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## The grounding of ability of usage of Bode Scale according to occupational dust lung pathology as criterion for patients' rehabilitation at specialized sanatoriums at the southern coast of the Crimea

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### ABSTRACT

The ability and advisability of usage of recommended by WHO in GOLD Program BODE scale were scientifically grounded according to occupational dust lung pathology, including its role as selective criterion for the rehabilitation at the specialized sanatorium at the southern coast of Crimea (in patients with dust bronchitis and pneumoconiosis), and also to estimate the effectiveness of methods of medical rehabilitation (in patients with dust bronchitis).

**Keywords:** Dust bronchitis, pneumoconiosis, BODE scale, rehabilitation at sanatoriums

### 1. Introduction

According to the Fund of Social Insurance against accidents at work and occupational diseases of Ukraine, the Ministry of Health of Ukraine and Sanitary and Epidemiologic Service of Ukraine, in Ukraine increased levels of occupational hazards are registered periodically at 50% and constantly at 30% of all the industrial establishments functioning in Ukraine <sup>[1]</sup>. Therefore, the issues of diagnosis, treatment and rehabilitation of occupational diseases, including dust induced lung disease, in workers are of current interest for public health in our country.

During the last decade, conception of dust lung diseases developed considerably thanks to additional scientific facts concerning the pathogenic unity of dust lung pathology and chronic obstructive pulmonary diseases (COPD), including development and progression of bronchopulmonary pathology. It grounds the scientific concept which considers occupational chronic obstructive lung disease as the missing link of classification of occupational lung diseases <sup>[2]</sup>. According to this scientific concept, it can be suggested, that the usage of the criteria of COPD severity and effectiveness of methods of medical rehabilitation (including BODE scale), recommended by the WHO in GOLD global strategy is pathogenetically grounded for dust lung diseases, too <sup>[3]</sup>. In the frame of this research, it should be stressed, that there are no scientifically grounded criteria of estimation of effectiveness of rehabilitation at sanatoriums in patients with dust lung pathology. This fact makes the problem of medical rehabilitation of people with dust lung diseases at specialized sanatorium still more complicated. In addition, there are no comparative characteristics of patient' groups with occupational respiratory dust pathology with and without positive clinical effect of rehabilitation at sanatoriums. The latter, in our opinion, could be a base for differential choice of methods of treatment at sanatoriums.

Thus, scientific search for opportunities to increase the effectiveness of medical rehabilitation of people with dust lung diseases in specialized sanatoriums seems to be quite grounded.

The general purpose of the research is to optimize the rehabilitation of people with occupational lung pathology caused by the dust at specialized pulmonary sanatoriums at the Southern Coast of the Crimea. In order to achieve this aim, changes of body mass index (BMI) of BODE scale in patients with dust lung pathology were analyzed in this article according to clinical effectiveness of rehabilitation at sanatoriums.

### 2. Methods and Resources

362 male patients were examined, which were divided into the following groups. 112 patients with dust bronchitis, which developed clinical improvement (relief from cough and/or dyspnea) after treatment received at the sanatorium, were included into the 1<sup>st</sup> group. 93 patients of the 2<sup>nd</sup> group with dust bronchitis had no clinical improvement after rehabilitation at the sanatorium.

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81 patients with pneumoconiosis and clinical improvement after treatment at the sanatorium were included into the 3<sup>rd</sup> group. 76 patients of the 4<sup>th</sup> group with pneumoconiosis had no clinical improvement after therapy at the sanatorium. There was a remission of chronic bronchoobstructive disease in all (1<sup>st</sup> – 4<sup>th</sup>) groups of patients with dust induced respiratory pathology. These groups for comparison were created retrospectively by estimation of positive or no clinical effects of rehabilitation at the sanatorium in patients with lung pathology caused by dust. 32 healthy people were examined as a control group.

