Hanna Siatkowska, Jerzy Kozielski, Dariusz Ziora

Department of Lung Diseases and Tuberculosis in Zabrze, Faculty of Medicine and Subdivision of Dentistry in Zabrze, Silesian Medical University in Katowice, Poland
Head: Prof. J. Kozielski MD, PhD

Patients with chronic obstructive pulmonary disease in the primary care setting

Abstract

Introduction: Chronic obstructive pulmonary disease (COPD) is one of the most important public health problems due to its high prevalence, progressive nature, and costs of treatment and care.
Material and methods: We enrolled 1026 patients in our study (86.3% of the registered patients) to assess the incidence and severity of COPD, the degree of underdiagnosis, the association with smoking, and the presence of co-morbidities.
Results: COPD was diagnosed in 8.1% of the subjects over the age of 40, most of whom were current or former smokers (90.3%). More than half of the subjects (61.3%) presented with mild disease, 35.5% with moderate disease, and 3.2% with severe disease. The development of COPD is most affected by the number of pack-years and age. In women, the development of COPD is associated with a smaller number of pack-years.
Conclusions: We found that COPD is underdiagnosed in the primary care setting, as only 1% of the subjects carried the correct diagnosis. One of the reasons why COPD goes underdiagnosed is that doctors do not perform spirometry often enough. Cardiovascular disease is significantly more prevalent in patients with COPD.

Key words: COPD, epidemiology, spirometry, early diagnosis, cardiovascular disease, general practitioner

Introduction

Chronic exposure of the respiratory system to cigarette smoke or, to a lesser degree, to other environmental factors leads to an abnormal inflammatory response within the lungs, which in many cases results in progressive and incompletely reversible airflow limitation of the respiratory tract and in a pathological remodelling of the lungs. This airflow limitation is a diagnostic criterion of chronic obstructive pulmonary disease (COPD). COPD is one of the greatest public health problems due to its high prevalence, progressive nature, and costs of treatment and care [1, 2]. The rate of COPD development and its course vary from patient to patient [3]. Pulmonary changes develop from the very onset of exposure to COPD risk factors [4] and

discontinuation of exposure may, depending on the severity of the disease, improve pulmonary function, delay its progression, or even stop the progression of COPD completely [5].

Data on the incidence of COPD, its stages, underdiagnosis, association with smoking, and co-morbidities are incomplete and often inconsistent. The aim of our study was to evaluate these elements based on examinations conducted in the population of patients registered with general practitioners.

Material and methods

The study was conducted at the general practice of the Mining Complex of Outpatient Facilities of the "Unia Bracka" Foundation, the Miecho-

---

wice Health Centre, in a district of Bytom, with participation about 2450 registered adult patients. One of the two doctors employed at this health centre looked after about 1225 patients over the age of 18. The study was conducted between January and December 2006, and 1026 patients were enrolled (83.6% of all the patients registered with this doctor). The patients qualified for the study (without an acute respiratory disease or other contraindications to spirometry) underwent spirometry and were administered a questionnaire compiled by the Medical Research Council (MRC) in the United Kingdom [6]. Spirometry was performed using a portable spirometer (MicroLab 3300) in accordance with the recommendations of the Polish Society of Lung Diseases [7]. Spirometry was performed between 3 and 6 times on each of the patients. If the results were technically unsatisfactory, patients were asked to undergo a repeat spirometry at their next visit. If spirometry revealed signs of obstruction, a reversibility test was carried out involving a repeat spirometry performed 15 minutes following the inhalation of two doses of salbutamol (200 μg). The test was considered positive if FEV_1 increased by 15% from baseline and by more than 200 ml from the baseline spirometry values.

