

Correlates of respiratory admissions frequency in patients with obstructive lung diseases: coping styles, personality and anxiety

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Summary

Aim. Asthma and chronic obstructive pulmonary disease (COPD) are associated with a huge financial burden on the budget and healthcare in the world. Personality traits, ways of coping with stress and anxiety levels affect the functioning of sick people. Objective of the study was to evaluate correlation between those features and the frequency of hospital and outpatient clinic admissions among people with chronic pulmonary diseases.

Methods. Participants ($n = 100$) with asthma and COPD were subjected to: a sociodemographic survey, *NEO-FFI Personality Inventory*, *State-Trait Anxiety Inventory* (STAI) and *Brief COPE Inventory*.

Results. There was a relationship between the hospital admission frequency and neuroticism (positive correlation). The frequency of visits to the outpatient clinic was positively correlated with the level of conscientiousness, use of emotional support and negatively with cessation of action.

Conclusions. The obtained results may indicate the need to offer patients with respiratory diseases psychotherapeutic activities aimed at building a more constructive functioning, reducing anxiety, increasing the sense of control.

Key words: obstructive lung diseases, respiratory admissions frequency, mental functioning

Introduction

Chronic obstructive pulmonary disease (COPD) and asthma are chronic diseases that affect millions of people around the world. Epidemiological data indicate that about 300 million people have a diagnosis of asthma, and COPD is now one of the leading causes of mortality [1, 2]. Economic burden of asthma and COPD is also a problem of healthcare budget because of direct costs such as numerous clinic visits and hospitalizations [1, 3, 4].

It is believed that the patient's motivation for contact with medical personnel has many conditions. The use of specialist visits is considered as pro-health behavior, it also results from the cooperative attitude of the patient and adherence to medical recommendations [5]. It is also rational to establish contact with a physician following exacerbation of symptoms, although the ability of pulmonary patients to distinguish exacerbation of the disease from the physiological symptoms of stress is discussed in this case [6, 7]. Taking into account psychological variables, some patients will initiate contact with a physician for instrumental purposes and to relieve tension in the situation of increased anxiety accompanying the struggle with the stressful situation [8, 9]. People differ in the initial level of anxiety, its tolerance and predisposition to anxiety reactions in new situations [10]. Behavioral patterns in difficult situations, such as enhancing escape reactions, or satisfying mental needs (e.g., care) in the case of activation of support, may also play a significant role in the regulation of contact with medical personnel. It should also be added that activation of support as a way of dealing with difficult situations in people with selected respiratory diseases may be justified due to the fact that these patients have a reduced sense of control over the course of the disease. Furthermore, asthma treatment often includes the family (support system), and the daily activity of the patients is significantly reduced, while the limitations in functioning may be deliberately introduced through anxiety driven by feedback between the mental state and symptoms [11].

Research has shown that anxiety is the most common psychological disorder in people with obstructive diseases [12–14] and its level is significantly higher than in healthy people [15]. According to the Spielberger's model of trait anxiety [16], people with a high level of trait anxiety reveal a tendency to respond to stimuli with ambiguous character with anxiety and increased tension, which may result from increased excitability of the nervous system. It can be expected that in situations of slight exacerbation of the disease or other negative experiences, a high level of trait anxiety increases the likelihood of stress reactions. In COPD and asthma, focusing attention on negative stimuli can lead to the most common symptoms such as dyspnea, fast breathing, etc., which additionally increases the risk of stress transaction [9, 11].

Gudmundsson et al. [8] show that people with anxiety benefit from contact with health care even twice as often as those without this problem. Some patients with high levels of anxiety may also have strong defense mechanisms that lower the quality of cooperation with the clinician. In turn, people with selected respiratory diseases experiencing anxiety have a greater tendency not to follow medical recommendations, which in the long-term affects the need for hospitalization [17]. There is also a positive relationship between the level of anxiety in people with obstructive lung diseases

and the number of hospitalizations [18, 19] as well as the length of hospitalization [20]. This correlation can be explained by the fact that a high level of anxiety leads to a weaker discernment of the symptoms of anxiety and breathing problems, which results in more frequent use of medical help [6, 7].

