

The pharmacotherapy preferred by doctors in treatment of patients diagnosed with asthma or chronic obstructive pulmonary disease or allergic rhinitis and concomitant diseases: an epidemiological analysis

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Abstract

Introduction: The clinical course of asthma and chronic obstructive pulmonary disease (COPD) is influenced by the co-occurrence of other chronic diseases and their pharmacotherapy. There are no data associated with the doctors' pharmacotherapy preferences in treatment of patients with asthma, COPD or allergic rhinitis and concomitant diseases.

Aim: The assessment of doctors' preferences in pharmacotherapy of asthma, COPD or allergic rhinitis in relation to concomitant diseases.

Material and methods: General practitioners, pulmonologists, allergists, laryngologists and paediatricians ($n = 319$) participated in a questionnaire survey concerning their preferences in pharmacotherapy of asthma, COPD and allergic rhinitis in relation to concomitant diseases enrolling 11,310 patients with asthma, COPD and allergic rhinitis.

Results: The concomitant diseases were reported in 58.5% of patients with asthma, 80.8% of patients with COPD and 46.4% of patients with allergic rhinitis. Patients with asthma were most frequently treated with inhaled glucocorticosteroids. However, in the subgroups with concomitant diseases, an increased usage of inhaled long-acting β_2 -mimetics was noted. Regardless of comorbidities, patients with COPD were most frequently treated with inhaled long-acting β_2 -mimetics whereas patients with allergic rhinitis – with nasal glucocorticosteroids and third-generation antihistamines.

Conclusions: The co-occurrence of chronic diseases was most frequent among patients diagnosed with COPD. The treatment of asthma, COPD and allergic rhinitis is consistent with international recommendations and the occurrence of concomitant diseases did not significantly influence therapeutic preferences and decisions.

Key words: asthma, chronic obstructive pulmonary disease, allergic rhinitis, concomitant diseases, pharmacotherapy, preferences.

Introduction

Asthma is a chronic inflammation disease with an accompanying, increased bronchial sensitivity. The frequency of asthma in Poland is estimated at 10.6% [1]. Direct and indirect annual costs of asthma treatment in the European Union are estimated at EUR 30 billion.

The appropriate pharmacotherapy allows obtaining control over asthma and minimizes its impact on pa-

tients' daily functioning [2]. The occurrence of asthma in patients with various comorbidities deteriorates their quality of life [3] and increases not only the frequency of the disease exacerbations [4] but also the rate of death in the period of 30 days following the hospitalization due such to exacerbations [5]. In this group, comorbidities such as: chronic bronchitis, chronic obstructive pulmonary disease (COPD), chronic sinusitis, stomach ulcers,

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cardiovascular disease, osteoporosis, diabetes, depression and cancer are more frequent than in the general population [6–9]. However, the most common comorbidities observed in patients with asthma are other allergic diseases such as allergic rhinitis and conjunctivitis [10, 11]. Chronic sinusitis is more frequent among patients with severe asthma than in those suffering from its mild form [12]. Asthma is also a risk factor for COPD development. It is estimated that the coexistence of COPD occurs in 20% of patients diagnosed with asthma and that the likelihood of this coexistence increases with age [13]. The deterioration of the ventilation parameters in older patients is an independent risk factor for fatal cardiovascular events [14]. Also, the risk of hypertension [15] and ischemic brain events [16] is increased in patients with asthma. Furthermore, a higher prevalence of asthma is observed among patients with obesity and type 2 diabetes [17–21]. In addition the sleep apnoea syndrome, gastroesophageal reflux disease and depression were shown to increase the frequency of asthma exacerbations [19–24].

According to the GINA recommendations, the severity of asthma should determine the selection of pharmacotherapy, while the difficulties in asthma control, despite intensification of pharmacotherapy, should encourage the search for concomitant diseases as well as the lack of compliance.

The COPD is a chronic disease, characterized by long-lasting bronchial obstruction accompanied by a chronic inflammatory response to toxic molecules and gases [25, 26]. The frequency of COPD, confirmed by spirometry, is 8.9% in the population aged over 40 years old [26], with the disease's morbidity increasing over time [27]. It is estimated that COPD will be the third most common cause of death in 2020 [28]. The comorbidities such as type 2 diabetes and ischemic heart disease are the cause of increased frequency of COPD exacerbations necessitating hospitalization [29]. In addition, an increased frequency of both depression and anxiety was found among COPD patients [30]. Moreover, the anxiety associated with dyspnoea is an independent risk factor for hospitalization in COPD exacerbations [31, 32], while depression is a risk factor for death in patients with COPD [31, 32]. Therefore, the choice of pharmacotherapy in COPD patients should be based on the COPD category in accordance with the GOLD recommendations, but also individualized taking into account other contraindications.

