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PREDICTING THE RISKS AND ODDS OF REHOSPITALIZATION OF PATIENTS WITH EATING DISORDERS IN ANXIETY-DEPRESSIVE DISORDERS

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Ключові слова: *тривога, депресія, тривожно-депресивні розлади, харчова поведінка, порушення харчової поведінки, прогноз*

Abstract. *Prediction of risks and odds of rehospitalization of patients with eating disorders in anxiety-depressive disorders. Ogorenko V.V., Kokashynskyi V.O. The article represents the results of a study aimed on predicting the risks and odds of rehospitalization among patients with eating disorders in anxiety-depressive disorders. In total, 147 patients with anxiety and depressive disorders were examined. Patients were divided into a main group of 82 and a*

comparison group of 65 patients. The main group consisted of 21 (26%) men with a mean age of 38.33 (SD 11.53) and 61 (74%) women with a mean age of 43.15 (SD 11.44). The comparison group consisted of 19 (29%) men, mean age 37.53 (SD 9.75) and 46 (71%) women, mean age 45.22 (SD 12.17). At the time of the initial examination in the main group, 35 (43%) patients were hospitalized for the first time, 47 (57%) – rehospitalized; in the comparison group, 23 (35%) patients – for the first time hospitalized, and 42 (65%) – rehospitalized. It was found that 27 patients were rehospitalized within the next year after the intervention and treatment. Clinical-anamnestic, clinical-psychopathological and psychodiagnostic study supplemented by psychometric scales (PHQ-9 health questionnaire, Dutch Eating Behaviour Questionnaire (DEBQ), State-Trait Anxiety Inventory (STAI; C.D. Spielberger), Methodology for assessing the integrative Quality of Life Index (QLI; J.E. Mezzich)) was conducted. As a result of the study, it was found that patients in the main group had a 3.6 times lower risk of rehospitalization over the next year than patients in the comparison group. When constructing a unipolar regression model, the best predictive power and discriminative ability was demonstrated by the number of previous hospitalizations ($p < 0.01$, AUC 0.75 (0.67-0.82)) and the intervention in the main group, which reduced the odds of rehospitalization over the next year by 4.8 times. The highest discriminative ability was demonstrated by the multiple logistic regression model (AUC 0.83 (0.76-0.88)), according to which intervention in the main group reduced the odds of rehospitalization in the next year by 5.9 times. The results of the study became the basis for the development of differentiated treatment and correctional measures for eating disorders in patients with anxiety-depressive disorders to improve the quality of care, prevent psychosocial maladjustment and improve the quality of life of this population.

Реферат. Прогнозування ризиків та шансів повторної госпіталізації пацієнтів з порушеннями харчової поведінки при тривожно-депресивних розладах. Огоренко В.В., Кокашинський В.О. У статті наведено результати дослідження, метою якого було прогнозування ризиків та шансів повторної госпіталізації серед пацієнтів з порушеннями харчової поведінки при тривожно-депресивних розладах. Було обстежено 147 пацієнтів із тривожно-депресивними розладами. Пацієнти були розподілені на основну – 82 особи та групу порівняння – 65 осіб. Основна група складалася з 21 (26%) чоловіка, середній вік яких становив 38,33 (SD 11,53), та 61 (74%) жінки, середнім віком 43,15 (SD 11,44). Група порівняння – 19 (29%) чоловіків, середнім віком 37,53 (SD 9,75), та 46 (71%) жінок, середнім віком 45,22 (SD 12,17). На момент первинного огляду в основній групі 35 (43%) пацієнтів госпіталізовані в стаціонар первинно, 47 (57%) – повторно; у групі порівняння первинно – 23 (35%) пацієнти, повторно – 42 (65%). Установлено, що 27 пацієнтів були госпіталізовані повторно протягом наступного року після втручання та лікування. Проводилося клініко-анамнестичне, клініко-психопатологічне та психодіагностичне дослідження, доповнене психометричними шкалами (анкета про стан здоров'я PHQ-9, голландський опитувальник харчової поведінки (DEBQ), тест «Дослідження тривожності» (опитувальник Спілбергера), методика оцінки інтегративного показника якості життя (Х.Е. Меззіч)). У результаті дослідження встановлено, що пацієнти основної групи мали в 3,6 рази нижчий ризик повторної госпіталізації протягом наступного року, ніж пацієнти групи порівняння. При побудові уніполарної регресійної моделі найкращу прогностичну силу та дискримінаційну здатність мала кількість попередніх госпіталізацій ($p < 0,01$, AUC 0,75 (0,67-0,82)) та втручання в основній групі, що зменшувало шанс повторної госпіталізації протягом наступного року в 4,8 рази. Найбільшу дискримінаційну здатність мала множинна логістична регресійна модель (AUC 0,83 (0,76-0,88)), за якою втручання в основній групі зменшувало шанси повторної госпіталізації протягом наступного року в 5,9 рази. Результати дослідження стали основою для розробки диференційованих лікувально-корекційних заходів при порушеннях харчової поведінки у хворих на тривожно-депресивні розлади задля підвищення якості надання допомоги, профілактики психосоціальної дезадаптації й підвищення якості життя такого контингенту.