Among the important variables determining the interpretation of the significance of events and the regulation of behavior, there are many other personality conditions apart from trait anxiety [21]. In reference to the Big Five model, decreased health is associated with high neuroticism [18, 22–29] and low conscientiousness [28–30], agreeability [28, 29], extraversion [28–30], and openness to experience [28, 30]. The effectiveness of medical actions is related to openness and extraversion [31]. Conscientious people follow medical recommendations and pay attention to the dates of follow-up visits. This relationship is particularly evident in groups of people with chronic diseases, including respiratory diseases [22, 32].

People with asthma and COPD are exposed to additional stress associated with coping with the disease. The symptoms of stress can be strengthened by the tendency of some patients to interpret them as an increase in the severity of symptoms. The transactional stress model [9] assumes that the assessment of a stressful situation depends, on the one hand, on the personality-conditioned interpretation of events (primary assessment) and, on the other hand, on the process of coping with stress related to the assessment of available resources. Based on the transactional stress model, many detailed concepts of dealing with it arose, and one of them refers to the idea of Lazarus, as well as to the concept of behavior regulation [33, 34]. An important aspect of this model is the inclusion of the search for support and its division into emotional and instrumental support. A patient with a chronic disease manifests for the medical personnel both the need to receive information and emotional support, although it is stated that patients generally have difficulty defining their own expectations [35]. It seems reasonable to assume that an individual in the role of a patient, focused on receiving emotional support, can expect it from many sources (medical personnel, family, work environment). According to the discussed concept, outpatient appointments and hospitalizations are a means of regulating behaviors used to achieve the goal. At the same time, they can be a behavioral form of coping with stress.

Active coping with the disease is associated with attempts to change the situation in which the patient was found and with a higher quality of life [36]. Coping with emotions, especially with their expression, translates to a better assessment of health, reduction of stress and is associated with a smaller number of visits [37]. Avoidance strategies are important in reducing stress at the beginning of the disease and at the time of diagnosis, but may have a negative impact in the long run. In coping with chronic disease, which is asthma or COPD, it is optimal to follow medical prescriptions, but also to have adequate knowledge about the disease. Avoidance strategies by diverting attention or – in an extreme situation – preventing information about the disease, limit its understanding and control [38], and thus reduce the use of the therapeutic regime and lead to an increase in physical symptoms [39]. It was shown that the fewer avoidance strategies were used by patients with respiratory diseases, the less likely they were to visit the hospital during the year preceding the study [40].

At the same time, on the basis of previous studies, it may be assumed that the condition for effective coping is flexibility and the ability to select the strategy properly depending on the situation because the strategy, which can be considered the most functional, varies depending on the situation [41, 42].

In the model tested in this study, Spielberger's concept of trait and state anxiety [16], the Big Five personality traits [43] and Carver and Scheier's concept of coping [33, 34], were used to determine three sources of variability in the behavior of patients with obstructive pulmonary diseases in the field of contact with the health service. First of all, people differ in the threshold of tolerance to stress and the degree of reacting with anxiety to new situations. Moreover, in certain circumstances they may experience elevated state anxiety. Secondly, permanent personality dispositions determine the way of interpreting reality and adaptation to the environment, which may affect the primary assessment of the stressful situation, but also the regulation of health behaviors. Thirdly, the behavioral dimension of the patient's functioning is conditioned by the secondary assessment in stress situations, based on the availability of certain forms of dealing with situations whose requirements exceed their own resources or force self-regulatory processes.

The aforementioned theoretical and empirical reports lead to the conclusion that the frequency of contacts between people with respiratory diseases and health care can be related to both the severity of somatic symptoms and accompanying anxiety, personality predispositions and preferences in terms of coping with stress. On the basis of the literature on the subject presented above, the following hypotheses were formulated:

1. Personality traits related to the tendency to feel anxiety (neuroticism and trait anxiety), conscientiousness, openness to experience, and extroversion have a positive impact on the frequency of contact of patients with obstructive lung diseases with medical personnel.
2. Task-oriented styles of coping with stress, search for emotional and instrumental support are positively associated with the frequency of contact between patients with obstructive pulmonary diseases and medical personnel.
3. The style of coping with stress focused on cessation of activities is negatively associated with the frequency of visits of patients with pulmonary diseases in outpatient clinics, and positively with the frequency of hospitalizations.
4. The number of situations that are accompanied by dyspnea and the level of anxiety in pulmonary patients are positively associated with the frequency of contact with medical personnel.

