У групі ризику розвитку негативних психологічних станів у подружжів знаходяться родини з низькою або ж надто високою вираженістю емоційного зв'язку, особи жіночої статі, сім'ї з порушеннями сімейної адаптації.

Медико-психологічна допомоги для родини пацієнта є невід'ємною складовою комплексу лікувальних заходів у онкологічній практиці.

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NEW MODELS FOR ASSESSING THE IMPACT OF INTERACTIONS OF RISK FACTORS ON THE DEVELOPMENT OF A FATAL OUTCOME OF CARDIOVASCULAR DISEASE

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Abstract

Various methods for determining cardiovascular risk does not allow to quantify the effect of direct impact of each risk factor and their interactions. In the current study, mathematical models have been used on the basis of the main provisions of the theory of a statistically planned experiment to assess the nature and magnitude of the direct impact of two factors (systolic blood pressure and total cholesterol), and their interaction on the risk of fatal outcome of cardiovascular diseases.

Keywords: cardiovascular risk, risk factors, interaction effects, mathematical models.

The definition and assessment of cardiovascular risk are strategically important for the choice of the system of preventive measures and tactics of treatment of cardiovascular diseases (CVD). At present, forecasting the risk of probable cardiovascular events is considered as a priority mandatory component of the treatment of cardiac patients [1].

From a large number of known risk factors (RF) the most important are three not modified (gender, age, heredity) and seven modified RF (smoking, arterial hypertension (AG) dyslipidemia, diabetes, obesity, stress, unsustainable nutrition and inactivity. However, a major study INTERHEART was found that, in order of statistical significance, the most important in terms of the risk of myocardial infarction (IM) is dyslipidemia, smoking, arterial hypertension and stress [1].

The number of methods of determining the cardiovascular risk is quite large [2, 3, 4], but in the European countries and, in particular, in Ukraine, the generally accepted method is using the SCORE scale (Systematic Coronary Risk Evaluation) [5,6]. Having a kind of table, this scale allows to obtain a clear quantitative assessment of the effects of combinations of 5 risk factors on the predicted characteristic of the CVD fatal outcome within 10 years. When solving optimization problems, this indicator should be considered as an optimization parameter (target function, response function). Cardiovascular diseases, being a multifactorial by definition, expect the presence of complex interactions between different RF, which are included in the definition of Total Risk and are often ignored [6.7]. Interaction can be explained by the sharp deterioration of the forecast, many studies and clinical practice.

However, convenient for practitioners scales, tables, diagrams, graphs, etc. do not allow in determining the general cardiovascular risk to quantify the power of direct influence of each RF and their interaction. This assessment can be obtained by constructing mathematical models, the value of which consists in the possibility of making an informed clinical decision on the modification of lifestyle, the use of drug therapy, the intensity of intervention etc.

In the study, models were reasonably chosen, built and analyzed, allowing to assess the nature and magnitude of the direct influence of the two RF and their interactions on the risk of developing a fatal outcome of CVD. Risk factors in the models were systolic blood pressure (SBP) and total cholesterol (TC).

The construction of regression models was carried out by processing the array of information shown in the tables SCORE. In the construction of models used the basic provisions of the theory of statisticaly planned experiment, which allows to evaluate independently of each other the power of influence of RF and their interaction.

When choosing the type of model the target installation consisted in necessity of description with high accuracy of system behavior simple approximating function of universal both in the form, and on the algorithm of modeling. These requirements are met by well-proven polynomial quadratic models.

For two modified RF (SBP and TC) postulated model of their influence on the probability of fatal outcome of cardio-vascular disease (P_{cvd}) has the following form:

$$P_{cvd} = b_0 + b_1 x_1 + b_2 x_2 + b_{11} x^2_1 + b_{22} x^2_2 + b_{12} x_1 x_2 ; (1)$$

where x_1 and x_2 - dimensionless coded values of SBP and TC accordingly.

Numerical values of linear (main) coefficients b_1 and b_2 directly characterize the power of influence of the corresponding RF and thus determine the rate of change P_{cvd}. Nonlinearity of influence of RF is determined by coefficients b_1 and b_2 which are considered as accelerating changes in the magnitude of the P_{cvd}.

The phenomenon of synergy (potentiation) in the model (1) is taken into account by the coefficient of pair interaction b_{12}. Values b_{12} allows you to estimate the power of one of the RF depending on the level on which the other.

