**Stefan Wesołowski[1], Piotr W. Boros[1], Tomasz Dębowski[2]**

[1]Department of Respiratory Physiopathology, National Tuberculosis and Lung Diseases Research Institute, Warsaw
Head: Prof. S. Wesołowski, MD, PhD
[2]Medical Division, Chiesi Poland, Warsaw
Head: T. Dębowski

# Chronic obstructive pulmonary disease in Poland: distribution of patients according to the new GOLD 2011 classification. Cross-sectional survey

## Przewlekła obturacyjna choroba płuc w Polsce: podział pacjentów według nowej klasyfikacji GOLD 2011. Badanie przekrojowe

The research was supported by Chiesi Poland (printing the materials, collecting data, and database processing)

### Abstract

**Introduction:** In 2011 new classification for chronic obstructive pulmonary disease (COPD) was introduced, which are not based on the extent of airflow limitation alone, but also on symptoms and risk of exacerbation. The objective of our work was to present the characteristics of COPD patients according to the GOLD 2011 categories.

**Material and methods:** A cross-sectional survey was performed with the participation of 411 specialists in pneumonology or allergology all over from Poland.

**Results:** In the group of 2271 patients we obtained the following distribution of COPD categories: A 687 (30.3%), B 403 (17.7%), C 256 (11.3%), and D 925 (40.7%). There were very few patients with no exacerbation (1.3%). In subgroups A and B there were no such patients at all. The main reason for classification of patients into categories C and D was the number of exacerbations of COPD (66.0% and 40%, respectively). Cardiovascular comorbidities were more frequent in subgroups B and D, with more symptoms (82%) than in subgroups A and C (57%, $p < 0.001$).

**Conclusions:** In a large group of patients, representative of the population of COPD patients in Poland, we observed an uneven distribution of patients in the GOLD 2011 categories, with 71% of patients assigned to category A or D. In our study, the main reason for classifying to category C or D was the high risk of disease exacerbation rather than the degree of $FEV_1$ reduction, as noted in other reports.

**Key words:** COPD, GOLD 2011 classification, COPD exacerbations

**Pneumonol. Alergol. Pol. 2014; 82: 511–517**

### Streszczenie

**Wprowadzenie:** W 2011 roku została wprowadzona nowa klasyfikacja przewlekłej obturacyjnej choroby płuc (POChP), uwzględniająca nie tylko stopień obturacji oskrzeli, ale także nasilenie objawów i ryzyko zaostrzeń choroby. Celem niniejszej pracy było przedstawienie charakterystyki pacjentów z POChP zgodnie z kategoriami GOLD 2011.

**Materiał i metody:** Przeprowadzono badanie przekrojowe z udziałem 411 lekarzy specjalistów pneumonologii i alergologii z całej Polski.

**Wyniki:** W grupie 2271 chorych stwierdzono następujący rozkład pacjentów w poszczególnych kategoriach POChP: A 687 (30,3%), B 403 (17,7%), C 256 (11,3%) i D 925 (40,7%). W całej grupie było bardzo mało pacjentów bez zaostrzeń POChP (1,3%),

**Address for correspondence:** Prof. Stefan Wesołowski, Department of Respiratory Physiopathology, National Tuberculosis and Lung Diseases Research Institute, Płocka 26, 01–138 Warsaw, tel.: 22 431 22 23, e-mail: s.wesolowski@igichp.edu.pl
DOI: 10.5603/PiAP.2014.0068
Praca wpłynęła do Redakcji: 3.06.2014 r.

ISSN 0867–7077

a w podgrupach A i B takich pacjentów nie było wcale. Głównym powodem kwalifikacji do kategorii C i D była liczba zaostrzeń POChP (odpowiednio 66,0% i 40% pacjentów). Współistnienie chorób układu krążenia stwierdzano częściej w podgrupach o nasilonych objawach B i D (82%) niż w podgrupach A i C (57%, $p < 0{,}001$).