We analysed the results for FEV_1, FVC, and FEV_1/FVC in absolute terms and as a percentage of the predicted value. The normal ranges for these variables were in accordance with the guidelines of the European Community for Coal and Steel (ECCS) [8]. The diagnosis of COPD was made in accordance with the Global Initiative for Chronic Obstructive Lung Disease (GOLD) in patients with a negative reversibility test and when FEV_1/FVC was below 70% of the absolute value [5] with age-adjustment [9] in order to avoid false positive results (in older patients) and false negative results (in younger patients). The severity of COPD was assessed in accordance with the GOLD classification [5]. The MRC questionnaire included questions about smoking, respiratory symptoms, past and present lower respiratory tract diseases and their treatment, and about cardiovascular diseases. The questionnaire also included a question about the date of last spirometry. Medical records of patients with an obstructive pattern of ventilation were carefully analysed for co-morbidities and previous treatment. COPD was differentiated from asthma based on the patient's history (atopic features, frequent bronchospastic disorders in childhood, family history), current complaints (episodes of wheezing, paroxysmal dyspnoea sometimes accompanied by non-productive cough, chest tightness developing at night), and the presence of wheezes discovered on chest auscultation. Inconclusive cases were referred to the Outpatient Clinic of Lung Diseases for further evaluation. Hypertension was diagnosed in accordance with the Polish Hypertension Society guidelines, adopting a blood pressure value of 140/90 mm Hg as the threshold. Chronic coronary artery disease was diagnosed according to the Canadian Cardiovascular Society (CSS) criteria. Body mass index (BMI) values were calculated from the following formula: body mass in kilograms divided by the height in square metres. Hyperlipidaemia was diagnosed in line with the criteria published in the European Society of Cardiology (ESC) guidelines [10]. The statistical analysis was performed using the Statistica 4.3 En software package. The database was drawn up using an Excel spreadsheet. For all the quantitative variables, descriptive statistics, means, medians, maximum values, minimum values, standard deviations (SD), 95% intervals around the mean value, and standard errors were calculated. A significance level of p = 0.05 was adopted. The t-Student test was used for differences between the means and variances, and the uniformity of variance in the study groups was assessed with the Levene test. Frequency tables were used to summarise qualitative variables, and the statistical significance for qualitative variables was assessed using contingency tables. The degree of correlation was calculated using Pearson's χ^2 test, and the correlation coefficient was also determined: χ^2 and Spearman's rank correlation coefficient R.

Results

The study was conducted on 1026 subjects (83.8% of the population): 491 (47.9%) men and 535 (52.1%) women, 18–83 years of age. The mean age was 48.8 years (SD 16.3 years). The number of patients over the age of 40 was 703 (68.5%): 331 men and 372 women.

Almost half of the subjects (567 [55.3%]) were current or former smokers and the remaining 459 (44.7%) had never smoked.

A total of 343 subjects (33.4%; 200 men and 143 women) were current smokers. Former smokers accounted for 21.8% of the subjects (224 subjects: 135 men and 89 women). The mean age of the smoking men and that of smoking women was comparable (45.0 [SD 13.6] and 44.7 [SD 14.3] years, respectively). Former smokers were about 10 years older than current smokers. The mean age of never-smokers was 48 (SD 17.9) years and this group was characterised by a female-to-male predominance.
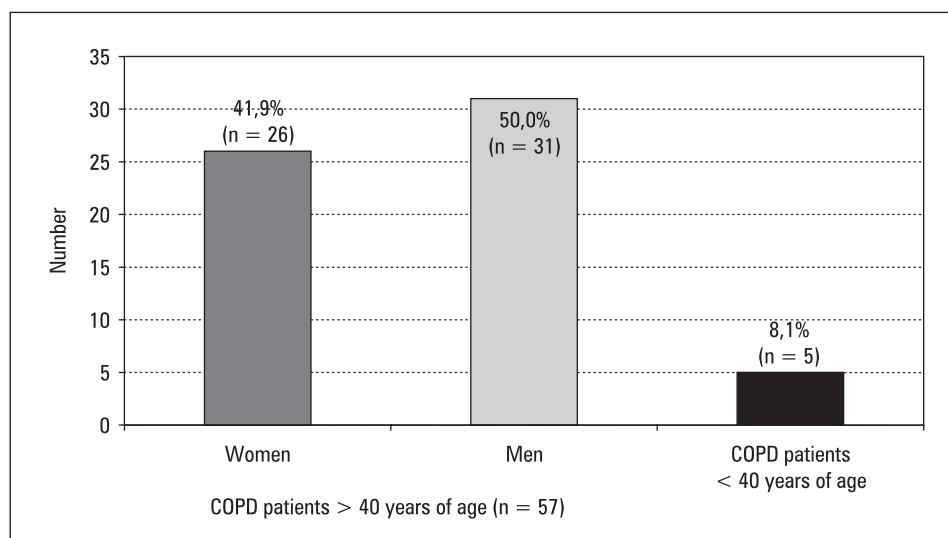
Figure 1. The number of COPD patients above 40 years of age