In accordance with the applied method the coded values of x_1 (SBP) and x_2 (TC) were calculated by Following Formulas:

$$x_1 = 0,0333(SBP) - 5 \qquad (2)$$
$$x_2 = 0,5(TC) - 3 \qquad (3)$$

The levels of variation of factors, the area of their definition, natural and coded values are presented in Table. 1.

Table 1

Levels of variation of factors in the construction of risk assessment models of fatal cardiovascular diseases within 10 years.

Factor name	Designation factor	Number of levels	Coded values of factor variation levels						
			-1	-1/2	-1/3	0	1/3	1/2	1
			The natural values of factors						
Systolic blood pressure, SAD, mmHg.	x_1	4	120	-	140	-	150	-	180
Total cholesterol, (cholesterol), mmol / l	x_2	5	4	5	-	6	-	7	8

To determine the model coefficients of each block, a calculated matrix is compiled (Table 2), realizing a complete search of all combinations of factor levels. Subsequent processing of the information, entered into the calculation matrix, allowed to determine the values of all regression coefficients in the quadratic model represented by the formula (1).

Table 2

Estimated matrix and comparison of actual values of cardiovascular risk with those calculated in the model for smokers 50 years of age

The calculated matrix						Actual (P_{cvd}), calculated ($P^{\wedge}ccc$) and their difference (Δ)		
x_0	x_1	x_2	x_{11}	x_{22}	x_{12}	P_{cvd}	$P^{\wedge}_{cvd}$	Δ
1	1	0	1	0	0	10	10,0	**0**
1	1	-1/2	1	1/4	-1/2	8	8,4	**-0,4**
1	1	-1	1	1	-1	7	7,0	**0**
1	1/3	1	1/9	1	1/3	10	10,1	**-0,1**
1	1/3	1/2	1/9	1/4	1/6	8	8,4	**-0,4**
1	1/3	0	1/9	0	0	7	7,0	**0**
1	1/3	-1/2	1/9	1/4	-1/6	6	5,8	**0,2**
1	1/3	-1	1/9	1	-1/3	5	4,7	**0,3**
1	-1/3	1	1/9	1	-1/3	7	7,2	**-0,2**
1	-1/3	1/2	1/9	1/4	-1/6	6	5,9	**8,1**
1	-1/3	0	1/9	0	0	5	4,8	**0,2**
1	-1/3	-1/2	1/9	1/4	1/6	4	3,9	**0,1**
1	-1/3	-1	1/9	1	1/3	3	3,1	**-0,1**
1	-1	1	1	1	-1	5	4,9	**0,1**
1	-1	1/2	1	1/4	-1/2	4	3,9	**0,1**
1	-1	0	1	0	0	3	3,2	**-0,2**
1	-1	-1/2	1	1/4	1/2	3	2,7	**0,3**
1	-1	-1	1	1	1	2	2,2	**-0,2**

Values of coefficients in the specified models, reflecting the influence of the SBP and TC on the value of P_{cvd} smoking and non-smoking men of four age categories are presented in Table 3.

Values of coefficients in models of influence of studied factors on the risk of development of fatal cardio-vascular diseases during 10 years in smokers and non-smokers of men of different age

Age, years	Coefficient values in models											
	Smoking men						Non-smoking men					
	b_0	b_1	b_2	b_{11}	b_{22}	b_{12}	b_0	b_1	b_2	b_{11}	b_{22}	b_{12}
50	5,83	3,39	2,35	0,79	0,36	1,04	2,73	1,77	1,05	0,56	0,21	0,57
55	8,98	5,45	3,55	1,46	0,93	1,59	4,81	2,88	1,90	0,67	0,43	0,96
60	13,86	8,07	5,20	2,12	1,70	2,21	7,10	4,44	2,85	1,35	0,50	1,34
65	20,64	11,70	7,00	3,06	1,28	3,34	10,71	6,44	3,85	1,90	0,36	1,66

