The Barthel index-dyspnea a tool for respiratory rehabilitation: reply to the letter by Chuang [Letter of clarification]

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Dear editor

We read the remarkable letter by Chuang.1 We thank him for his valid suggestions on our paper. Interestingly, he focused on the two dimensions of the Barthel index-dyspnea (BI-d), which was exactly our goal. As rehabilitators, our goal is to provide patients with physical therapy depending on their health status and to improve their respiratory function.

We need to verify and demonstrate the efficacy and the outcomes of respiratory rehabilitation, supported by physical therapy. For these reasons, we need an assessment device that measures respiratory improvement during daily motor activities that should be monitored.

The modified Barthel index2 is a well-consolidated and widely used instrument to assess the performance of a person in a predetermined and fixed set of activities of daily living (ADLs). By proposing BI-d,3 we aimed to develop a scale to measure how dyspnea precludes or reduces the same ADLs, with the ultimate goal of globally assessing the effectiveness of rehabilitation. Hence, an assessment method that measures the impact of dyspnea on activities monitored by a rehabilitation program is of utmost importance for rehabilitators.

Large part of Chuang’s letter is based on the Chronic Respiratory Questionnaire-dyspnea (CRQ-d). The CRQ-d is a health-related quality of life (health status) questionnaire, with a dyspnea “domain”.4 However, for our purposes, the CRQ-d is too individualized as each subject selects five activity items – “the most important” – out of 26 listed activities. Therefore, each subject may choose different items from other subjects in the same study group. Due to this significant methodology, CRQ was standardized recently into a version that contains a total of only five items with a dyspnea domain, all of which have to be responded.5

Conversely, the modified Barthel index3 includes a predetermined and fixed set of ADLs. This allows better comparison between subjects or group of subjects, before and after a treatment, a significant criterion in rehabilitation, and a specific field for which we mainly developed the scale. Moreover, CRQ-d is dyspnea centered, whereas BI-d is activity centered.

This first paper on BI-d validation is auspicious. The metric qualities are good and the variability is acceptable, with 95% confidence intervals of correlation coefficient of BI-d versus 6-minute walking test being −0.609 and −0.352, respectively.

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Table 1 Four clinical cases according to GOLD severity criteria of obstruction: stages 1–4

| Patient no | GOLD | BMI (kg/m²) | FEV₁ (% predicted) | FVC% predicted | Tiffeneau-index (FVC/FEV₁) | Drug therapy | Rehabilitation sessions number | LTOT | PaO₂ T0 | PaCO₂ T0 | pH T0 | PaO₂/FiO₂ T0 | 6MWT T0 | 6MWT T1 | Barthel T0 | Barthel T1 | BI-d T0 | BI-d T1 |
|------------|------|-------------|--------------------|----------------|-----------------------------|--------------|-------------------------------|------|--------|---------|-------|----------------|---------|---------|------------|-----------|--------|--------|
| #1         | 1    | 39.7        | 87                 | 67             | 65                          | LAMA         | 20                            | No   | 89     | 423.81  | 7.41  | 410            | 100    | 100     | 6          | 5         | 5      |
| #2         | 2    | 25.1        | 62                 | 96             | 65                          | LAMA-LABA    | 21                            | No   | 62     | 295.23  | 7.47  | 280            | 345    | 98      | 100        | 22        | 5      |
| #3         | 3    | 25.7        | 45                 | 105            | 43                          | LAMA-LABA-ICS| 27                            | No   | 81     | 385.71  | 7.47  | 245            | 310    | 100     | 38         | 20        | 20     |
| #4         | 4    | 34.0        | 27                 | 58             | 46                          | LAMA-LABA-ICS| 30                            | Yes  | 77.1   | 273.00  | 7.42  | 125            | 230    | 80      | 90         | 39        | 20     |

Abbreviations: BMI, body mass index; FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity; Tiffeneau-index (FVC/FEV₁); LTOT, long-term oxygen therapy; T0, at baseline; PaO₂, partial pressure of oxygen; PaCO₂, partial pressure of carbon dioxide; pH, logarithm of the reciprocal of hydrogen ion concentration; FiO₂, inspiratory fraction of oxygen; 6MWT, 6-minute walking test; BI-d, Barthel index-dyspnea; T1, at the end of the rehabilitation program; LAMA, long-acting muscarinic agent; LABA, long-acting β₂ agonist; ICS, inhaled corticosteroid; GOLD, Global Initiative for chronic Obstructive Lung Disease.

As pointed out in our paper, additional studies in respiratory rehabilitation programs are required to further assess the applicability of the scale in a broadest context. Mild COPD patients are among those populations who are potential candidates of BI-d. Dr Chuang showed accurately that only 8.1% of our study population had mild COPD. This is obvious as COPD is largely underestimated, and patients usually consult a specialist only when they are diagnosed with GOLD 2–6 stage disease. Table 1 and Figure 1 show a few outcomes of four subjects based on the four GOLD stages. They also show that the less obstructed the patient, the lower the BI-d was. Conversely, the more obstructed...
the patient, the higher the BI-d was. After pulmonary rehabilitation, the BI-d improved in all patients. The best results were observed in GOLD 4 stage as they received a more intensive health care and rehabilitation program. On the other hand, the smallest limitation was assessed at the baseline, and the smallest differences in outcome were observed in subjects at GOLD 1 stage.

**Conclusion**

In conclusion, we consider it appropriate to uphold all items of both the modified Barthel index score (because they collect important information from a physical rehabilitation point of view) and of the Barthel dyspnea index (because they allow the estimate of the outcome of a specifically tailored respiratory rehabilitation program).

**Disclosure**

The authors report no conflicts of interest in this communication.

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