COPD was diagnosed in 62 (6.04%) of the subjects at the mean age of 58.5 (SD 13.8) years. Among the 62 subjects with COPD, only 5 were below 40 years of age (Fig. 1). The remaining 57 (92%) subjects (31 men and 26 women) were at least 40 years old. Among subjects over the age of 40, COPD was diagnosed in 8.1%. No statistically significant association between COPD and sex was observed.

Current and former smokers (34 and 22 subjects, respectively) accounted for 90.3% of patients suffering from COPD.

The mean number of pack-years in the group of smokers with COPD was 40.3 (SD 31.9), which was almost twice the number observed in the overall study population of current smokers (24.3 [SD 19.6]). In the group of smokers with COPD, at a comparable age of smoking men and women, women developed COPD at almost half the intensity of smoking than men did (p < 0.05). Table 1 shows a more detailed analysis of age and the number of packet-years in the groups of former and current male and female smokers. Within the group of 62 subjects with a diagnosis of COPD, more than a half had stage I (mild) disease (38 [61.3%] subjects), 22 (35.5%) had stage II (moderate) disease, 2 (3.2%) had stage III (severe) disease (Table 2), and none of the patients had stage IV (very severe) disease.

Nearly 75% of the subjects with stage I disease, 80% of the subjects with stage II disease, and all of the subjects with stage III disease reported coughing with sputum production. Dyspnoea occurred in almost 70% of the subjects with moderate disease and all of the subjects with severe disease.

A history of the following co-morbidities was most commonly given by the subjects: acute bronchitis (40.6% [417 subjects]), pneumonia (16.7% [171 subjects]), and asthma (3.9% [40 subjects]). A history consistent with the diagnosis of chronic bronchitis was provided by 2.2% (23) of the subjects. A total of 34.3% (353) of the subjects were receiving antihypertensive treatment, and ischaemic heart disease was documented in 23.6% (242) of the subjects. Table 3 provides a detailed analysis of the data on the respiratory and cardiovascular co-morbidities elicited from the patients.

Prior to the study, COPD was the least frequently diagnosed disease in the study population. It had been diagnosed in 10 out of 1026 (1.0%) subjects. In 7 of them the diagnosis of COPD had been made against guidelines. Five of them had never undergone spirometry, with the diagnosis having been made on the sole basis of history and clinical manifestations, and in the remaining two the diagnosis had been based on a technically unacceptable spirometry test. The correct diagnosis of COPD had only been made in 3 subjects (0.3% of the study population), including 4.8% of the subjects with newly diagnosed COPD. Two of them had moderate disease and the third patient with previously diagnosed COPD was being treated for severe disease.

Although more than 90% of the subjects with newly diagnosed COPD were current or former smokers and had a significant history of lower respiratory tract diseases (74% [46 subjects] had a history of acute bronchitis and 40.3% [25 subjects] had a history of pneumonia) as many as 51.6% (32) of the subjects with newly diagnosed COPD had never been treated for any lower respiratory tract disease (including one patient with severe COPD). The remaining patients with the diagno-

Table 1. The average number of pack-years among female and male current and former smokers diagnosed with COPD (n = 62)

Habit	Sex/habit	Age (SD)	Test t-Studenta	Average pack-years SD	Test t-Studenta	Average pack-years SD
Current smokers (n = 34)	Female smokers (n = 15)	52.3 (12.8)	NS	26.2 (12.8)	p < 0.05	40.3 (31.9)
	Male smokers (n = 19)	54.2 (13.3)		51.4 (38.0)		
Former smokers (n = 22)	Female former smokers (n = 7)	65.0 (5.9)	NS	28.3 (11.9)	NS	31.3 (23.8)
	Male former smokers (n = 15)	62.3 (13.7)		32.7 (28.0)		

SD — standard deviation

Table 2. The number of COPD patients. sex. age and pack-years in particular stages of COPD