**Wnioski:** W dużej grupie pacjentów, reprezentatywnej dla populacji chorych na POChP w Polsce, wykazano nierównomierny rozkład chorych w poszczególnych kategoriach klasyfikacji GOLD 2011. Najliczniejsze były podgrupy A i D, do których zaliczono 71% wszystkich chorych. W niniejszym badaniu główną przyczyną klasyfikacji do kategorii C lub D było wysokie ryzyko zaostrzeń choroby, a nie — jak stwierdzano w innych doniesieniach — stopień zmniejszenia $FEV_1$.

**Słowa kluczowe:** POChP, klasyfikacja GOLD 2011, zaostrzenia POChP

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## Introduction

Chronic obstructive pulmonary disease (COPD) is usually a progressive, complex disease leading to considerable reduction in quality of life, due to respiratory disability, and finally to death. In Poland COPD is diagnosed in more than 20% of smokers aged over 40 years [1]. COPD is already a serious burden on health care systems in many countries, and the burden is set to increase: by 2020 COPD is estimated to become the world's third major cause of death [2]. The establishment of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) was the reaction to the challenges posed by COPD. On the basis of reliable clinical trials, recommendations have been formulated for diagnosing and treating COPD, which are available around the world. The first document, published more than 10 years ago [3], has been updated many times. In 2011 new classification of the disease was introduced, which caused a major change in the approach to COPD [4]. In the recommendations thus far the severity of the disease was defined only on the basis of the degree of $FEV_1$ reduction measured by spirometry. The new assessment scheme is the first multidimensional system that takes into account not only the results of spirometry, but also the intensity of symptoms and the risk of disease exacerbation. The new classification system assigns patients to one of the following four categories: A — scant symptoms, fairly good lung function, low risk of exacerbations; B — more symptoms, fairly good lung function, low risk of exacerbations; C — scant symptoms, poor lung function or high risk of exacerbations; and D — more symptoms, poor lung function or high risk of exacerbations. The introduction of the GOLD 2011 recommendations encouraged renewed assessment of the distribution of patients in particular categories according to the new classification. Since the new classification a few studies have been published with the application of the GOLD 2011 assessment system among the pre-established groups of patients [5–8]. These analyses gave new information on the distribution and characteristics of COPD patients, but originally these were clinical or epidemiological studies, and their protocols did not contain objectives, to which have now been applied. Only a few studies have evaluated the characteristics of patients with COPD according to GOLD 2011 classification in groups of patients not selected for clinical trials [9, 10]. In Poland, little research has been done on the epidemiology of COPD [1, 11], and so far there has been no work referring to the GOLD 2011 classification. The objective of our work was to present the characteristics of patients with COPD encountered in daily medical practice, taking into account the new GOLD 2011 categorisation system, and its comparison with the previous GOLD 2007 classification.

## Material and methods

We conducted a multicentre, non-interventional, observational survey aimed at assessing patients with COPD. The data were collected for three months, from February to April 2013. A total of 411 doctors, specialists in pneumonology or allergology, from all over Poland, who were taking care of the patients with COPD, were involved in the study. In order to ensure an even inclusion of patients from various centres, each doctor could qualify no more than ten patients for the study. The including criteria were as follows: COPD diagnosed at least six months earlier and confirmed by spirometry, age ≥ 40 years, regular intake of inhaled long-acting $beta_2$-agonists (LABA), or temporary intake of short-acting $beta_2$-agonists. The exclusion criteria were as follows: asthma in the patient history, exacerbation of COPD within the past six weeks, actual participation in any other clinical trial, or the coexistence of a chronic disease in an unstable condition. Only outpatients were included. The doctors participating in the