According to current observations, the number of cases and prevalence of eating disorders (EDs) are constantly increasing worldwide. The main problem is the occurrence of EDs in children and adolescents and untimely diagnosis, most often at the higher stages of the disease, when complications arise. Usually, at the time of diagnosis of EDs, patients have physical health problems, concomitant mental and behavioural disorders and, as a result, a low level of psychosocial functioning [1, 2].

The mortality rate among patients with EDs is of serious concern as it is one of the highest compared to other mental disorders. This phenomenon is caused by both severe somatic complications and the mental state of patients, which is confirmed by a significant suicide rate as one in five people with anorexia

nervosa (AN) took their own life by committing suicide. In addition, a tendency to a long, protracted, and sometimes chronic course is observed, which often leads to social and labour maladjustment and disability of patients [3, 4].

The lifetime prevalence rates of anorexia nervosa might be up to 4% among females and 0.3% among males. Regarding bulimia nervosa, up to 3% of females and more than 1% of males suffer from this disorder during their lifetime. It is noted that anorexia nervosa and bulimia nervosa are reported worldwide among males and females from all ages., and not only among young women. Both eating disorders may carry a five or more times increased mortality risk [5].

The aim of the study was to predict the risks and odds of rehospitalization in patients with eating disorders in the setting of anxiety-depressive disorders.

MATERIALS AND METHODS OF RESEARCH

The study was carried out on the basis of the Municipal Enterprise "Dnipropetrovsk multidisciplinary clinical hospital for the provision of psychiatric care" Dnipro Regional Council" in 2019–2021. At the beginning of the study, 147 patients with anxiety-depressive disorders were examined. Patients were divided into a main group of 82 patients and a comparison group of 65 ones. The main group consisted of 21 (26%) men with a mean age of 38.33 (SD 11.53) and 61 (74%) women with a mean age of 43.15 (SD 11.44). The comparison group was 19 (29%) men, mean age 37.53 (SD 9.75) and 46 (71%) women, mean age 45.22 (SD 12.17). There was no statistically significant difference in gender between the two groups.

At the time of the initial examination in the main group, 35 (43%) patients were hospitalized for the first time, 47 (57%) – rehospitalized; in the comparison group, 23 (35%) patients – for the first time, and 42 (65%) repeatedly. There was no statistically significant difference in this indicator between the groups.

Analysis of archival documentation was conducted and the number of previous hospitalizations among patients hospitalized again at the time of the initial examination was determined.

Also, data analysis was conducted on the rehospitalization of patients of the entire sample during the next year after the intervention and treatment. It was found that 27 patients were rehospitalized during the following year.

Allocation to the main and comparison groups was random to ensure randomization. Diagnosis of disorders was conducted according to the criteria of ICD-10.

All respondents gave their personal written informed consent to participate in the study. The study was conducted with strict adherence to the principles of bioethics, in accordance with the Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects, developed by the World Medical Association, the UNESCO's Universal Declaration on Bioethics and Human Rights and approved by the Biomedical Ethics Commission of Dnipro State Medical University (Protocol No. 12 of 25.10.2023) [6,7].

Clinical-anamnestic, clinical-psychopathological and psychodiagnostic studies were conducted, supplemented by psychometric scales:

- PHQ-9 health questionnaire [8];
- Dutch Eating Behaviour Questionnaire (DEBQ) [9];

- State-Trait Anxiety Inventory (STAI; C.D. Spielberger, Y.L. Hanin) [10];
- Methodology for assessing the integrative Quality of Life Index (QLI; J.E. Mezzich) [11].