Material and methods

The research was conducted on the group of 100 subjects suffering from moderate and severe level of asthma ($N = 50$) or COPD ($N = 50$). Participants of the study were 54 women (24 with COPD, 30 with asthma) and 46 men (26 with COPD, 20 with asthma). The groups of persons with asthma and COPD did not differ significantly in terms of sex ($\chi^2 = 2.335$; $p = 0.311$). The study covered people aged 18–88, the mean age was 59.1 years ($SD \pm 14.93$). Out of 100 participants, 84 were the patients

of an outpatient clinic and also 84 were hospitalized in a pulmonary ward during the year preceding the research. The average number of visits in outpatient clinic was 6.27 ($SD \pm 6.39$) (among women: mean 6.08; $SD \pm 7.06$; among men: mean 6.51; $SD \pm 5.47$) and the average number of hospitalizations was 2.4 ($SD \pm 2.11$) (among women: mean 2.17; $SD \pm 2.22$; among men: mean 2.63; $SD \pm 1.98$).

The assessment of the severity of the disease and qualification for participation in this study was based on the diagnosis provided by the attending physicians – it was the basic inclusion criterion in the study. The remaining criteria are the lack of intellectual disability, written consent and state of health allowing the participation in the study. Subjects were patients of the Provincial Health Care Treatment Center of Lung Diseases and Rehabilitation in Lodz and the Provincial Outpatient Clinic of Lung Diseases and Respiratory Allergy in Lodz.

The study was approved by the Ethics Committee (approval no. RNN/578/10/KB).

The following methods were used:

1. NEO-FFI *Personality Inventory* (developed by P.T. Costa and R.R. McCrae, Polish adaptation by B. Zawadzki, J. Strelau, P. Szczepanik, M. Śliwińska [43]; it is composed of 60 items measuring personality traits according to the Big Five Model: openness, conscientiousness, extraversion, agreeableness, and neuroticism.
2. *State-Trait Anxiety Inventory* (STAI) (developed by C.D. Spilberger, R.L. Goruch, R.E. Lushene, Polish adaptation by C.D. Spilberger, J. Strelau, M. Tesarczyk, K. Wrześniewski [44]; it contains 20 items measuring the level of state anxiety (at the very moment of the study) and 20 items measuring trait anxiety (the overall tendency to see different life events as threatening and react with anxiety).
3. *Brief COPE Inventory* (Ch. S. Carver, Polish adaptation by Z. Juczyński, N. Ogińska-Bulik) – is an abbreviated version of the COPE Inventory. It is a scale to measure 14 stress coping styles [45]. The full version of this tool is the most commonly used one for measuring coping styles [18]. The study used a shortened version due to the state of health and the age of the subjects.
4. Sociodemographic questionnaire – it allowed to obtain sociodemographic data and more detailed information about pulmonary disease – e.g., in which situations the patient has dyspnea (range from playing sports to sitting or lying still) [46], the number of exacerbated physical condition (episode of worsening well-being lasting for at least 24 h, characterized by worsening of dyspnea, coughing and spitting [47]) the number of hospitalizations in a pulmonary ward or visits in an outpatient clinic during the year preceding the research.

The analysis of predictors of the frequency of visits to the specialist clinic and hospitalizations was performed using the hierarchical regression with the least-square method. Basic assumptions of the applicability of this method have been checked. The significance level was set at $p \leq 0.05$. In order to verify the influence of gender on the relationships between the variables analyzed in the study, the Mann-Whitney U test was used. None of the analyzed differences was statistically significant. Introduction of gender to the obtained multiple regression models did not cause significant changes either in the values of linear regression coefficients for the variable compo-

nents of the models (B , $Beta$) or in the predictive power of the models (R^2). In order to maintain the accuracy of measurement of the predictors coefficients and to obtain a clear picture of the percentage of the explained variance after considering all variables, it was assumed that in the case of strong alignment of independent variables referring to similar theoretical constructs, two separate regression models will be analyzed. This allowed to calculate the total percentage of variance for a complete model and the coefficients of individual predictors, excluding the variable entering into a strong correlation. The analysis showed that none of the correlated variables (trait anxiety and neuroticism) explained the variance of the variable 'frequency of visits', so the analyses were based on a collective model. The subsequent blocks in hierarchical regression included: dispositional variables (personality traits and trait anxiety), somatic complaints (dyspnea), styles of coping with stress, and emotional state operationalized as a state anxiety. Calculations were made using the SPSS 25 software.