Diagnosis of occupational lung disease was made in accordance with "A List of Occupational Diseases", approved by the Resolution of the Cabinet of Ministers of Ukraine of October 8, 2000, № 1662 [4], modern classification, and was also based upon the data of sanitary and hygienic characteristics of working conditions, clinical, functional, and X-ray investigations. We used BODE Celli B.R. [5] scale of estimation of severity of COPD, shown at the table. 1

**Table 1:** Scale of estimation of severity of COPD (Celli B.R., 2004)

Index	Points (BODE Index)			
	0	1	2	3
FEV <sub>1</sub> , % of predicted value	≥ 65	50–64	34–49	≤ 35
6-MWD*, m	≥ 350	250–349	150–249	≤ 149
MMRC dyspnea †, points	0–1	2	3	4
BMI‡, kg/m <sup>2</sup>	> 21		≤ 21	

Note: \* – the distance walked in six minutes [6], † – MMRC dyspnea (modified Medical Research Council dyspnea) [7], ‡ – body mass index (kg/(height , m<sup>2</sup>); categories: decreased – BMI < 18,5; normal – 18,5-24,9; increased – ≥ 25,0; pre-obesity – 25,0-29,9; obesity I degree – 30,0-34,9; obesity II degree – 35,0-39,94; obesity III degree – ≥ 40) [8,9].

BODE index has great prognostic value. The maximum number of points means worst prognosis. In particular, BODE scale in patients with COPD has a higher prognostic value than FEV<sub>1</sub> for mortality risk, including respiratory mortality risk [5]. BODE index is recommended also as a predictor of high risk of hospitalization of patients with

COPD due to worsening of their condition [10].

**3. Results and Discussion**

Representation of results of diagnostics of severity based on BODE scale in the 1<sup>st</sup> group of patients are shown at the tables 2-5.

**Table 2:** Characteristics of severity based on BODE scale in the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> group of patients

Index	Points (BODE index)							
	On admission				At discharge			
	0	1	2	3	0	1	2	3
FEV <sub>1</sub>								
6-MWD								
MMRC dyspnea								
BMI								
BODE index	2				1			

**Table 3:** Characteristics of severity based on BODE scale in the 2<sup>nd</sup> group of patients

Index	Points (BODE index)							
	On admission				At discharge			
	0	1	2	3	0	1	2	3
FEV <sub>1</sub>								
6-MWD								
MMRC dyspnea								
BMI								
BODE index	4				4			

**Table 4:** Characteristics of severity based BODE scale in the 3<sup>rd</sup> group of patients

Index	Points (BODE index)							
	On admission				At discharge			
	0	1	2	3	0	1	2	3
FEV <sub>1</sub>								
6-MWD								
MMRC dyspnea								
BMI								
BODE index	4				4			

**Table 5:** Characteristics of severity based on BODE scale in the 4<sup>th</sup> groups of patients

Index	Points (BODE index)							
	On admission				At discharge			
	0	1	2	3	0	1	2	3
FEV <sub>1</sub>								
6-MWD								
MMRC dyspnea								
BMI								
BODE index	6				6			

Analysis of the represented statistical data (see the tables 2 - 5) demonstrates, that the severity of chronic dust lung disease in the 1<sup>st</sup> group of patients is 2 by BODE index, and decreases to 1 point (BODE index) under the influence of rehabilitation. Taking into account, that there is positive clinical changes under the influence of the received treatment in the 1<sup>st</sup> group of patients, it can be argued, that BODE index equal 2 (based on BODE scale) is informative indication to prescribe the rehabilitation at specialized pulmonary sanatoriums at the Southern Coast of the Crimea. In this clinical improvement develops first of all due to the decrease of MMRC dyspnea.

There were no significant changes of the investigated index under the influence of medical rehabilitation at the sanatorium in patients with dust bronchitis and initial (on admission) BODE index equal 4 (BODE index at discharge was 4, too). In addition, there was no clinical improvement at the 2<sup>nd</sup> stage of the investigation. These facts suggest, that direction to the rehabilitation at specialized pulmonary sanatoriums at the Southern Coast of the Crimea doesn't indicated for patients with severity of dust bronchitis equal 4 (BODE index).