Sex/age/pack-years	Stage I: mild COPD $FEV_1 > 80\%$ $FEV_1\%FVC < 70\%$ n = 38 (61.3%)	Stage II: moderate COPD $50\% < FEV_1 < 80\%$ $FEV_1\%FVC < 70\%$ n = 22 (35.5%)	Stage III; severe COPD $30\% < FEV_1 < 50\%$ $FEV_1\%FVC < 70\%$ n = 2 (3.2%)	Total n = 62 (100%)
Women (n = 27)	15 (39.5%)	12 (54.5%)	0 (0%)	27 (43.5%)
Age	21–71 lat	37–83 lat		
Men (n = 35)	23 (60.5%)	10 (45.5%)	2 (100.0%)	35 (56.5%)
Age	35–76 lat	47–81 lat	56–65 lat	
Total (n = 62)	38 (100.0%)	22 (100.0%)	2 (100.0%)	62 (100%)
Average age	57.3 (14.1)	60.4 (13.7)	60.5 (6.4)	58.5 (13.8)
Pack-years	31.3 (27.7)	31.7 (24.1)	98.0 (65.1)	33.7 (29.6)

SD — standard deviation

Table 3. The prevalence of the respiratory and cardiovascular diseases among the population studied n = 1026 (data from interview)

Disease entity	Number	Percentage
Past severe bronchitis	417	40.6%
Past pneumonia	171	16.7%
Asthma	40	3.9%
Chronic bronchitis	23	2.2%
COPD	10*	1.0%
Hypertension	352	34.3%
Chronic coronary disease	242	23.6%

*3 patients had chronic obstructive pulmonary disease (COPD) confirmed previously with the spirometric tests. 7 patients were diagnosed not in accordance with GOLD standards

sis of COPD carried a previous diagnosis of chronic bronchitis (30.6% [19 subjects]) or asthma (12.9% [8 subjects]) (Fig. 2).

Forty-four subjects (71%) with COPD were overweight or obese. The mean BMI for this group was 26.1 kg/m² (SD 4.2 kg/m²), the minimum BMI was 19.0 kg/m², and the maximum BMI was 40.2 kg/m² (SD 3.9 kg/m²). These data are shown in Table 4.

Abnormalities of lipid metabolism were present in 46 subjects with COPD (88.5%) and diabetes mellitus in 14.5%.

Hypertension and chronic coronary artery disease in subjects with COPD were twice as prevalent compared to the overall study population.

Due to the doubly prevalent hypertension and coronary artery disease in subjects with COPD, we carried out an analysis of correlation between COPD and coronary artery disease and hypertension (p < 0.05), the results of which are summarised in Table 5.

Spirometry had never been performed in 779 subjects (75.9%), and 72 subjects (7.0%) had
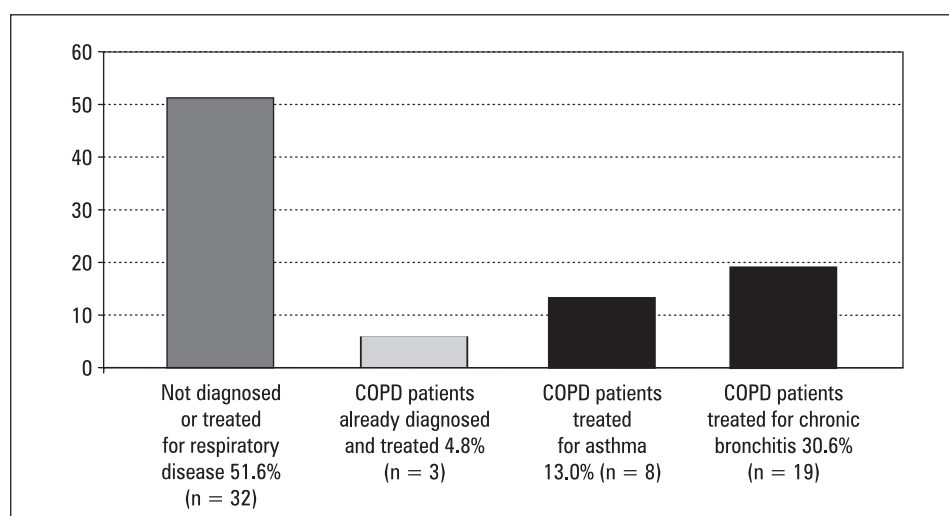
Figure 2. The percentage of patients treated and not treated before the study