The frequency of allergic rhinitis is estimated at 5–17% in children aged 6–7 years old [33]. According to other studies, yearly allergic rhinitis occurred in 2.1% of children and 3.0% of adults, whereas seasonal in 8.9% of children and 8.7% of adults [34–37]. It has been shown that both direct and indirect costs associated with allergic rhinitis are high [38]. The disease does not cause serious complications but it does deteriorate the quality of life as well as decreases the productivity at work [39,

40]. It should be noted that among patients with allergic rhinitis, the occurrence of asthma is higher than in the general population. Therefore, the effective treatment of allergic rhinitis is crucial.

As mentioned above, the clinical course of asthma and COPD may be modified by comorbidities. Thus, an individual pharmacotherapy strategy should be considered. There are no data assessing the doctors' therapeutic preferences in patients with asthma, COPD or allergic rhinitis and comorbidities. Moreover, there are no data on the impact of the current GINA [41], GOLD [42] and allergic rhinitis recommendations on these preferences.

Aim

Therefore, the aim of the study was the assessment of doctors' preferences in pharmacotherapy of asthma, COPD or allergic rhinitis in relation to concomitant diseases.

Material and methods

In this observational survey, 11,310 outpatients with asthma, COPD or allergic rhinitis were interviewed nationwide by 319 general practitioners, pulmonologists, allergists, laryngologists and paediatricians from March to November 2016. Doctors participating in the study were recruited by medical representatives. Characteristics of the surveyed population are summarized in Table 1.

The two-part questionnaire consisted of several dichotomous and multiple choice questions. The first part of the questionnaire included the doctor's demographic data (specialization, internship, place of work) and question about therapeutic decisions taken in patients with asthma, COPD and allergic rhinitis with comorbidities, as well as factors determining these decisions.

The second part of the questionnaire included the patient's demographic data (gender, age, place of residence, education level) and clinical data: primary diagnosis (asthma/COPD/allergic rhinitis), disease duration, severity of the disease (for asthma: controlled asthma, partially controlled asthma/uncontrolled asthma according to GINA; for COPD: category from A to D according to GOLD; for allergic rhinitis: mild/moderate/severe), treatment used due to primary disease (divided into groups of drugs, depending on the primary diagnosis), comorbidities (allergic rhinitis, allergic conjunctivitis, chronic sinusitis, gastroesophageal reflux disease, overweight, obesity, type 1 and type 2 diabetes, sleep apnoea syndrome, COPD, depression, hypertension, ischaemic heart disease, other diseases on the basis of an ICD-10 code), and comorbidities medication.

Statistical analysis

The statistical analysis was performed using the Statistica 10.0 PL (Cracow, Poland) software package. Vari-

Table 1. Characteristics of doctors participating in the study (N = 319)