**Table 1. Patient characteristics by category: A, B, C, and D, according to GOLD 2011**

| | Categories of chronic obstructive pulmonary disease | | | | |
|---|---|---|---|---|---|
| | A (n = 687) | B (n = 403) | C (n = 256) | D (n = 925) | Total (n = 2271) |
| Age | 59.6 ± 9.3 | 65.6 ± 8.5 | 60.6 ± 9.8 | 66.3 ± 9.3 | 63.5 ± 9.7 |
| Sex (f/m) | 37%/63% | 36%/64% | 38%/62% | 34%/66% | 36%/64% |
| BMI [kg/m$^2$] | 26.66 ± 3.94 | 27.65 ± 4.52 | 26.88 ± 4.4 | 27.06 ± 4.81 | 27.02 ± 4.47 |
| Smoking (never/past/active smokers) | 8%/43%/49% | 8%/49%/43% | 11%/46%/43% | 6%/52%/42% | 7%/48%/44% |
| Pack years | 26.8 ± 16.8 | 32.7 ± 15.9 | 28.6 ± 16.2 | 35.8 ± 19.1 | 31.8 ± 18.0 |
| $FEV_1$% pred. | 69.3 ± 10.1 | 63.3 ± 8.5 | 58.0 ± 13.3 | 48.5 ± 12.7 | 58.5 ± 14.4 |
| Exacerbations/year | 1.00 ± 0.00 | 1.00 ± 0.00 | 1.97 ± 0.69 | 2.00 ± 0.80 | 1.52 ± 0.75 |
| mMRC | 1.76 ± 0.42 | 3.13 ± 0.37 | 1.91 ± 0.29 | 3.43 ± 0.6 | 2.7 ± 0.91 |

BMI — body mass index; mMRC — modified Medical Research Council dyspnoea score mMRC — modified Medical Research Council dyspnoea score

study completed questionnaires including the following items: age, sex, duration of COPD, smoking history, modified Medical Research Council dyspnoea score (mMRC) [12], number of exacerbations within the past 12 months, last measured $FEV_1$/FVC and $FEV_1$ percentage of predicted, and the presence and type of comorbidities. An exacerbation of COPD was defined as a worsening of symptoms that required oral corticosteroids and/or antibiotics, and/or hospitalisation. On the basis of the data from the questionnaires, we were able to assign the patients to proper GOLD 2011 A, B, C, or D category. Category A included patients with mMRC below 2 and $FEV_1$ equal to or higher than 50% of the predicted, and with less than two COPD exacerbations within a year. Category B included the patients with mMRC score two or more and $FEV_1$ equal to or higher than 50% of predicted, and less than two COPD exacerbations in a year. Category C included patients with mMRC below 2 and at least one of the following conditions met: $FEV_1$ below 50% of the predicted or at least two exacerbations of COPD in a year. Category D included the patients with mMRC of 2 or more and at least one of the following conditions met: $FEV_1$ below 50% of the predicted or at least two exacerbations of COPD in a year.

Consent was obtained from each doctor involved in the study. Ethics approval was not required for this study as no patient-identifiable material was recorded; all collected data were anonymous.

## Statistical methods

Summary statistics included the mean ± standard deviation for continuous data and number (percentage) for categorical data. The chi-squared test was used to check the interdependence between the categorical data. The verification of differences between the groups, for more than two groups, was conducted with one-way analysis of variance. Data were entered into Statistica software, version 9.1 (StatSoft, Inc. 2010) for analyses.

## Results

From among the collected 4110 questionnaires, the data relating to the spirometry values, the number of disease exacerbations, and the intensity of symptoms was available for 2271 (55.3%) of the patients in the stable period of the disease, who fulfilled the spirometry-based criteria for COPD diagnosis ($FEV_1$/FVC < 0.7). Further calculations are related to these patients (n = 2271 constitutes 100%). There were 1457 (64.2%) men and 814 (35.8%) women, and the average age was 63.5 ± 9.8 years. Active or former smokers comprised 91.9% of the study group, and mean tobacco exposure was 31.8 ± 18.1 pack-years. Mean $FEV_1$ was 58.6 ± 15.0% of predicted. The figures relating to the patient characteristics are presented in Table 1.

