Nonfunctional Evaluation In Pulmonary Rehabilitation

Tudor Toma, MD. PhD.
Homerton University Hospital
London, UK
Pulmonary Rehabilitation

Aims:

• To reduce symptoms
• Reduce disability
• Reduce handicap
• Improve quality of life
Why Non Functional Evaluation?

Poor association between pulmonary function and symptoms.

Minimal Outcomes For Evaluation*

- Dyspnoea
- Exercise ability
- Health status
- Activity level

* According to ATS & BTS statements on pulmonary rehabilitation
Other areas for evaluation

• Dysfunction of peripheral and respiratory muscles.
• Anxiety and depression.
• Abnormalities of nutrition and body composition.
Dyspnoea

During daily activities.
- Medical Research Council (MRC) dyspnoea questionnaire.
- The Baseline and Transitional Dyspnoea Indexes (BDI and TDI).
- The dyspnoea component of the Chronic Respiratory Disease Questionnaire.
- The University of California San Diego Shortness of Breath Questionnaire (UCSD-SOBQ).
- The Pulmonary Functional Status and Dyspnoea Questionnaire (PFSDQ).
Medical Research Council
Dyspnoea Scale

1. Not troubled by breathlessness except on strenuous exercise
2. Short of breath when hurrying or walking up a slight hill
3. Walks slower than contemporaries on the level because of breathlessness, or has to stop for breath when walking at own pace
4. Stops for breath after about 100 m or after a few minutes on the level
5. Too breathless to leave the house, or breathless when dressing or undressing
Dyspnoea

Baseline Dyspnoea Index (BDI)

- 0-4 with a focal score which is the sum from:
  - Functional impairment
  - Magnitude of task
  - Magnitude of effort

Transitional Dyspnoea Indexes (TDI)

- Changes from -3 to 3.
- Responds to therapeutic interventions.

Mahler DA et al. The measurement of dyspnoea: contents, interobserver agreement and physiologic correlations of two new clinical indexes. Chest 1984; 85:751-758
Dyspnoea

Dyspnoea

• Correlation between measurements tools.

<table>
<thead>
<tr>
<th>Variables</th>
<th>ΔMRC</th>
<th>ΔVAS</th>
<th>ΔBDI/TDI</th>
<th>Δ6MWD</th>
<th>ΔCRQ Dyspnea</th>
<th>ΔCRQ Mastery</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔMRC</td>
<td>1</td>
<td>0.35*</td>
<td>0.37*</td>
<td>-0.09</td>
<td>-0.06</td>
<td>-0.36*</td>
</tr>
<tr>
<td>ΔVAS</td>
<td>0.35*</td>
<td>1</td>
<td>0.28*</td>
<td>-0.12</td>
<td>0</td>
<td>-0.13</td>
</tr>
<tr>
<td>ΔBDI/TDI</td>
<td>0.37*</td>
<td>0.28*</td>
<td>1</td>
<td>-0.11</td>
<td>0.11</td>
<td>0.65*</td>
</tr>
<tr>
<td>Δ6MWD</td>
<td>-0.09</td>
<td>-0.12</td>
<td>-0.11</td>
<td>1</td>
<td>0.21</td>
<td>0.16</td>
</tr>
</tbody>
</table>

*p < 0.05.

Dyspnoea

Ethnic differences?

*Figure 4. Breathlessness scores: Borg scale and VAS from baseline FEV₁ to FEV₁ at PC₂₀.*

Disability

The difficulty for someone to do the things that other people do.

Measured by:

• Treadmill or cycle ergometer exercise test.
• Six minute walk test.
• Shuttle walking test.
Disability

Six minute walk test: patients are instructed to walk as far as possible in a corridor or large room at his/her own pace for 6 minutes.

- 54 m = clinical significant change.
- Biases: practice effect and encouragement.

Strict standardization is essential.

Disability

Six minute walk test

Post-Pre (m)

Ries AL et al. The Effects of Pulmonary Rehabilitation in the National Emphysema Treatment Trial.
Health Status

Quality of life

• The gap between desires in life and achievements.