Variable	Result	Variable	Result
Specialization, n (%):		The most frequent therapeutic decisions taken in patients with COPD, n (%):	
Family medicine	16 (5.0)	Anticholinergic	156 (49.0)
Pulmonology	210 (66.0)	Short-acting inhaled β_2 -mimetic	83 (26.0)
Allergology	64 (20.0)	Inhaled glucocorticosteroids	32 (10.0)
Laryngology	3 (1.0)	Long-acting inhaled β_2 -mimetic	188 (59.0)
Paediatrics	26 (8.0)	Theophylline	6 (2.0)
Internship, n (%) [years]:		Oral glucocorticosteroids	0 (0)
≤ 10	0 (0)	Indacaterol	3 (1.0)
11–15	13 (4.0)	Inhibitor of phosphodiesterase 4	6 (2.0)
16–20	46 (14.0)	The most important factors influencing these therapeutic decisions, n (%):	
> 20	260 (82.0)	Patient age	121 (38.0)
Basic work place, n (%):		GOLD recommendations taking into account the severity of the disease	265 (83.0)
Public hospital	76 (24.0)	Occurrence of concomitant diseases	128 (40.0)
Private hospital	0 (0)	Interactions with other drugs	96 (30.0)
Public outpatient clinic	160 (50.0)	Impact on quality of life	156 (49.0)
Private clinic	57 (18.0)	Frequent therapeutic decisions taken in patients with allergic rhinitis, n (%):	
Private outpatient practice	26 (8.0)	Antihistamine I generation	19 (6.0)
Place in which the doctor works, n (%):		Antihistamine II generation	150 (47.0)
Rural	3 (1.0)	Antihistamine III generation	260 (80.0)
Town ≤ 200 000 residents	192 (60.0)	Drugs reducing nasal congestion	93 (29.0)
City > 200 000 residents	124 (39.0)	Nasal glucocorticosteroids	297 (93.0)
The most frequent therapeutic decisions taken in patients with asthma, n (%):		The most important factors influencing these therapeutic decisions, n (%):	
Short-acting inhaled β_2 -mimetic	128 (40.0)	Patient age	115 (36.0)
Inhaled glucocorticosteroids	268 (84.0)	Speed of the drug	160 (50.0)
Antileukotriene	51 (16.0)	Safety of use	239 (75.0)
Long-acting inhaled β_2 -mimetic	61 (19.0)	Efficacy	268 (84.0)
Long-acting anticholinergic	0 (0)	Severity of symptoms	239 (75.0)
Theophylline	0 (0)	Minimal effect on the central nervous system	160 (50.0)
Oral glucocorticosteroids	0 (0)	Interactions with other drugs	131 (41.0)
Antibody anti-IgE	0 (0)	Comorbidities	105 (33.0)
The most important factors influencing these therapeutic decisions, n (%):		Effect of the treatment on quality of life	179 (56.0)
Patient age	83 (26.0)	The effect of diagnosis of other chronic disease on modification of treatment for asthma or COPD or allergic rhinitis, n (%)	258 (81.0)
Recommendations GINA taking into account the severity of the disease	277 (87.0)	Reducing the dose of the drug used, n (%)	29 (9.0)
Occurrence of concomitant diseases	115 (36.0)	Increasing the dose of the drug used, n (%)	16 (5.0)
Interactions with other drugs	112 (35.0)	Changing the current drug used to a preparation of another group, n (%)	118 (37.0)
Impact on quality of life	179 (56.0)	Adding another drug, n (%)	38 (12.0)
		Withdrawal of a previously used drug, n (%)	57 (18.0)

able values were presented as percentages and mean values with standard deviations (SD). Separate groups were compared using the χ^2 and χ^2 for trend tests. A $p < 0.05$ was considered as statistically significant.

Results

Characteristics of doctors participating in this study

The group of participating doctors was dominated by pulmonologists and allergists (66% and 20%, respectively), working mainly in public outpatient clinics and hospitals in towns and cities. Eighty-two percent of doctors were working for more than 20 years (Table 1).

The therapeutic decision declared by doctors

Inhaled glucocorticosteroids and short-acting β_2 -agonist were most commonly used by patients with asthma. Antileukotriene drugs and inhaled long-acting β_2 -agonist were also frequently used. The most important factors influencing the doctors' therapeutic decisions were the GINA recommendations taking into consideration the disease's severity, the impact of the treatment on the patient's quality of life, and the comorbidities and drug interactions (Table 1).

In the population of patients with COPD, inhaled long-acting β_2 -agonists and cholinolytics were most commonly used, followed by short-acting β_2 -agonists. The severity of the disease, impact of the treatment on the quality of life, and comorbidities and patient's age were all taken into account in addition to GOLD recommendations in the decision making (Table 1).

In the population of patients with allergic rhinitis, nasal glucocorticosteroids and antihistamine III generation drugs were most commonly used. The most important factors influencing the treatment decisions were the efficacy, safety, and severity of the symptoms. Furthermore, comorbidities were determined as a very important factor influencing the therapeutic decisions for approximately 1/3 of doctors and as an important factor for 55% of doctors (Table 1).

The therapeutic decision taken in patients with asthma, COPD and allergic rhinitis and reported comorbidities

Thirty-seven percent of doctors declared that a diagnosis of *de novo* comorbidities most frequently resulted in a change of the used drug to a different one from another group, however cases of drug discontinuation or introduction were also common (Table 1).