The data were processed using Statistica 6.1 software (StatSoftInc., serial number AGAR909E415822FA). For measures with a normal type of distribution, parametric statistical methods (arithmetic mean and standard deviation (M (SD))) were used to present the measures. The homogeneity of groups in terms of qualitative characteristics was checked by the chi-square test [12]. ROC analysis with the calculation of the area under the ROC curve and comparison of ROC curves was performed using MedCalc Statistical Software trial version 22.009 (MedCalc Software Ltd, Ostend, Belgium; <https://www.medcalc.org>; 2023). To determine the odds ratio (OR) with a 95% confidence interval (CI), a simple logistic regression analysis and, on its basis, a multiple logistic regression analysis were performed. To obtain the numerical value of the clinical significance of the built regression model, we used the AUC (Area Under Curve) indicator, which is the area under the curve that assesses the quality of the model in this way: 0.9–1.0 – excellent, 0.8–0.9 – very good, 0.7–0.8 – good, 0.6–0.7 – average, 0.5–0.6 – unsatisfactory [13]. Differences were considered significant if the statistical significance of the result was $p < 0.05$.

To classify the weight of patients and determine the degree of obesity, the body mass index (BMI) was calculated using the formula $BMI = \text{weight (in kg)} / \text{height}^2 \text{ (in m}^2\text{)}$. BMI < 18.5 – underweight, 18.5–24.9 – normal weight, 25.0–29.9 – overweight, 30.0–34.9 – first degree obesity, 35.0–39.9 – obesity of the II degree, ≥ 40.0 – obesity of the III degree [14].

RESULTS AND DISCUSSION

We analysed the relative risk of rehospitalization during the year based on the data obtained during the initial examination of patients in the entire sample; the results are presented in Table 1.

Thus, patients in the intervention group who received the study intervention, which combined psychopharmacotherapy and psychotherapeutic/psychocorrectional interventions, had a 3.6 times lower risk of readmission over the next year than patients in the comparison group who received psychopharmacotherapy alone according to clinical guidelines.

Patients with low and moderate levels of personal anxiety, presence of obesity and obesity class I, and middle-aged (45–59 years) had a higher risk of readmission.

Table 1

Relative risk of rehospitalization

Predictor	RR (95% CI)	p
Low personal anxiety degree (yes/no)	5.62 (3.96-7.96)	<0.01
Interventions (yes/no)	0.28 (0.17-0.46)	<0.01
Moderate personal anxiety degree (yes/no)	3.58 (1.91-6.73)	<0.01
Previous hospitalizations (yes/no)	2.87 (2.15-7.15)	<0.05
Obesity class I (yes/no)	2.83 (1.45-5.55)	<0.01
Middle age (yes/no)	2.74 (1.32-5.69)	<0.01
Presence of obesity (yes/no)	2.16 (1.07-4.35)	<0.05
Young age (yes/no)	0.37 (0.18-0.76)	<0.01

Notes: RR – Relative Risk; CI – Confidence Interval; p<0.05 – statistically significant indicator.

Young patients had a 2.7 times lower risk of readmission.

In addition, the odds ratio was calculated. Predictors of high risk of readmission that were statistically significant in the univariate logistic regression model are listed in Table 2.

The number of previous hospitalizations had the most significant predictive power and the best discriminative ability (p<0.01, AUC 0.75 (0.67-0.82)). The

second most predictive model was an intervention that reduced the risk of readmission by 4.8 times (p<0.01, AUC 0.68 (0.60-0.76)). The most reliable predictors were also middle age, young age, and moderate levels of personal anxiety (p<0.01). The ROC curves of significant predictors of high risk of readmission in patients with eating disorders in anxiety and depressive disorders are shown in Figure 1.