Table 4. The prevalence of diseases other than respiratory among COPD patients (n = 62)

Disease entity	The number of patients diagnosed with the disease	The percentage of patients diagnosed with the disease
BMI ≥ 25 (overweight. obesity)	44	71.0%
Diabetes	9	14.5%
Dislipidodses	46	88.5%
Hypertension	40	64.5%
Coronary thrombosis	38	61.3%
Vascular lesions (varicose veins. atherosclerosis of peripheral vessels)	25	43.1%
Chronic gastritis duodenitis. gastroesophageal	32	58.2%

BMI — *body mass index*

their last spirometry done a very long time ago, before the year 2001. This meant that at baseline more than 5 years had elapsed since their last spirometry. Nearly half of the subjects with COPD (30 [48.4%]) had never had a spirometry done before and 13 subjects (21.0%) had had this test done more than 5 years before, i.e. before the year 2001 (Table 6). Only 30.6% of the subjects with COPD had had a spirometry done within the 5 years prior to baseline (i.e. between 2001 and 2006).

Discussion

COPD is an insidious disease and for the first few years its only manifestation may be a morning cough, often treated by patients as a "natural smoker's cough". Such patients get used to their symp-

toms and do not seek medical assistance [11] until they start experiencing dyspnoea [12].

Studies show that only 20% of patients with COPD present to their GPs because of symptoms of the disease [13, 14]. This finding has been confirmed by a study conducted among the inhabitants of the Krakow area which demonstrated that about 70% of patients with recently diagnosed COPD reported symptoms (morning cough, sputum production, dyspnoea) but these symptoms were almost never the reason for seeking medical attention [15]. The low percentage of patients presenting with symptoms of COPD results from the considerable lack of awareness of the disease [16]. In Poland this is the case, with as many as 80% patients suffering from COPD [12]. The widespread lack of awareness, failure to report symptoms to GPs on the part of patients, and failure to perform spirometry on the part of doctors all lead to the underestimation of the prevalence of COPD [17, 18]. It is believed that fewer than 6% of patients with COPD worldwide carry the actual diagnosis [19]. Most of them are patients with late-stage COPD, while the greatest degree of underdiagnosis of COPD is observed among patients with stage I or II of the disease [16, 20]. In Poland, among the patients looked after by general practitioners, most patients suffering from COPD have stage I or II of the disease (about 70–80%) [21, 22].

Our study showed that patients with mild COPD were enrolled without correct diagnosis of the disease although they accounted for nearly 3/4 of the subjects with newly diagnosed COPD. Similar findings were obtained by Maciejewski [23]. Only 1 out of 55 subjects with mild disease and 9 out of 94 subjects with moderate disease carried

Table 5. COPD and the concurrent cardiovascular diseases

Patients	Coronary thrombosis (n)	Correlation rate Test χ^2 Pearson (p)	Hypertension	Correlation rate Test χ^2 Pearson (p)
COPD patients (n = 62)	38	p < 0.01	40	p < 0.01
Non COPD patients (n = 964)	204		312	

Table 6. The frequency of spirometric tests performed in the population studied (n = 1026)

Spirometric test	Population studied (n = 1026)	The percentage of patients examined	COPD in population studied (n = 62)	The percentage of patients
Never performed	779	75.9%	30	48.4%
Performed before 2001	72	7.0%	13	21.0%
Total	851	82.9%	43	69.4%
Performed after 2001	175	17.1%	19	30.6%

the diagnosis of COPD at baseline. Such a high degree of underdiagnosis (only 4.8% of the subjects in our study carried the diagnosis of COPD at baseline) resulted from the underreporting of symptoms by patients and the failure to perform spirometry by doctors at the health centre, where only 17% of the patients had actually undergone this examination in the previous 5 years.