Inhaled glucocorticosteroids were most commonly used in the treatment of asthma despite the co-occurrence of hypertension, type 2 diabetes, cardiovascular diseases and sleep apnoea (Table 2). However, the usage frequency of this drug was slightly decreased in such

groups in favour of the increased usage of long-acting β_2 -mimetics in comparison to the above described declaration related to the general population diagnosed with asthma. Similarly, in the treatment of COPD with comorbidities, inhaled long-acting β_2 -mimetics were most commonly used (Table 2). Nevertheless, in groups with comorbidities the use of inhaled short-acting β_2 -mimetics was increased in comparison to the above-described declaration related to the general population with COPD. In the treatment of allergic rhinitis, independently of comorbidities, nasal glucocorticosteroids and antihistaminic III generation drugs were the most common treatment (Table 2).

Study group characteristics

The study group was dominated by urban residents with vocational and secondary education, suffering from asthma. Characteristics of the surveyed population are summarized in Table 3.

Among the patients with asthma, 61.8% were diagnosed with controlled asthma. Uncontrolled asthma occurred in 1.3% of the population. Among the patients suffering from COPD, 48.0% were in the B category and 25.5% in the C category according to the GOLD recommendation. Among the patients with allergic rhinitis, 61.6% suffered from the disease's moderate and 32.6% from mild intensity (Table 4).

The most common treatment for asthma was inhaled glucocorticosteroids and long-acting β_2 -mimetics. For COPD the treatment most commonly involved inhaled long-acting β_2 -mimetics, cholinolytic drugs and inhaled glucocorticosteroids, whereas for allergic rhinitis – nasal glucocorticosteroids (Table 4).

Comorbidities were reported in 58.5% of patients with asthma, 80.8% of patients with COPD and 46.6% of patients with allergic rhinitis (Table 4).

The most common comorbidities in patients with asthma included hypertension (26.3%), allergic rhinitis (12.6%) and the gastroesophageal reflux disease (11.5%), among patients with COPD it was hypertension (58.3%), type 2 diabetes (23.2%), ischemic heart disease (21.8%) and overweight (20.3%) whereas in patients with allergic rhinitis – hypertension (17.8%) and the gastroesophageal reflux disease (13.8%).

The most important factors influencing the selection of the used asthma treatment were the GINA recommendations taking into account the severity of the disease (94.0%), patient age (53.0%) and the impact on the quality of life (48.1%). For COPD, the most important factors included the GOLD recommendations taking into account the severity of the disease (94.1%), patient age (63.8%) and the impact on the quality of life (57.9%). For allergic rhinitis, such factors involved the recommendations taking into account the severity of the disease (97.1%), patient age (68.5%) and the impact on the quality of life (66.3%). The comorbidities and drug interactions were

Table 2. Therapeutic preferences in the pharmacotherapy for asthma, COPD or allergic rhinitis and concomitant diseases

