performing
20 forced expiratory technique (FET). FET is to be performed after each position during chest
21 physical therapy and after each cycle during Flutter and HFWCO therapy.

22 1. Inhale to total lung capacity, followed by a 2-3 second breath hold.

- 1 2. Keeping the glottis open, perform a forced exhalation maneuver to functional
- 2 residual capacity. Repeat step 1 and 2 three times.
- 3 3. Inhale to total lung capacity then cough to clear loosened secretions.
- 4 4. If secretions are mobilized, continue with step 1, 2, and 3 until clear.
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