The unwillingness to perform spirometry observed among doctors is not only common in Poland but in other countries, with the reasons including a lack of a spirometer (as was the case with our health centre), a lack of time, a lack of skills required for the appropriate execution of the test, and a lack of the knowledge required for the correct interpretation of the spirometry results [24, 25]. A study conducted in the United Kingdom showed that 15 out of 21 practicing doctors had a spirometer at their disposal with only 2 of them actually performing the test [26]. In the United States, during 8 years of follow-up of patients with a diagnosis of COPD hospitalised at university hospitals, only 31% of COPD patients underwent spirometry [27]. A correctly performed spirometry test not only increases the incidence of COPD but allows one to avoid an incorrect diagnosis. Walker et al. [28] conducted a study among patients managed for COPD by primary care physicians and found that only half of them had their disease confirmed by spirometry. The remaining half of the patients enrolled in the study did not have any signs of obstruction and were being managed for a disease they did not have [28].

In Poland, 5–10% of the entire adult population cared for by primary care physicians suffer from COPD [29]. In Europe, the percentage of COPD patients over the age of 18 is similar (4–10%) [30, 31]. In our study the incidence of COPD in the study population of adults was 6.04%, which is consistent with the results of other Polish studies [32].

COPD is much more prevalent in patients over the age of 40 than it is in younger patients, with smoking being the main risk factor [33–37]. In our study, 14.8% of smokers over the age of 40 were suffering from COPD, which is similar to other studies in which the prevalence of COPD among smokers over the age of 40 ranged from 15% to 20% and even 30% [21].

Prevention and early treatment of COPD, especially smoking cessation, stop the development of COPD and cardiovascular disease, the association of which with COPD has been confirmed [38, 39]. Most recent publications suggest that the presence of COPD increases the risk of hypertension [40] and ischaemic stroke [41] and is associated with higher hospitalisation and mortality rates in patients with chronic ischaemic heart disease [42, 43].

In our study, more than 60% of subjects with COPD were being managed for hypertension and/or chronic coronary artery disease, while the prevalence of these two co-morbidities in the overall study population was twice as low. Lipid abnormalities, which are a predictive factor for cardiovascular disease, were observed in more than 3/4 of subjects with COPD and were often associated with overweight or obesity observed in 61.3% of the subjects.

An increased risk of cardiovascular changes in patients with COPD is not the only risk observed in this group. There is an increasing body of evidence supporting the co-existence of COPD with other conditions, including gastrointestinal conditions, particularly gastro-oesophageal reflux disease [44–46]. In our study, based on the history and the available medical documentation, we found gastrointestinal symptoms in 58.2% of the subjects with COPD. They were present in half of the subjects with mild disease and all of the subjects with severe disease.

Conclusions

1. Chronic obstructive pulmonary disease is underdiagnosed in the primary care setting, which is mainly due to the fact that doctors fail to perform spirometry often enough.
2. The number of smoking packet-years and age are the two most important risk factors for COPD.
3. Cardiovascular disease is significantly more prevalent in patients with COPD.
4. Current and former smokers over the age of 40 should be referred for spirometry, and patients with newly diagnosed COPD should be referred to smoking cessation counselling groups.