Results

Initial correlation analyzes revealed that there is a covariance between selected psychological variables and the frequency of visits to the outpatient clinic and hospitalizations (Table 1).

Table 1. Relationship between pairs of variables – straight line correlations

Specification	Number of visits to an outpatient clinic N = 83		Number of hospitalizations N = 85	
	r	p	r	p
Conscientiousness	0.37	0.001	0.09	0.441
Neuroticism	0.04	0.699	0.29	0.009
Extraversion	0.15	0.179	-0.18	0.103
Openness to experience	0.09	0.406	0.05	0.680
Agreeability	0.10	0.375	-0.03	0.800
Trait anxiety	-0.02	0.869	0.27	0.014
Number of symptoms (somatic complaints)	0.18	0.093	0.02	0.831
Instrumental support seeking	0.29	0.007	-0.11	0.340
Emotional support seeking	0.35	0.001	-0.07	0.553
Active coping	0.08	0.484	-0.01	0.954
Planning	0.05	0.641	0.02	0.864
Positive reframing	0.05	0.637	-0.03	0.774
Acceptance	0.25	0.020	0.01	0.967
Humor	-0.09	0.435	-0.06	0.584

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Turning to religion	0.04	0.734	-0.06	0.614
Self-distraction	0.21	0.057	0.07	0.510
Denial	0.09	0.405	0.16	0.143
Venting	0.21	0.054	0.14	0.205
Substance use	-0.17	0.125	-0.11	0.334
Behavioral disengagement	-0.35	0.001	0.08	0.448
Self-blame	-0.04	0.714	0.07	0.512
State anxiety	-0.05	0.670	0.26	0.020

In the next stage, hierarchical regression analysis was performed using the step-wise method, which allowed to determine the percentage of variance explained by individual variables, the change in the coefficient of determination within the variable block, and minimize the risk of apparent correlations. The variable 'number of situations that are accompanied by dyspnea' may reflect the patient's condition and be directly related to the frequency of treatment – the higher the result, the worse functioning of the patient. Due to the occurrence of many correlations (coping styles), only the strongest ones were included in the regression model in order to increase the statistical power of analyses

It was checked which set of variables allows to explain the frequency of contacts with health services in patients with asthma and COPD. The dependent variable were the results of the subjective assessment of frequency of outpatient visits, which were assessed on the basis of information obtained in the own questionnaire. Independent variables – based on the assumed model – were: personality traits (conscientiousness, neuroticism), trait anxiety, selected styles of coping with stress as regulators of behavior in difficult situations (seeking emotional and instrumental support, cessation of activities), the number of activities accompanied by dyspnea (which is an indirect indicator of the current severity of the disease) and state anxiety. The model has been evaluated for collinearity. The calculated inflation rates ranged from 1.01 to 1.64 (inflation variance factors). Both analyses were carried out on the results of the entire study group, regardless of gender or disease. The regression model revealed that three independent variables were statistically significant (search for emotional support, conscientiousness and cessation of activities), while neuroticism, trait anxiety, number of symptoms, instrumental support seeking, and state anxiety were irrelevant (Table 2). The analysis shows that the total variability of outpatient visits explained by the regression model is around 28.74%.

Table 2. Predictors of frequency of ambulatory visits in patients with AO and COPD in light of multiple regression analysis by hierarchical method (N=85).