Table 2

Univariate logistic regression model of readmission predictors

Predictor	OR (95% CI)	p	AUC (95% CI)
Previous admissions (number)	1.18 (1.07-1.29)	<0.01	0.75 (0.67-0.82)
Interventions (yes/no)	0.21 (0.08-0.54)	<0.01	0.68 (0.60-0.76)
Middle age (yes/no)	3.46 (1.42-8.35)	<0.01	0.65 (0.57-0.73)
Young age (yes/no)	0.29 (0.12-0.69)	<0.01	0.65 (0.57-0.73)
Moderate personal anxiety degree (yes/no)	6.17 (2.16-17.62)	<0.01	0.63 (0.55-0.71)
Previous hospitalizations (yes/no)	3.48 (1.24-9.81)	<0.05	0.63 (0.55-0.71)

Notes: OR – Odds Ratio; CI – Confidence Interval; AUC – Area Under Curve; p<0.05 – statistically significant indicator.

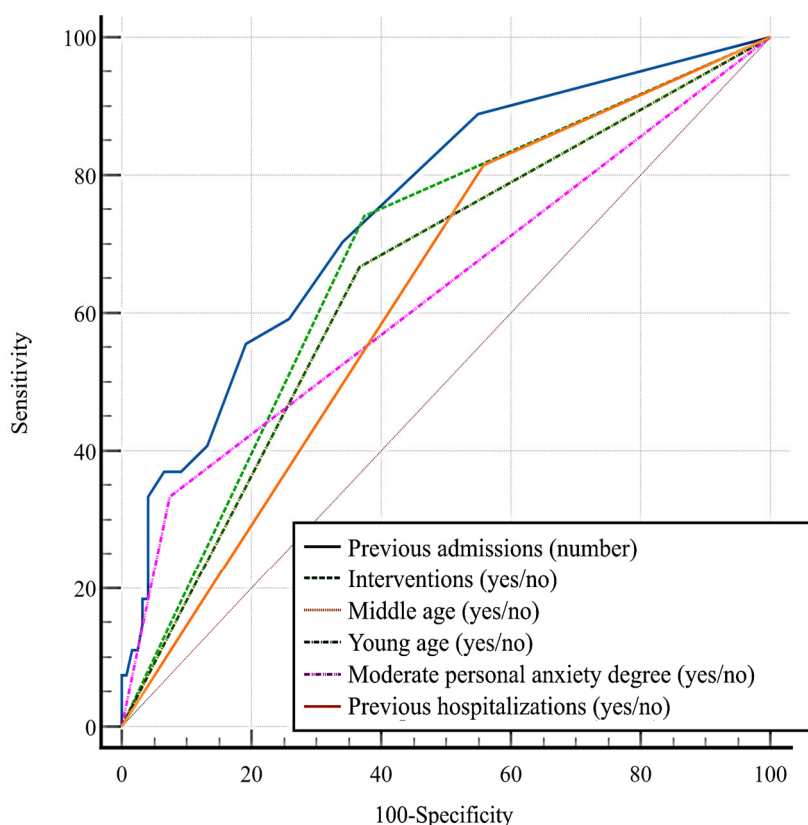


Fig. 1. ROC curves of significant risk of readmission predictors in patients with eating disorders in anxiety-depressive disorders (univariate regression model)

A multiple regression model of the factors that predicted readmission within the next year after the initial examination was built; the results are presented in Table 3.

After inclusion in the multiple regression model, intervention, moderate level of personal anxiety, obesity class I, and middle age retained a significant prognostic influence. The OR (95% CI) was greater

than the unipolar model of the intervention rates and reduced the odds of hospitalization by 5.9 times. The AUC for the multiple regression model was 0.83 (0.76-0.88), which is significantly higher than for the univariate models created. The ROC curves of significant predictors of high risk of readmission in patients with eating disorders in anxiety and depressive disorders are shown in Figure 2.

Table 3

Multiple logistic regression model of readmission predictors

Predictor	OR (95% CI)	p	AUC (95% CI)
Interventions (yes/no)	0.17 (0.06-0.49)	<0.01	0.83 (0.76-0.88)
Moderate personal anxiety degree (yes/no)	5.80 (1.67-20.16)		
Obesity class I (yes/no)	4.56 (1.35-15.48)		
Middle age (yes/no)	3.12 (1.14-8.54)		

Notes: OR – Odds Ratio, CI – Confidence Interval, AUC – Area Under Curve, p<0.05 – statistically significant indicator.