Health status (Health related quality of life)

• Quantification of the impact of disease on daily life and well being in a formal and standardized manner.
Health Status

1. Utility scales:
   a. Quality of well being scale
   b. Sickness Impact Profile
   c. Medical Outcomes Study Short Form (SF-36)

2. Disease specific scales:
   a. St George’s Respiratory Questionnaire
   b. Chronic Respiratory Disease Questionnaire
Health Status

St George’s Respiratory Questionnaire

- **Symptoms**: distress due to respiratory symptoms.
- **Activity**: disturbance of physical activity.
- **Impacts**: overall impact on daily life and well being.
Health Status

SGRQ: aggregates changes.

Health Status

SGRQ: after PR

Modified after Griffiths TL et al. Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. Lancet 2000 Jan 29;355(9201):362-8
Health Status

Improvements exceed the minimal clinical important difference.

Activity Level

Abilities to perform activities of daily living.

Components:

- Capacity: what the patient can do.
- Performance: what the patient does.
- Reserve: the difference between capacity and performance.
- Capacity utilization: how often performance = capacity.
Activity Level

Pulmonary Functional Status Scale (PFSS):

- 56 item, self-administered, 15 min.
- Domains of:
  - Functional activity
  - Dyspnoea
  - Psychological status

Table 2—Pulmonary Rehabilitation Outcome Measures (n = 149)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Prerehabilitation</th>
<th>Postrehabilitation</th>
<th>Changes†</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-min walk distance, feet</td>
<td>740 ± 425</td>
<td>970 ± 510</td>
<td>230 ± 240</td>
</tr>
<tr>
<td>PFSS functional activities, U</td>
<td>14.8 ± 5.0</td>
<td>17.1 ± 4.3</td>
<td>2.3 ± 2.2</td>
</tr>
<tr>
<td>PFSS dyspnoea, U</td>
<td>2.2 ± 0.9</td>
<td>2.7 ± 0.7</td>
<td>0.5 ± 0.8</td>
</tr>
<tr>
<td>PFSS psychological status, U</td>
<td>8.3 ± 1.9</td>
<td>9.2 ± 1.5</td>
<td>1.0 ± 1.4</td>
</tr>
</tbody>
</table>

*Data are presented as mean ± SD.
†Changes resulting from pulmonary rehabilitation in a group of patients given pulmonary rehabilitation by the Connecticut Pulmonary Rehabilitation Consortium centers between 1993–1994. The prehabilitation to postrehabilitation changes in the 6-min walk distance and all PFSS subscores were significant (p < 0.0001).

BODE Index

Table 2. Variables and Point Values Used for the Computation of the Body-Mass Index, Degree of Airflow Obstruction and Dyspnea, and Exercise Capacity (BODE) Index.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Points on BODE Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>FEV₁ (% of predicted)¶</td>
<td>65</td>
</tr>
<tr>
<td>Distance walked in 6 min (m)</td>
<td>≥350</td>
</tr>
<tr>
<td>MMRC dyspnea scale§</td>
<td>0–1</td>
</tr>
<tr>
<td>Body-mass index¶</td>
<td>&gt;21</td>
</tr>
</tbody>
</table>

BODE Index

Changes in BODE may reflect the effects of PR.

Other Areas For Evaluation

Anxiety and depression.
  • Centers for Epidemiologic Studies Depression Scale (CES-D).

Nutrition and body composition.
  • BMI
  • Fat free mass
    – Bioimpedance analysis.
    – Dual energy x-ray absorptiometry.
Conclusions

• Non functional assessment is required to capture the effect of intervention.
• Enough tests to keep the staff and patient busy for the whole rehab period.
• Simple instruments are available even for a non English speaking population.
Disability

Six minute walk test: no correlation with FEV<sub>1</sub>

Disability

**Shuttle Walking Test:** patients walk up and down a 10m at gradually increasing speeds as dictated by a beeping signal.

- Incremental → exercise capacity and not endurance.
- Self pacing is eliminated.

Activity Level

Pulmonary Functional Status and Dyspnoea Questionnaire (PFSDQ):

• 164-item, 20 min self administered questionnaire.
• Activities independently rated both for performance and association with dyspnoea.
• Shorter version PFSDQ-M
Health Status

SGRQ: no strong relationship with spirometry

Other Areas For Evaluation

Anxiety and depression.
• Centers for Epidemiologic Studies Depression Scale (CES-D).

Nutrition and body composition.
• BMI
• Fat free mass
  – Bioimpedance analysis.
  – Dual energy X-ray absorptiometry.