Blocks of variables	Independent variables (step)	Variable entered into the equation	Coefficients					Change statistics				Model assessment
			B	SE B	Beta	t	p	F change	p change	ΔR^2	R^2_{adj}	
1 (dispositional traits)	constant value		-4.65	3.00		-1.549	0.125					
	conscientiousness (1) ^a	Yes	0.33	0.09	0.37	3.615	0.001	13.071	0.001	0.136	0.13	
	neuroticism	No	-	-	0.11	1.079	0.284					
	trait anxiety	No	-	-	0.02	0.210	0.834					
2 (somatic complaints)	number of symptoms	No	-	-	0.16	1.621	0.109					
3 (coping with stress)	constant value		-1.214	3.08		-0.394	0.694					
	conscientiousness	Yes	0.29	0.09	0.33	3.315	0.001					
	cessation of activities (2) ^b	Yes	-1.21	0.40	-0.30	-3.045	0.003	9.270	0.003	0.088	0.21	
	constant value		-3.59	3.10		-1.158	0.250					
	conscientiousness	Yes	0.25	0.08	0.29	3.005	0.004					
	cessation of activities	Yes	-1.05	0.39	-0.26	-2.694	0.009					
	emotional support seeking (3) ^c	Yes	0.85	0.32	0.26	2.689	0.009	7.231	0.009	0.064	0.26	
instrumental support seeking	No	-	-	0.11	0.881	0.381						
4 (emotional state)	state anxiety	No	-	-	0.07	0.765	0.447					

^a Adjustment of model $F(1, 84) = 13.071$; $p = 0.001$; root-mean-square = 395.238; Standard error of estimate 5.499; ^b Adjustment of model $F(2, 84) = 11.821$; $p < 0.001$; root-mean-square = 325.069; Standard error of estimate 5.244; ^c Adjustment of model $F(2, 84) = 10.890$; $p < 0.001$; root-mean-square = 278.313; Standard error of estimate 5.055;

A separate regression analysis was carried out to demonstrate the importance of anxiety, personality traits, the number of situations in which dyspnea appears, and behaviors regulating behavior in stressful situations (seeking emotional support) in explaining the frequency of hospitalizations of patients with asthma and COPD. Based on the obtained regression model, it was not found that the studied psychological variables and the number of dyspnea situations are a significant predictors of frequency of hospitalizations ($F(1, 82) = 7.222$; $p = 0.009$; adjusted $R^2 = 0.07$), although neuroticism plays a role and explains 8.2% of dependent variable (Beta = 0.29; $B = 0.08$; standard error $B = 0.03$; $t(82) = 2.687$; $p = 0.009$).

Discussion

Analysis of the results of the study allows to verify the hypotheses presented in the introduction. In the study, the positive correlation between neuroticism and frequency of hospitalizations was shown. People with high neuroticism tend to interpret neutral or ambiguous stimuli as more threatening and less controllable [48, 49]. People with high neuroticism react to stress in a more intensive way, they tend to break down, panic and their main stress coping strategies are behavioral disengagement and denial [49]. Neurotic people experience more unpleasant physical symptoms and feel less comfortable [22, 48]. Moreover, higher neuroticism may result in a sense of losing control, also over health. Such lack of confidence cause more frequent use of support and health care [50]. This may explain the relation between neuroticism and the frequency of hospitalizations because lack of control may result in anxiety and panic in a situation of dyspnea. This may in return increase dyspnea and lead to the need of hospitalization.

The study has also confirmed that frequent outpatient visits concerned conscientious people who sought emotional support in the illness, which is consistent with other reports. Conscientiousness is a personality trait that tells about perseverance, motivation, dutifulness, self-discipline, thoroughness and good organization [18, 43]. Conscientious people would then be those who obey medical recommendations, pay attention to dates of medical check-ups [26, 32], which may explain the result of the study.

Emotional support turned out to be related to the number of outpatient visits. This confirms that the contact of patients with the health service plays a role of regulating emotions in the process of coping with stress. In addition, the relationship between the style of coping with stress and the frequency of visits can be interpreted in the category of satisfying the need for support through medical care. This result also seems to be part of a common opinion on the search for support by people in late adulthood during visits to attending physicians. In this case, support may also result from contact with other patients with respiratory diseases who exhibit similar psychosomatic problems. This conclusion should, however, be confirmed by longitudinal studies which would allow to assess whether the disease also gives patients potential secondary benefits such as care provided by the patient's environment, including health care.