References

1. World Bank/WHO Global Burden of Disease Study http:www.who.int/topics/global burden of disease; 11.2007
2. Lopez A.D., Shibuya K., Rao C. et al. Chronic obstructive pulmonary disease: current burden and future projections. Eur. Respir. J. 2006; 27: 397–412.
3. Prescott E. Tobacco-related diseases: the role of gender. Dan. Med. Bull. 2000; 47: 115–131.
4. Anto J.M., Vermeire P., Vestbo J., Sunyer J. Epidemiology of chronic obstructive pulmonary disease. Eur. Respir. J. 2001; 17: 982–994.
5. Rozpoznawanie i leczenie przewlekłej obturacyjnej choroby płuc. Wytyczne Światowej Inicjatywy Zwalczania Przewlekłej Obturacyjnej Choroby Płuc (GOLD 2006). Med. Prakt. 2007; wyd. spec. 2: 13–16.
6. Meek P.A., Schwartzstein R.M., Adams L. et al. Dyspnea. Mechanisms, assessment and management: a consensus statement. Am. J. Respir. Crit. Care Med. 1999; 159: 321–340.
7. Zalecenia Polskiego Towarzystwa Chorób Płuc dotyczące wykonywania badań spirometrycznych. Pneumonol. Alergol. Pol. 2006; 74 (supl. 1): 6–44.
8. Quanier P.H., Tammeling G.J., Cotes J.E. et al. Lung volumes and forced expiratory flows. Eur. Respir. J. 1993; supl. 6: 5–49.
9. Enright P.L., Kaminsky D.A. Strategies for screening for chronic obstructive pulmonary disease. Respir. Care 2003; 48: 1194–1201.
10. Europejskie Towarzystwo Kardiologiczne. Europejskie wytyczne dotyczące prewencji chorób układu krążenia w praktyce klinicznej. Kardiol. Pol. 2004; 61 (supl. 1): 1–92.
11. Rennard S.M., Decramer P., Calverley N.B. et al. Impact of COPD in North America and Europe in 2000: subjects perspective of confronting international survey. Eur. Respir. J. 2002; 20: 799–805.
12. Zieliński J. Profilaktyka POChP. Nowe zadanie dla lekarza rodzinnego. Lekarz Rodz. 2005; 7–8: 748–756.
13. Chapman K.R. Chronic obstructive pulmonary disease: are women more susceptible than men? Clin. Chest Med. 2004; 25: 331–341.
14. Soriano J.B., Maier W.C., Egger P. et al. Recent trends in physician diagnosed COPD in women and men in the UK. Thorax 2000; 55: 789–794.
15. Krawczyk K., Skucha W. Częstość występowania przewlekłej obturacyjnej choroby płuc wśród przewlekle palących tytoń mieszkańców Krakowa i Proszowic. Przegl. Lek. 2000; 57: 617–618.
16. Menzin J., Brown J.S., Guadagno L. et al. Care-seeking behavior among subjects with early chronic obstructive lung disease identified through a community spirometry screening program: findings from the respiratory health promotion study (RHPS). Chest 2006; 130: 170.
17. Price D.B., Tinkelman D.G., Nordyke R.J. et al. Scoring system and clinical application of COPD diagnostic questionnaires. Chest 2006; 129: 1531–1539.
18. Halbert R.J., Isonaka S. International Primary Care Respiratory Group (IPCRG) Guidelines. Integrating diagnostic guidelines for managing chronic respiratory diseases in primary care. Prim. Care Resp. J. 2006; 15: 13–19.
19. Halbert R.J., Natoli J.L., Gano A., Badamgarav E., Buist S.A., Mannico D.M. Global burden of COPD systematic review and metaanalysis. Eur. Respir. J. 2006; 28: 523–532.
20. Stratelis G., Jakobsson P., Molstad S., Zetterstrom O. Early detection of COPD in primary care: screening by invitation of smokers aged 40 to 55 years. Br. J. Gen. Pract. 2004; 54: 201–206.
21. Bednarek M., Pływaczewski R., Górecka D. et al. Wczesne rozpoznawanie POChP badaniem spirometrycznym u palących papierosy mieszkańców Warszawy. Pneumonol. Alergol. Pol. 2002; 70: 139–147.
22. Lubiński W., Płusa T., Mierzejewska-Zawisza J.M. et al. Early detection of COPD in mass spirometry. Eur. Respir. J. 2002; 20 (supl. 38): 123.
23. Maciejewski J. Częstość występowania POChP w praktyce lekarza rodzinnego. Rozprawa doktorska, Instytut Gruźlicy i Chorób Płuc, 2007.
24. Grassi F.T., Stafford C. The use of spirometry to screen patients with chronic obstructive pulmonary disease risk factors at a military treatment facility. Chest 2006; 130: 174 S.
25. Glaab T., Banik N., Singel C., Wencker M. Guideline conformance for outpatient management of COPD in Germany. Dtsch. Med. Wochenschr. 2006; 131: 1203–1208.
26. Bashford S., Chadwick S., Ward J. et al. Identifying chronic obstructive pulmonary disease in the community — a primary care survey. Eur. Respir. J. 2002; 20 (supl. 38): 413S.
27. Damaria M., Celli B.R., Mellerova H.X., Pinto Plata V.M. Discrepancy in the use of confirmatory tests in patients hospitalized with the diagnosis of chronic obstructive pulmonary disease or congestive heart failure. Respir. Care 2006; 51: 1120–1124.
28. Walker P.P., Mitchell P., Diamantea F., Warburton C.J., Davies L. Effect of primary-care spirometry on the diagnosis and management of COPD. Eur. Respir. J. 2006; 28: 945–952.
29. Zieliński J., Roszkowski-Śliż K. Narodowy program wczesnego rozpoznawania i profilaktyki POChP. Pneumonol. Alergol. Pol. 2002; 70: 125–129.
30. Faulconer E.R., de Lusignan S. An eight — step method for assessing diagnostic data quality in practice: chronic obstructive pulmonary disease as an exemplar. Inform. Prim. Care 2004; 12: 243–254.
31. Lindberg A., Bjerg-Backlund A., Ronmark E., Larsson L.G., Lundback B. Prevalence and underdiagnosis of COPD by disease severity and the attributable fraction of smoking Report from the Obstructive Lung Disease in Northern Sweden Studies. Respir. Med. 2006; 100: 264–272.
32. Niepsuj G., Kozielski J., Niepsuj K., Ziora D., Polońska A., Cieślicki J. Przewlekła obturacyjna choroba płuc wśród mieszkańców miasta Zabrze. Wiad. Lek. 2002; 55 (supl. 1): 354–359.
33. Menezes A.M., Perez-Padilla R., Jardim J.R. et al. Chronic obstructive pulmonary disease in five Latin American cities (the PLATINO study): a prevalence study. Lancet 2005; 366: 1875–1881.
34. WordHealthOrganization.TobaccoAtlas.http://www.who.int/tobacco/global_data/country_profiles/amro/en/ Accessed 15, 2005. 11.2007.
35. Buist A.S., McBurnie M.A., Vollmer W.M. et al. International variation in the prevalence of COPD (The BOLD Study): a population-based prevalence study. Lancet 2007; 370: 741–750.
36. Fukuchi Y., Nishimura M., Ichinose M. et al. Prevalence of chronic obstructive pulmonary disease in Japan: the Nippon COPD epidemiology study. Respirology 2004; 9: 458–465.