Variable	Rare	Frequent	Most common
Drugs used in patients with asthma and concomitant hypertension, <i>n</i> (%):			
Short-acting inhaled β_2 -mimetic	93 (29.0)	137 (43.0)	89 (28.0)
Inhaled glucocorticosteroids	41 (13.0)	46 (14.0)	233 (73.0)
Antileukotriene	76 (24.0)	172 (54.0)	70 (22.0)
Long-acting inhaled β_2 -mimetic	64 (20.0)	153 (48.0)	102 (32.0)
Long-acting anticholinergic	204 (64.0)	99 (31.0)	16 (5.0)
Theophylline	201 (63.0)	108 (34.0)	9 (3.0)
Oral glucocorticosteroids	230 (72.0)	86 (27.0)	3 (1.0)
Antibody anti-IgE	290 (91.0)	19 (6.0)	9 (3.0)
Drugs used in patients with asthma and concomitant type 2 diabetes, <i>n</i> (%):			
Short-acting inhaled β_2 -mimetic	86 (27.0)	115 (36.0)	118 (37.0)
Inhaled glucocorticosteroids	61 (19.0)	57 (18.0)	249 (78.0)
Antileukotriene	76 (24.0)	169 (53.0)	73 (23.0)
Long-acting inhaled β_2 -mimetic	61 (19.0)	137 (43.0)	121 (38.0)
Long-acting anticholinergic	223 (70.0)	80 (25.0)	16 (5.0)
Theophylline	195 (61.0)	115 (36.0)	9 (3.0)
Oral glucocorticosteroids	268 (84.0)	51 (16.0)	0 (0)
Antibody anti-IgE	287 (90.0)	16 (5.0)	16 (5.0)
Drugs used in patients with asthma and concomitant cardiovascular diseases, <i>n</i> (%):			
Short-acting inhaled β_2 -mimetic	93 (29.0)	137 (43.0)	89 (28.0)
Inhaled glucocorticosteroids	35 (11.0)	38 (12.0)	246 (77.0)
Antileukotriene	80 (25.0)	175 (55.0)	64 (20.0)
Long-acting inhaled β_2 -mimetic	51 (16.0)	166 (52.0)	102 (32.0)
Long-acting anticholinergic	198 (62.0)	105 (33.0)	16 (5.0)
Theophylline	214 (67.0)	99 (31.0)	6 (2.0)
Oral glucocorticosteroids	258 (81.0)	57 (18.0)	3 (1.0)
Antibody anti-IgE	281 (88.0)	26 (8.0)	13 (4.0)
Drugs used in patients with asthma and concomitant sleep apnoea, <i>n</i> (%):			
Short-acting inhaled β_2 -mimetic	83 (26.0)	108 (34.0)	128 (40.0)
Inhaled glucocorticosteroids	54 (17.0)	41 (13.0)	223 (70.0)
Antileukotriene	93 (29.0)	160 (50.0)	67 (21.0)
Long-acting inhaled β_2 -mimetic	54 (17.0)	134 (42.0)	131 (41.0)
Long-acting anticholinergic	204 (64.0)	89 (28.0)	26 (8.0)
Theophylline	169 (53.0)	137 (43.0)	13 (4.0)
Oral glucocorticosteroids	242 (76.0)	73 (23.0)	3 (1.0)
Antibody anti-IgE	284 (89.0)	19 (6.0)	16 (5.0)
Drugs used in patients with COPD and concomitant hypertension, <i>n</i> (%):			
Short-acting inhaled β_2 -mimetic	102 (32.0)	102 (32.0)	115 (36.0)
Inhaled glucocorticosteroids	70 (22.0)	172 (54.0)	76 (24.0)
Antileukotriene	192 (60.0)	108 (34.0)	19 (6.0)
Long-acting inhaled β_2 -mimetic	64 (20.0)	115 (36.0)	140 (44.0)
Long-acting anticholinergic	102 (32.0)	86 (27.0)	131 (41.0)

Table 2. Cont.