It is revealed, that the severity of dust lung disease increases first of all due to decreased exercise tolerance (6-MWD) and BMI in the 3<sup>rd</sup> group of patients with pneumoconiosis in comparison with the 1<sup>st</sup> group of patients. In the 3<sup>rd</sup> group of patients on admission BODE index is 4 and doesn't change under the influence of prescribed treatment. At the same time, positive clinical changes were revealed in the same group of patients due to statistically significant increase of FEV<sub>1</sub> by 7,7% and 6-MWD by 12,7% at discharge. These changes of FEV<sub>1</sub> and 6-MWD can't influence the degree of sensitivity of BODE scale.

Thus, it can be suggested that BODE scale can be used for the estimation of effectiveness of the rehabilitation at the sanatorium only in patients with dust bronchitis, but can't be used for the estimation of effectiveness of the rehabilitation in patients with pneumoconiosis. It can be also suggested,

that standard rehabilitation at the sanatorium according to patients with pneumoconiosis can't influence the degree of sensitivity of BODE scale.

At the same time, results of our investigations suggest, that BODE scale in patients with pneumoconiosis can be used as selection criterion for the rehabilitation at the specialized pulmonary sanatorium. The direction to the rehabilitation at the specialized sanatorium at the Southern Coast of Crimea is indicated for patients with pneumoconiosis and severity equal 4 (BODE index) due to ability to decrease the reversible bronchial limitation (FEV<sub>1</sub>) and to increase exercise tolerance (6-MWD). The direction to the rehabilitation at the specialized sanatorium doesn't indicated for patients with pneumoconiosis and severity equal 6 (BODE index). It should be stressed, that there are no any contraindications to rehabilitation at the sanatorium for patients with dust bronchitis and pneumoconiosis, as there weren't revealed any cases of worsening of pulmonary complains in investigated patients.

**4. Conclusions**

1. It is established, that BODE index equal 2 (based on BODE scale) is informative prognostic criterion of efficacy of the rehabilitation at specialized sanatoriums at the Southern Coast of the Crimea in patients with dust bronchitis (to determine the indications to the treatment).
2. In patients with dust bronchitis and initial (on admission)) BODE index equal 4 there were no changes of investigated index under the influence of rehabilitation (at discharge BODE index is 4, too). In addition, there was no clinical improvement at the 2<sup>nd</sup> stage of the investigation. These facts suggest, that direction to the rehabilitation at specialized pulmonary sanatoriums at the Southern Coast of the Crimea doesn't indicated for patients with severity of dust bronchitis equal 4 (BODE index).
3. It is established, that BODE scale can be used for the

estimation of effectiveness of the rehabilitation at the sanatorium only in patients with dust bronchitis, but can't be used for the estimation of effectiveness of the rehabilitation in patients with pneumoconiosis.

4. BODE scale in patients with pneumoconiosis can be used as selection criterion for the rehabilitation at the specialized pulmonary sanatorium: the direction to the rehabilitation at the specialized sanatorium at the Southern Coast of Crimea is indicated for patients with pneumoconiosis and severity equal 4 (BODE index) due to ability to decrease the reversible bronchial limitation (FEV<sub>1</sub>) and to increase exercise tolerance (6-MWD). The direction to the rehabilitation at the specialized sanatorium doesn't indicated for patients with pneumoconiosis and severity equal 6 (BODE index).
5. Thus, obtained facts can be interpreted as scientific grounding of ability and advisability to use BODE scale (recommended by WHO in GOLD Program) <sup>[3]</sup> for diagnostics of severity and as prognostic criterion of the need for hospitalization and depth according to occupational dust lung diseases. BODE scale can be used as selection criterion for the rehabilitation at the specialized sanatorium at the southern coast of Crimea (patients with dust bronchitis and pneumoconiosis), and also for estimation of efficacy of performed rehabilitation (patients with dust bronchitis)

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