Geometric images of the response surface reflecting the influence of the SBP and TC on the P_{cvd} for smokers and non-smokers of 50 and 65 years of age are presented in Fig. 1, 2.
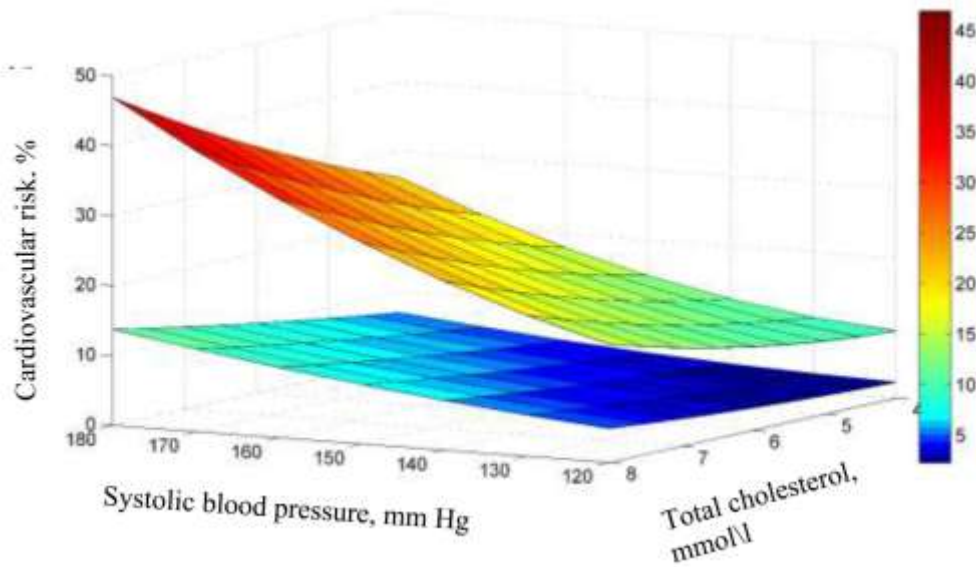

Fig. 1. The influence of systolic blood pressure and total cholesterol on the magnitude of the cardiovascular risk of smoking men 50 and 65 years of age
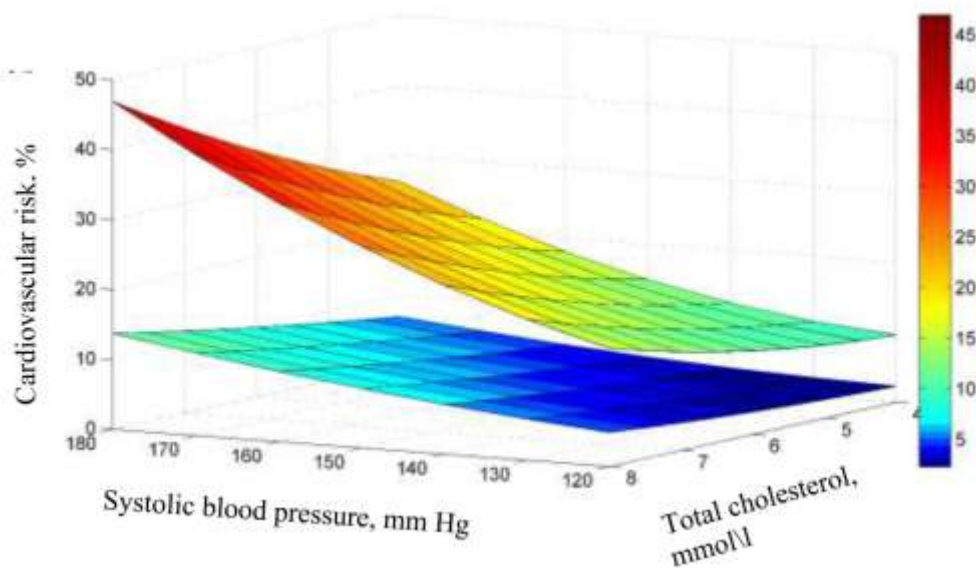

Fig. 2. The effect of systolic blood pressure and total cholesterol on the magnitude of the cardiovascular risk of non-smokers in men 50 and 65 years of age.

Adequacy of the received models is confirmed by almost 100 percent coincidence of calculated and actual values of P_{cvd} (table 2).