The following distribution was obtained for the analysed group: category A, 687 (30.3%); category B, 403 (17.7%); category C, 256 (11.3%); and category D, 925 (40.7%). The graphic presentation of the GOLD 2011 category distribution is shown in Figure 1.

Analysis of the subgroups according to the ABCD categorisation showed statistically significant differences between them with regards to age, exposure to tobacco smoke, and, understandably, with regards to the frequency of exacerba-

tions and intensity of symptoms as well as the severity of airway obstruction. The patients with intense symptoms (categories B and D) were older and smoked more cigarettes than patients from categories A and C (ANOVA, $p < 0.001$). What is noteworthy is the fact that among the patients assigned to categories A and B there were no patients without an exacerbation. In the whole study group only 30 (1.3%) patients (all of them from categories C or D) did not have any exacerbations in the previous 12 months.

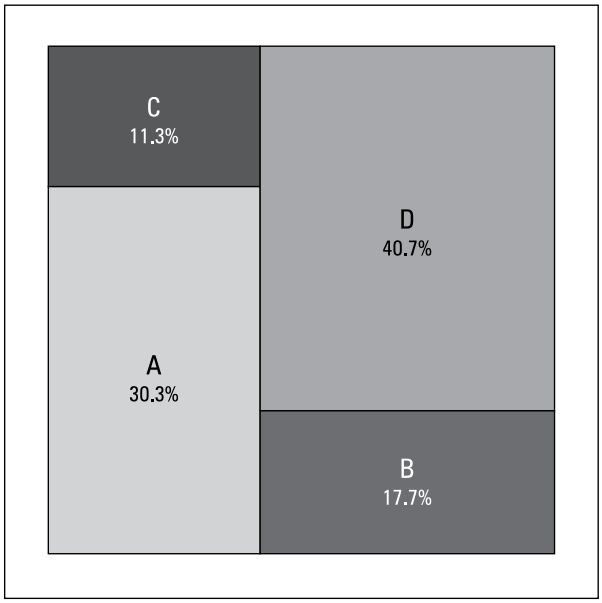


**Figure 1.** Proportions of patients in each GOLD 2011 COPD category in the study population

We compared the distribution of the patients in the new assessment system with reference to the previous GOLD 2007 classification, which was applied until 2010. In GOLD 2007 the severity of COPD was assessed by the reduction in $FEV_1$% of predicted (1 mild $FEV_1 \geq 80\%$, 2 moderate $50\% \leq FEV_1 < 80\%$, 3 severe $30\% \leq FEV_1 < 50\%$, 4 very severe $FEV_1 < 30\%$). Graphical presentation of the results is shown in Figure 2.

The patients who were previously classified as moderate COPD are now present in all categories of the new assessment system. They are the most numerous in categories A, B, and C, but also constitute a significant part of category D. The patients with severe and very severe COPD are now assigned mainly to category D and partly to C.

In the GOLD 2011 classification, categories A and B are explicitly defined. This is not the case in case of categories C and D. Into category C we can include the patients with mMRC below 2 and $FEV_1$ below 50% of the predicted value or with high risk of exacerbations (at least 2 exacerbations in the last year), as well as patients who fulfil both of these criteria. Respectively, in category D we can find patients with mMRC of 2 or more and $FEV_1$ below 50% of predicted value or with high risk of exacerbations, as well as the patients