Variable	Rare	Frequent	Most common
Theophylline	179 (56.0)	128 (40.0)	13 (4.0)
Oral glucocorticosteroids, n (%)	258 (81.0)	57 (18.0)	3 (1.0)
Drugs used in patients with COPD and concomitant type 2 diabetes, n (%):			
Short-acting inhaled β_2 -mimetic	99 (31.0)	115 (36.0)	105 (33.0)
Inhaled glucocorticosteroids	89 (28.0)	160 (50.0)	70 (22.0)
Antileukotriene	210 (66.0)	80 (25.0)	29 (9.0)
Long-acting inhaled β_2 -mimetic	54 (17.0)	93 (29.0)	172 (54.0)
Long-acting anticholinergic	102 (32.0)	89 (28.0)	128 (40.0)
Theophylline	265 (83.0)	51 (16.0)	3 (1.0)
Oral glucocorticosteroids	300 (94.0)	19 (6.0)	0 (0)
Drugs used in patients with COPD and concomitant cardiovascular diseases, n (%):			
Short-acting inhaled β_2 -mimetic	99 (31.0)	112 (35.0)	108 (34.0)
Inhaled glucocorticosteroids	83 (26.0)	166 (52.0)	70 (22.0)
Antileukotriene	201 (63.0)	83 (26.0)	35 (11.0)
Long-acting inhaled β_2 -mimetic	61 (19.0)	118 (37.0)	140 (44.0)
Long-acting anticholinergic	108 (34.0)	73 (23.0)	137 (43.0)
Theophylline	195 (61.0)	118 (37.0)	6 (2.0)
Oral glucocorticosteroids	271 (85.0)	46 (14.0)	3 (1.0)
Drugs used in patients with COPD and concomitant sleep apnoea, n (%):			
Short-acting inhaled β_2 -mimetic	93 (29.0)	115 (36.0)	112 (35.0)
Inhaled glucocorticosteroids	86 (27.0)	147 (46.0)	86 (27.0)
Antileukotriene	217 (68.0)	83 (26.0)	19 (6.0)
Long-acting inhaled β_2 -mimetic	51 (16.0)	115 (36.0)	153 (48.0)
Long-acting anticholinergic	83 (26.0)	80 (25.0)	156 (49.0)
Theophylline	175 (55.0)	124 (39.0)	19 (6.0)
Oral glucocorticosteroids	274 (86.0)	38 (12.0)	6 (2.0)
Drugs used in patients with allergic rhinitis and concomitant hypertension, n (%):			
Antihistamine I generation	249 (78.0)	61 (19.0)	9 (3.0)
Antihistamine II generation	90 (30.0)	131 (41.0)	93 (29.0)
Antihistamine III generation	76 (24.0)	115 (36.0)	128 (40.0)
Drugs reducing nasal congestion	195 (61.0)	112 (35.0)	13 (4.0)
Nasal glucocorticosteroids	61 (19.0)	76 (24.0)	182 (57.0)
Drugs used in patients with allergic rhinitis and concomitant type 2 diabetes, n (%):			
Antihistamine I generation	252 (79.0)	57 (18.0)	9 (3.0)
Antihistamine II generation	112 (35.0)	140 (44.0)	67 (21.0)
Antihistamine III generation	73 (23.0)	115 (36.0)	131 (41.0)
Drugs reducing nasal congestion	172 (54.0)	128 (40.0)	19 (6.0)
Nasal glucocorticosteroids	207 (65.0)	48 (15.0)	64 (20.0)
Drugs used in patients with allergic rhinitis and concomitant cardiovascular diseases, n (%):			
Antihistamine I generation	281 (88.0)	32 (10.0)	6 (2.0)
Antihistamine II generation	118 (37.0)	128 (40.0)	73 (23.0)
Antihistamine III generation	73 (23.0)	128 (40.0)	118 (37.0)
Drugs reducing nasal congestion	179 (56.0)	124 (39.0)	16 (5.0)
Nasal glucocorticosteroids	61 (19.0)	86 (27.0)	172 (54.0)
Drugs used in patients with allergic rhinitis and concomitant sleep apnoea, n (%):			

Table 2. Cont.

Variable	Rare	Frequent	Most common
Antihistamine I generation	252 (79.0)	54 (17.0)	13 (4.0)
Antihistamine II generation	134 (42.0)	128 (40.0)	57 (18.0)
Antihistamine III generation	83 (26.0)	115 (36.0)	121 (38.0)
Drugs reducing nasal congestion	160 (50.0)	134 (42.0)	26 (8.0)
Nasal glucocorticosteroids	61 (19.0)	70 (22.0)	188 (59.0)

Table 3. Study group characteristics (N = 11,310)

Parameter	Result
Age, mean ± SD [years]	49.7 ±19.6
Gender, n (%):	
Male	5,497 (48.6)
Female	5,813 (51.4)
Education, n (%):	
Primary	1,482 (13.1)
Vocational	3,608 (31.9)
Secondary	3,992 (35.3)
Higher	2,228 (19.7)
Place of residence, n (%):	
Rural	2,895 (25.6)
Town ≤ 200 000 residents	6,662 (58.9)
City > 200 000 residents	1,753 (15.5)
Primary diagnosis, n (%):	
Asthma	5,492 (48.6)
COPD	2,868 (25.3)
Allergic rhinitis	2,950 (26.1)

the least common factor taken into consideration in patients diagnosed with asthma (37.5% and 39.3%, respectively) – Table 4.

Discussion

Doctors participating in this study most commonly declared the use of inhaled glucocorticosteroids and then short-acting β₂-agonists for asthma treatment. This strategy is in accordance with grade 2 therapy and secondly with grade 1 therapy recommended by GINA [41]. It suggests that subjects with mild asthma dominated among their patients when initiating the treatment. This hypothesis is supported by the results assessing the factors determining the therapeutic decisions among which the most important were GINA recommendations taking into consideration the severity of the disease. It should be noted that inhaled glucocorticosteroids were most commonly used for asthma treatment regardless

of the co-occurrence of hypertension, type 2 diabetes, cardiovascular diseases and sleep apnoea. However, their use in patients with comorbidities slightly decreased in favour of long-acting β₂-mimetics. It is interesting as this strategy is not in accordance with grade 3 therapy recommended by GINA [41]. Thus, these decisions cannot be explained by asthma exacerbations. On the other hand, inhaled glucocorticosteroids are used in low doses and their absorption from the respiratory tract into the systemic circulation is low. Therefore, their impact on the course of comorbidities is negligible. Further studies are necessary to explain the factors that influenced these therapeutic preferences.