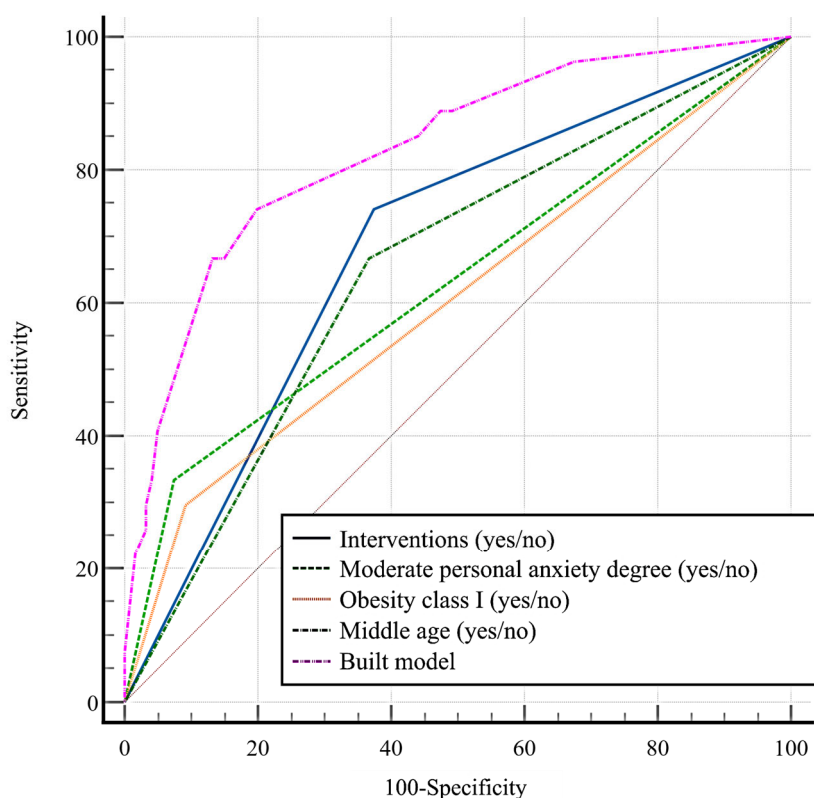


Fig. 2. ROC curves of significant predictors of the risk of readmission in patients with eating disorders in anxiety-depressive disorders (multiple regression model)

As a result, the study found that the severity of depressive symptoms had no predictive power and did not affect the risks and odds of rehospitalization during the year. The same results were obtained in a study of 56 adolescents with diagnosed AN, where the initial level of depression did not affect treatment outcomes and the risk of relapse [15].

According to the results of our study, it was found that the presence of obesity and obesity class I increased the risk of readmission. At the same time, obesity class I increased the odds of readmission according to the results of a multiple regression model. However, according to a study of ketamine treatment of depressive disorders, BMI did not affect the effectiveness of treatment [16].

The likelihood of readmission depending on the number of previous hospitalizations was investigated among 519 patients in eight New York City hospitals and readmission within 30 days of discharge among 1912 patients in a rural psychiatric hospital in the United States. These studies demonstrated a higher likelihood of readmission with an increase in the number of previous hospitalizations, which is consistent with the results of our study, where the

presence of previous hospitalizations increased the risks and odds of readmission, and the number of previous hospitalizations increased the odds of readmission [17, 18].

CONCLUSIONS

1. As a result of conducting the calculation of the relative risk of rehospitalization, it was found that patients in the main group had a 3.6 times lower risk of rehospitalization over the next year than patients in the comparison group.

2. When constructing a unipolar regression model, the best predictive power and discriminative ability was demonstrated by the number of previous hospitalizations ($p < 0.01$, AUC 0.75 (0.67-0.82)) and the intervention in the main group, which reduced the odds of readmission over the next year by 4.8 times.

3. The highest discriminative ability was demonstrated by the multiple logistic regression model (AUC 0.83 (0.76-0.88)), according to which intervention in the main group reduced the odds of readmission in the next year by 5.9 times.

4. The results of the study became the basis for the development of differentiated treatment and

correctional measures for eating disorders in patients with anxiety-depressive disorders to improve the quality of care, prevent psychosocial maladjustment and improve the quality of life of this population.

Contributors:

Ogorenko V.V. – conceptualization, methodology, project administration, writing – review & editing;

Kokashynskiy V.O. – formal analysis, investigation, writing – original draft, visualization, supervision, data curation.

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