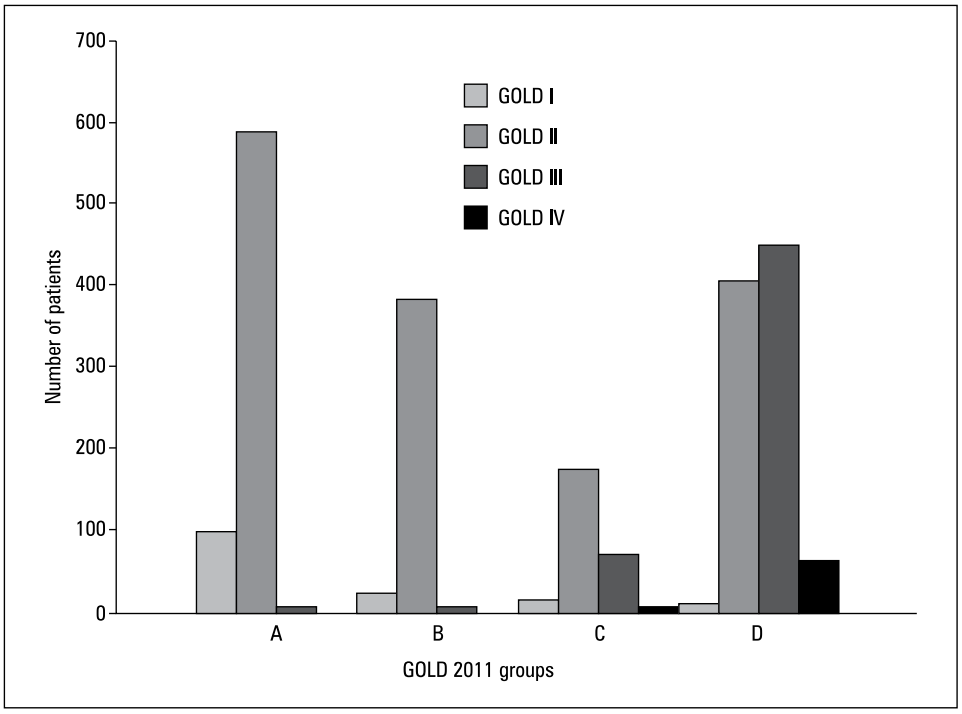


**Figure 2.** Distribution of COPD patients according to the GOLD 2007 and the new GOLD 2011 classification

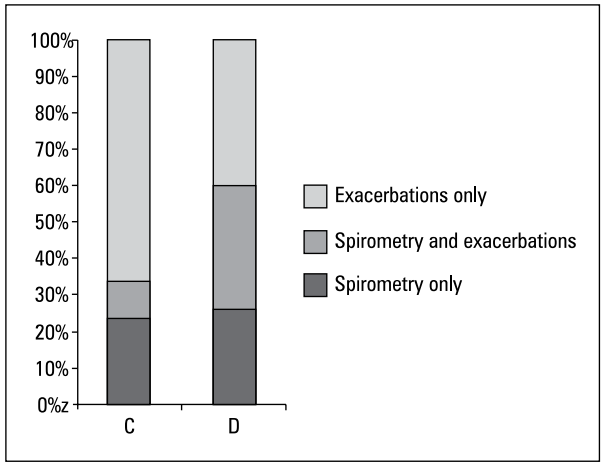


**Figure 3.** Proportions of the patients classified into category C or D of COPD on the basis of spirometry ($FEV_1 < 50\%$ of predicted) and/or the history of exacerbations

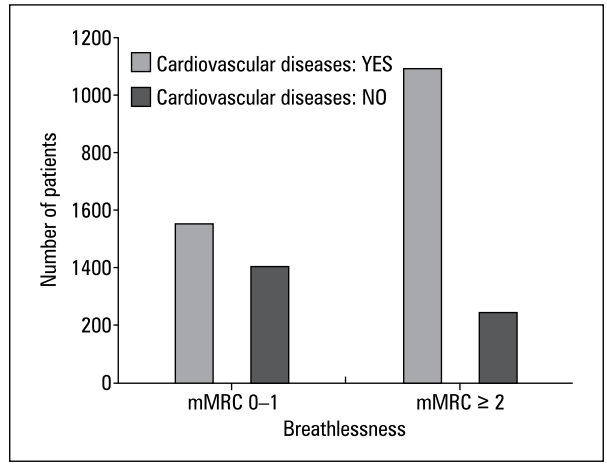


**Figure 4.** The incidence of cardiovascular comorbidities in the symptomatic subgroups B and D (mMRC ≥ 2) and subgroups with fewer symptoms A and C (mMRC < 2) of chronic obstructive pulmonary disease

fulfilling both these conditions (low $FEV_1$ and high risk of exacerbations).