The present study did not show any relation between active methods of coping with stress and the frequency of visits to the clinic or hospitalizations, but confirmed the negative relationship between the use of the strategy of cessation of activities and visits to outpatient clinic, which is in line with the assumed hypothesis. The use of this coping strategy, which is one of avoidance strategies, involves reduction of motivation or resignation from achieving the goal (e.g., resignation from activities related to conducting prophylactic examinations and taking active part in one's treatment process) [45]. In the context of research showing that even a large group of patients has insufficient knowledge about their illness or medicines [51, 52], it is worth considering whether cessation of activities is a strategy directly related to poor health or is rather related to a lack of knowledge about one's condition.

There was no correlation between the number of situations accompanied by dyspnea and the frequency of using outpatient services or hospitalizations. This result seems to be all the more surprising because the occurrence of dyspnea is the justified reason for the increased frequency of outpatient visits. Personality traits and styles of coping with stress turned out to have greater predictive values in this group of patients.

There are several limitations of the study. Firstly, all data obtained from participants were self-reported and more objective methods might be needed for more precise results. For example, analysis of medical documentation might be more precise than just relying on participants' memory as well as measuring, for example, autonomic reaction to assess anxiety level instead of using self-reported data. Another limitation of the study is its cross-sectional design. It is not entirely clear whether the hospital admissions and the course of the illness resulted from coping styles, level of anxiety and personality traits or the relationship was quite opposite. On the other hand, according to the theoretical ground of personality concept as well as coping styles, it is assumed that they are relatively stable over time. Lack of detected relationship between the state anxiety and the frequency of visits to the outpatient clinic may to a certain extent result from a failure to capture its dynamics. In the overall assessment, regular visits to the outpatient clinic from the patient's perspective may stabilize his/her level of anxiety the more so that frequent consultations are in some cases a form of coping with stress. The cross-sectional design of the study does not include the monitoring of disease exacerbations (or anxiety level) that could be directly related to hospitalization. However, it should be remembered that the picture of the patient's disease and his/her functioning at the time of the examination do not have to be closely related to previous hospitalizations.

In the context of further research on this topic, it would be worth taking into account the medicines used by respondents and their impact on mental functioning. It is worth to mention that beta-blockers used to treat asthma may have side effects in the form of depression, fatigue, anxiety or nightmares [53], and inhaled glucocorticosteroids – anxiety, depression, sleep disturbances, irritability or over-stimulation (however, they belong to very rare side effects) [54].

Conclusions

The frequency of visits to the outpatients clinic and hospitalizations is related to the selected personality traits, anxiety level and coping styles. Therefore the analysis of these variables should be taken into account when working with patients with chronic respiratory diseases. This is part of the biopsychosocial model of approach to the patient, and maybe even – in the context of high expenditures on health care related to the treatment of pulmonary diseases – in the biopsychosocial and economic model.

Based on this research, it is recommended to promote psychoeducation and psychotherapy in people with pulmonary diseases in collaboration with psychologists, psychiatrists, nurses and specialists dealing with respiratory diseases. Based on the obtained results, it is recommended that work with people with pulmonary diseases concentrated on providing emotional support (consisting, for example, in the interest in the patient, his/her needs, support for the spirit in situations of low mood, friendly

conversation, silent accompaniment [51]). In a wider social and budgetary context, getting emotional support by patients with respiratory problems through outpatient appointments is an interesting issue. Perhaps it is legitimate to look for sources of social support located outside the health service through social activation aimed at the population of people with respiratory diseases in combination with an individualized assessment of needs and resources and support networks.

In the care of people with respiratory diseases, it is worth considering that reducing anxiety or tendency to ponder and worry may also translate into ways of coping with stress. It has been shown that patients with pulmonary diseases have a greater tendency to use cessation of activities than healthy people, which may result from the chronic and progressive nature of the disease [15]. It may also be due to the low level of knowledge about one's health. Therefore, providing patients with more information about the course of their disease, ways of coping with dyspnea or exacerbation, and used medications seems justified in preventive activities. The indication for this group of patients may also include actions aimed at mobilizing resources [55], including increasing the sense of effectiveness, control, optimism, as well as training of mindfulness [56–58]. An interesting intervention, although not popular in a group of pulmonary patients, is the so-called training in gratitude, which results in reducing the amount of undesirable somatic symptoms and greater psychological well-being. Perhaps examining the effects of gratitude training in the group of people with respiratory diseases would be an interesting indication for further research [59].

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