When comparing the physicians’ declarations with the results in the study group of patients with asthma, some differences appear concerning the use of long-acting β₂-mimetics that were more commonly prescribed than short-acting inhaled β₂-mimetics. The comorbidities occurred in 58.5% of patients with asthma, with the most common one being hypertension. The most important factors indicated by the physician as justification of the treatment for asthma were the GINA recommendation taking into account the severity of the disease, whereas comorbidities were the least important factor taken into account.

In the population of patients with COPD, doctors most commonly declared the use of inhaled long-acting β₂-agonist and cholinolytics, followed by inhaled short-acting β₂-agonists. This selection of drugs is recommended by the GOLD strategy as the treatment of first choice in B–D class COPD [42]. The questionnaire did not include questions concerning the choice of drugs in relation to the severity of the disease. However, our results suggest that among the study population, patients with this stage of the disease were dominant. This hypothesis is supported by the results assessing factors determining the therapeutic decisions among which the most important factor was the GOLD recommendations tailored to the severity of the disease. It should be noted that inhaled long-acting β₂-mimetics were most commonly prescribed in COPD treatment regardless of the co-occurrence of hypertension, type 2 diabetes, cardiovascular diseases and sleep apnoea. However, in groups with comorbidities, an increased use of inhaled short-acting β₂-mimetics in comparison to the declaration was noted

Table 4. Clinical characteristics of study subgroups

Parameter	Asthma (N = 5492)	COPD (N = 2868)	Allergic rhinitis (N = 2950)
Duration of the disease, n (%):			
< 3 months	71 (1.3)	20 (0.7)	12 (0.4)
3–6 months	71 (1.3)	86 (3.0)	32 (1.1)
6–12 months	132 (2.4)	43 (1.5)	106 (3.6)
1–2 years	434 (7.9)	138 (4.8)	212 (7.2)
2–3 years	533 (9.7)	370 (12.9)	448 (15.2)
3–4 years	0 (0)	0 (0)	32 (1.1)
4–5 years	895 (16.3)	677 (23.6)	555 (18.8)
> 5 years	3,335 (60.9)	1,534 (53.5)	1,549 (52.5)
Severity of asthma according to GINA, n (%):			
Controlled asthma	3394 (61.8)	–	–
Partially controlled asthma	2,027 (36.9)	–	–
Uncontrolled asthma	71 (1.3)	–	–
Severity of COPD according to GOLD, n (%):			
Category A	–	338 (11.8)	–
Category B	–	1,377 (48.0)	–
Category C	–	731 (25.5)	–
Category D	–	424 (14.8)	–
Severity of allergic rhinitis, n (%):			
Mild	–	–	962 (32.6)
Moderate	–	–	1,817 (61.6)
Severe	–	–	171 (5.8)
Treatment used for asthma, n (%):			
Short-acting inhaled β_2 -mimetic	1,307 (23.8)	–	–
Inhaled glucocorticosteroids	1,560 (28.4)	–	–
Antileukotriene	972 (17.7)	–	–
Long-acting inhaled β_2 -mimetic	1,400 (25.5)	–	–
Long-acting anticholinergic	93 (1.7)	–	–
Theophylline	121 (2.2)	–	–
Oral glucocorticosteroids	33 (0.6)	–	–
Antibody anti-IgE	11 (0.2)	–	–
Treatment used for COPD, n (%):			
Anticholinergic	–	576 (20.1)	–
Short-acting inhaled β_2 -mimetic	–	424 (14.8)	–
Inhaled glucocorticosteroids	–	562 (19.6)	–
Long-acting inhaled β_2 -mimetic	–	843 (29.4)	–
Theophylline	–	330 (11.5)	–
Oral glucocorticosteroids	–	43 (1.5)	–
Indacaterol	–	69 (2.4)	–
An inhibitor of phosphodiesterase 4	–	20 (0.7)	–

Table 4. Cont.