We analysed the particular reasons for assigning patients to category C or D. Among the patients in category C, in the majority of them (66.0%) the number of exacerbations was the only reason for classification, while only one out of four patients (23.8%) was assigned to this category on the basis of airway obstruction severity. The consistency of the spirometry results and the history of exacerbations, i.e. fulfilling both conditions for category C, was observed in 10.2% of cases. Respectively, in category D, 40.1% patients were assigned exclusively on the basis of the number of exacerbations, 25.8% of the patients were classified due to the airway obstruction severity, and 34.1% due to having fulfilled both conditions. A graphical presentation is shown in Figure 3.

The potential impact of cardiovascular diseases on the symptomatic form of the disease was also assessed. In 82% of patients who reported more symptoms (categories B and D), cardiovascular comorbidities (arterial hypertension, ischaemic heart disease, cardiac failure, or atrial fibrillation) were found. In subgroups A and C, with fewer symptoms, such a coincidence was observed in 57% of cases ($p < 0.001$) (numerical data shown in Fig. 4).

## Discussion

GOLD 2011 recommendations have introduced a new, multidimensional system for categorising patients with COPD, aimed at a more extensive assessment of the disease severity and a more adequate, better suited choice of treatment. The recommendations were mainly based on the experts' opinions issued on the basis of clinical trials in large groups of patients with COPD, included in three major projects: TORCH, UPLIFT, and ECLIPSE [13–15]. Thus, they needed to be tested in general populations of patients. Our study is the first to describe the distribution of COPD patients in chest diseases specialist centres throughout Poland according to GOLD 2011 classification. As in other studies on patients with previously diagnosed COPD, we observed that the most highly populated categories were A and D, including a total of 71% of the patients. Such a pattern of distribution was reported in patient groups qualified for clinical trials, and in primary care as well [7, 10, 16]. Compared with the primary-care from report Haughney et al. [10], we found an even greater proportion of patients at high risk of unfavourable course of the disease — subgroups C and D (52% *v.* 36%, respectively). It is easy to understand that the patients with more symptoms, frequent exacerbations and poor lung function are often referred to chest disease or allergology specialists. However, it was surprising that our subgroup A had so many patients, as they represented the mildest form of the disease, which does not need specialist care. In categories A and B there were no patients without any exacerbations in the last 12 months, so it is likely that the patients with preserved lung function have to experience exacerbations to consider the diagnosis of COPD justified. This also means that screening spirometry programs aimed at early detection of COPD are ineffective, and COPD in subjects

with mild or moderate airway obstruction and no exacerbations is underdiagnosed.

By including factors other than $FEV_1$ in the assessment, the new system has resulted in a redistribution of patients into specific categories of the disease as compared to the GOLD 2007 classification. This is particularly related to the group of moderate COPD, which was previously the most numerous according to the GOLD 2007 assessment system. Now these patients are distributed among all categories of the new system, ranging from the mildest category, A, to the most severe, D. The GOLD 2011 classification has resulted in a large category D, which includes patients with moderate and severe as well as very severe COPD, according to the previous GOLD 2007 classification. This change of distribution pattern has direct consequences for treatment because particular ABCD categories have their assigned relevant treatment schemes. The new way of classifying patients has increased the number of patients for whom a more intensive therapy is recommended, with the use of inhaled corticosteroids as maintenance treatment. According to the previous GOLD 2010 recommendations, the patients with moderate form of COPD did not have indications for regular intake of inhaled corticosteroids, while the recommended treatment for them was the long-acting $beta_2$-agonists or long-acting anticholinergics only. The GOLD 2011 recommendations indicated the use of inhaled corticosteroids for patients in categories C and D, which comprises a significant part of patients with GOLD 2007 moderate COPD, who have now been shifted to these categories.

