

# 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.<sup>1</sup> 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 index<sup>2</sup> 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,<sup>3</sup> 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".<sup>4</sup> 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.<sup>5</sup>

Conversely, the modified Barthel index<sup>2</sup> 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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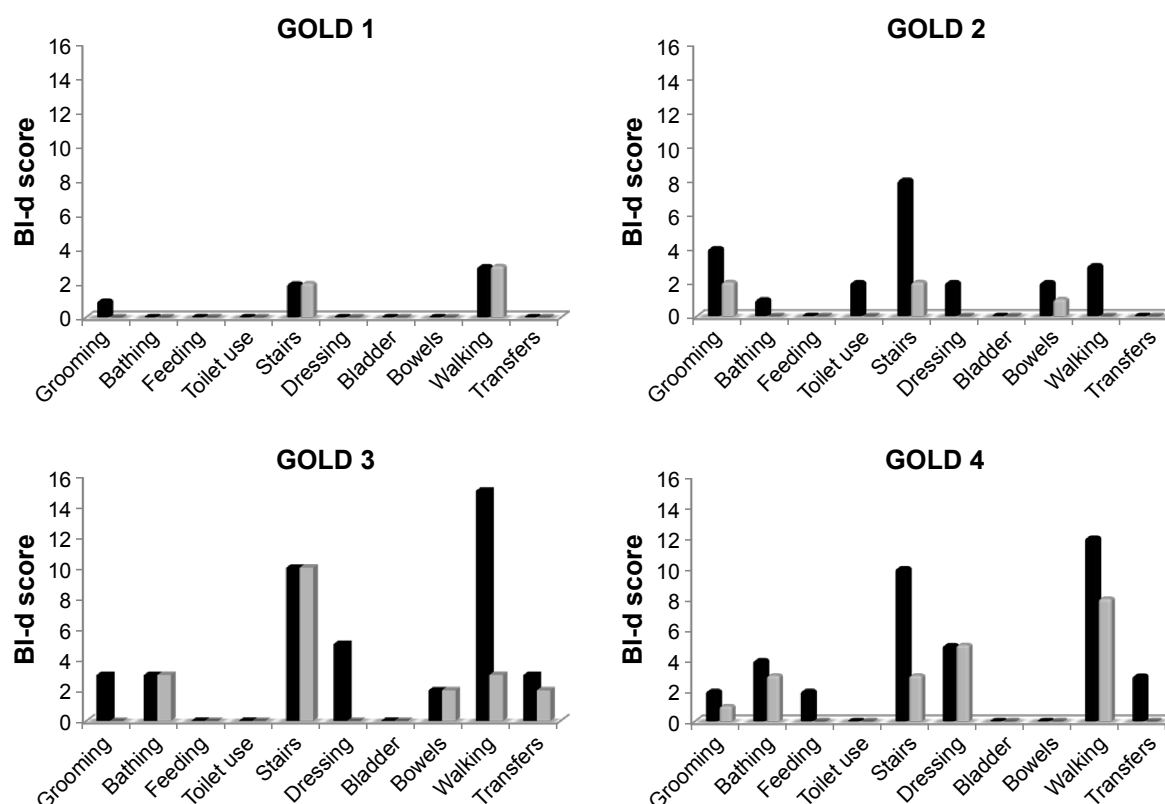
**Table 1** Four clinical cases according to GOLD severity criteria of obstruction: stages 1–4

Patient no	GOLD	BMI (kg/m <sup>2</sup> )	FEV <sub>1</sub> % predicted	FVC% predicted	TI	Drug therapy	Rehabilitation sessions number	LTOT T0	PaO <sub>2</sub> T0
#1	1	39.7	87	67	65	LAMA	20	No	89
#2	2	25.1	62	96	65	LAMA-LABA	21	No	62
#3	3	25.7	45	105	43	LAMA-LABA-ICS	27	No	81
#4	4	34.0	27	58	46	LAMA-LABA-ICS	30	Yes	77.1
Patient no	PaCO <sub>2</sub> T0	pH T0	PaO <sub>2</sub> /FiO <sub>2</sub>	6MWT T0	6MWT TI	Barthel T0	Barthel TI	BI-d T0	BI-d TI
#1	47	7.41	423.81	410	435	100	100	6	5
#2	41	7.47	295.23	280	345	98	100	22	5
#3	42	7.47	385.71	245	310	100	100	38	20
#4	52.2	7.42	273.00	125	230	80	90	39	20

**Abbreviations:** BMI, body mass index; FEV<sub>1</sub>, forced expiratory volume in 1 second; FVC, forced vital capacity; TI, Tiffeneau-index (FVC/FEV<sub>1</sub>); LTOT, long-term oxygen therapy; T0, at baseline; PaO<sub>2</sub>, partial pressure of oxygen; PaCO<sub>2</sub>, partial pressure of carbon dioxide; pH, logarithm of the reciprocal of hydrogen ion concentration; FiO<sub>2</sub>, inspiratory fraction of oxygen; 6MWT, 6-minute walking test; BI-d, Barthel index-dyspnea; TI, at the end of the rehabilitation program; LAMA, long-acting muscarinic agent; LABA, long-acting  $\beta_2$  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<sup>6</sup> stage disease.<sup>7–9</sup> 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



**Figure 1** Mean score distribution of each Barthel dyspnea item measured at the baseline (black columns) and at the end (gray columns) of the rehabilitation program. Subjects were subdivided according to GOLD severity grade.

**Abbreviations:** BI-d, Barthel index-dyspnea; GOLD, Global Initiative for chronic Obstructive Lung Disease.

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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