Parameter	Asthma (N = 5492)	COPD (N = 2868)	Allergic rhinitis (N = 2950)
Treatment used for allergic rhinitis, n (%):			
Antihistamine I generation	–	–	68 (2.3)
Antihistamine II generation	–	–	560 (19.0)
Antihistamine III generation	–	–	723 (24.5)
Drugs reducing nasal congestion	–	–	115 (3.9)
Nasal glucocorticosteroids	–	–	1,484 (50.3)
Concomitant diseases, n (%)			
Allergic rhinitis, n (%)	692 (12.6)	20 (0.7)	–
Allergic conjunctivitis, n (%)	373 (6.8)	43 (1.5)	183 (6.2)
Chronic sinusitis, n (%)	143 (2.6)	52 (1.8)	204 (6.9)
Gastroesophageal reflux disease, n (%)	632 (11.5)	508 (17.7)	408 (13.8)
Obesity, n (%)	313 (5.7)	244 (8.5)	139 (4.7)
Overweight, n (%)	533 (9.7)	582 (20.3)	236 (8.0)
Type 1 diabetes, n (%)	49 (0.9)	149 (5.2)	41 (1.4)
Type 2 diabetes, n (%)	500 (9.1)	665 (23.2)	118 (4.0)
Sleep apnoea syndrome, n (%)	49 (0.9)	138 (4.8)	32 (1.1)
Depression, n (%)	170 (3.1)	138 (4.8)	41 (1.4)
Hypertension, n (%)	1444 (26.3)	1,672 (58.3)	525 (17.8)
Ischemic heart disease, n (%)	341 (6.2)	652 (21.8)	41 (1.4)
Factors that influence the choice of the treatment used for asthma or COPD or allergic rhinitis, n (%):			
Patient age	2,911 (53.0)	1,830 (63.8)	2,021 (68.5)
GINA or GOLD recommendations or allergic rhinitis taking into account the severity of the disease	5,162 (94.0)	2,699 (94.1)	2,864 (97.1)
Occurrence of concomitant diseases	2,060 (37.5)	1,554 (54.2)	1,572 (53.3)
Interactions with other drugs	2,158 (39.3)	1,417 (49.4)	1,528 (51.8)
Impact on quality of life	2,642 (48.1)	1,661 (57.9)	1,956 (66.3)
Price of the drug	1,032 (18.8)	221 (7.7)	941 (31.9)

for general COPD populations. This may indicate frequent occurrence of dyspnoea among patients with comorbidities. The hypothesis is supported by the observation that COPD exacerbations are most common among patients with comorbidities such as diabetes and cardiovascular diseases [29].

In the observed group of patients, the most common COPD medications were inhaled long-acting β_2 -mimetics, cholinolytic drugs and inhaled glucocorticosteroids. The comorbidities occurred in 80.8% of patients with COPD, with the most common one being hypertension. The most important factors influencing the choice of asthma treatment were GINA recommendations tailored to the severity of the disease. It is worth mentioning that comorbidities were not among the three most important factors influencing the therapeutic decisions. However, a relatively common use of inhaled glucocorticosteroids

suggests their use for the prevention of exacerbations in COPD patients at high risk of exacerbation, which is in accordance with GOLD recommendations [42].

In the population of patients with allergic rhinitis, doctors most commonly declared the use of nasal glucocorticosteroids and antihistamine III generation drugs. Antihistamine drugs, according to recommendations, are the first-line treatment of allergic rhinitis together with preparations that reduce nasal congestion. However, an additional use of glucocorticosteroids is recommended when the therapy is not effective [43]. Thus, the declared decisions are partially inconsistent with the recommendations. On the other hand, glucocorticosteroids are most effective in removing all symptoms of allergic rhinitis [43]. Indeed, the doctors determined effectiveness as the most important factor in the decision-making process. It should be noted that the choice of nasal glucocor-

ticosteroids and antihistamine III generation drugs was not affected by the occurrence of comorbidities.

The frequency of nasal glucocorticosteroids prescribed in study patients with allergic rhinitis is in line with doctors' preferences. The most important factors influencing the selection of the treatment for allergic rhinitis were the recommendations tailored to the severity of the disease. Whereas comorbidities (reported in 46.6% of patients) were not among the three most important factors influencing therapeutic choices.

Conclusions

The co-occurrence of chronic diseases was most frequent among patients diagnosed with COPD. The treatment of asthma, COPD and allergic rhinitis is consistent with international recommendations and the occurrence of concomitant diseases did not significantly influence the therapeutic preferences and decisions.

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Conflict of interest

The authors declare no conflict of interest.

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