The characteristics of our patients were similar to those shown by Lange et al. [8]. Patients in subgroups B and D, i.e. those with intense symptoms, were older and had higher incidence of cardiovascular comorbidities as compared to subgroups A and C. Ischaemic heart disease and cardiac failure may cause a reduction in exercise capacity, just as COPD does. We believe that cardiovascular comorbidities may contribute to considerable intensification of symptoms among patients in categories B and D. Agusti et al. [7] observed worse exercise capacity and higher concentration of inflammatory biomarkers in such patients, compared to those from the two remaining categories, A and C. The most significant differences between our group of patients and the groups from other reports were found in the analysis of reasons for classification into categories C and D. In our patients the main reason for assignment to one of these subgroups was high risk of exacerbations, assessed on the basis of the history of the disease so far (categories C, 66% and D, 40%, of the patients). The results of previously published studies showed a reduction of $FEV_1$ as the basic reason for inclusion into category C (70–78% of the patients) or D (63–79% of the patients) [6, 7]. In our group there were more patients with frequent exacerbations of COPD (39% of the whole analysed group, including 76% patients in category C and 74.2% patients in category D) than in the groups of patients qualified for clinical trials. In the ECLIPSE study [7], the patients with frequent exacerbations constituted 28% of patients in subgroup C and 27% of patients in subgroup D. We do not have any clear explanation of such differences. We can speculate that on the one hand, patients with frequent exacerbations may be reluctantly included in clinical trials due to a greater risk of their withdrawal from the study. On the other hand, doctors in general practice may diagnose exacerbations of the disease too readily. We think it is likely that even trivial respiratory infections, often unnecessarily treated with antibiotics, constitute a sufficient reason to diagnose an exacerbation of COPD. This could explain the very low number of patients without any exacerbations in the whole our group, as well as their total absence in categories A and B.

### Strengths and weaknesses of the study

One strength of our research is the large number of patients from all over Poland, without the selection conditions typical of clinical tests, which usually qualify only a few percent of the patient population. Besides the basic criteria for diagnosing COPD, we did not impose any other limitations on including patients in the stable period of the disease. We may consider that we have selected a group representative of the population of patients with COPD, treated as outpatients in specialist centres.

Our study also has some weaknesses. The sponsor of the study decided not to include patients receiving regular treatment with SAMA/LAMA. It is difficult to assess the impact of this decision on the results of the study. In the questionnaire we only used the mMRC score for assessing the symptoms; we did not use the COPD Assessment Test (CAT). We did this on purpose to maintain the simplicity of the questionnaire. The CAT is not commonly used in Poland as yet, and its completion could have caused problems for patients and doctors who were not familiar with the test. We realise that the mMRC score assesses

only one aspect of the symptoms of COPD, i.e. dyspnoea, whereas the CAT is a multidimensional tool. The results of the assessment of symptoms, and in turn the classification of patients into proper GOLD 2011 categories with the use of mMRC score and the CAT, may therefore differ. We have not verified the correctness of diagnosing exacerbations of COPD either, leaving this to the competence of the doctors completing the questionnaires. In order to facilitate the completion of this point, we included criteria for diagnosing mild, moderate, and severe exacerbation of the disease in the questionnaire. The frequency of diagnosed exacerbations may not reflect their actual frequency in the analysed population; but still our results show the real diagnostic habits of the doctors completing the survey.

## Conclusions

In a large group of patients, representative of the population of patients with COPD in Poland, we observed an uneven distribution of patients in GOLD 2011 categories, with the majority of patients belonging to the mildest category A or the most severe category D. In the whole of our population there were very few patients with no exacerbations of COPD. In subgroups A and B all patients experienced exacerbations, which we believe could contribute to the diagnosis of COPD. In our patients, the main reason for classifying patients into category C or D was high risk of disease exacerbation, rather that the degree of $FEV_1$ reduction, as was observed in other studies.

## Conflict of interest

The authors declare no conflict of interest.

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