37. Pena V.S., Miravitlles M., Gabriel R. et al. Geographic variations in prevalence and underdiagnosis of COPD: results of the IBERPOC multicentre epidemiological study. Chest 2000; 118: 981–989.
38. Sin D.D., Man S.F. Systemic inflammation and mortality in chronic obstructive pulmonary disease. Can. J. Physiol. Pharmacol. 2007; 85: 141–147.
39. Lee J.H., Leen D.S., Kim E.K. Simvastatin inhibits cigarette smoking induced emphysema and pulmonary hypertension in rat lungs. Am. J. Respir. Crit. Care Med. 2005; 172: 987–993.
40. Dhungel S., Paudel B., Shah S. Study of prevalence of hypertension in Chronic Obstructive Pulmonary Disease patients admitted at Nepal Medical College and Teaching Hospital. Nepal Med. Coll. J. 2005; 7: 90–92.
41. Hozawa A., Billings J.L., Shahar E. et al. Lung function and ischemic stroke incidence. The atherosclerosis risk in communities study. Chest 2006; 130: 1642–1649.
42. Lofdahl C.G., Postma D.S., Pride N.B., Boe J., Thoren A. Possible protection by inhaled budesonide against ischaemic cardiac events in mild COPD. Eur. Respir. J. 2007; 29: 1115–1119.
43. Sidney S., Sorel M., Quesenberry C.P., De Luise C., Lanes S., Eisner M.D. COPD and incident cardiovascular disease hospitalizations and mortality: Kaiser Permanent Medical Care Program. Chest 2005; 128: 2068–2075.
44. Rascon-Aguilar I.E., Pamer M., Wludyka P., Cury J., Coultas D., Lambiase L.R. Role of gastroesophageal reflux symptoms in exacerbations of COPD. Chest 2006; 130: 1096–1101.
45. Phulpoto M.A., Qayyum S., Rizvi N., Khuhawar S.M. Proportion of gastroesophageal reflux symptoms in patients with chronic obstructive pulmonary disease. J. Pak. Med. Assoc. 2005; 55: 276–279.
46. Casanova C., Daudet J.S., del Valle Velasco M., Martin J.M., Aguirre-Jaime A., de Torres J.P. Increased gastro-oesophageal reflux disease in patients with severe COPD. Eur. Respir. J. 2004; 23: 841–845.