Instability of values b_1 and b_2 due to the interaction of corresponding RF. In the studied range of changes of SBP and TC, maximum and minimum values b_1 and b_2 for the four age groups smoking and non-smoking males are shown in Fig. 1. 3.4.
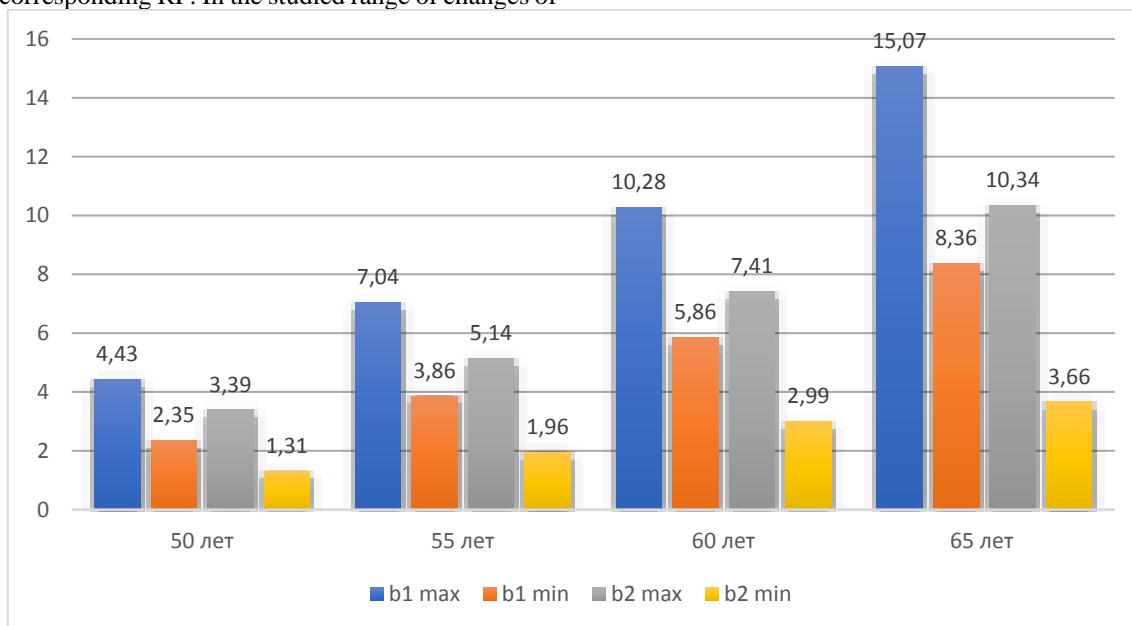

Fig. 3.
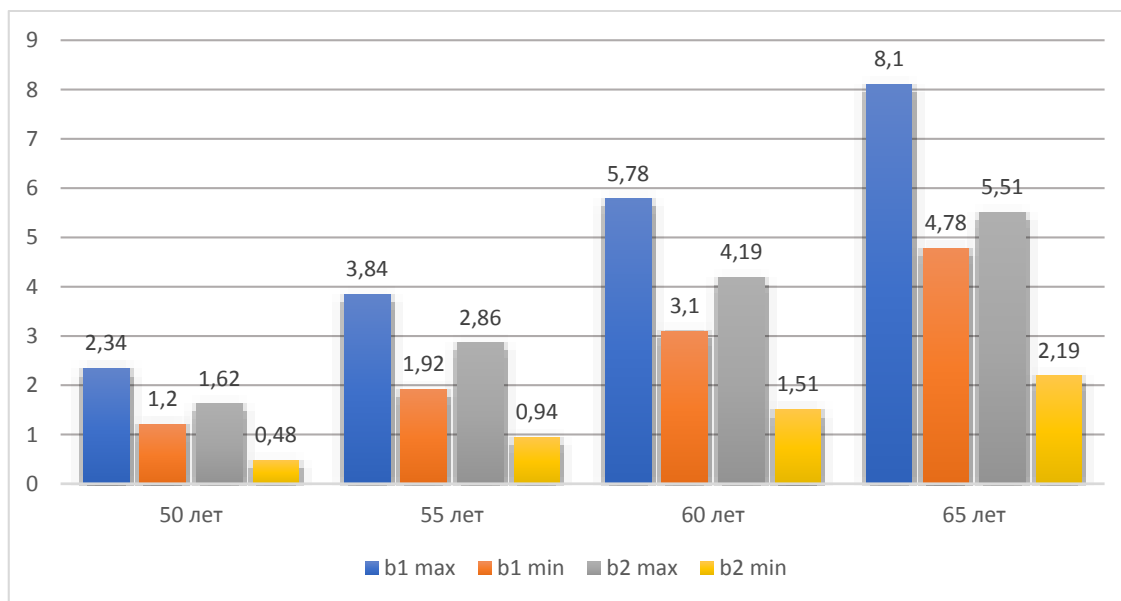*Maximum and minimum values b1 and b2 in the models of calculation P_{cvd} Non-smoking men of different ages.*

Fig. 4.
Maximum and minimum values b1 and b2 in the models of calculation p_{cvd} Non-smoking men of different ages.

The analysis of the constructed models and diagrams showed that:

(a) The most significant risk factor is the SBP. The degree of negative influence of TC in the age groups of smokers and non-smokers was less;

b) The growth of the SBP and TC accompanied by an increase of P_{cvd}.;

b) The interaction index b_{12} changes the values of b_1 and b_2 when x_2 (TC) and x_1 (SBP) change, respectively. Therefore, the only numerical estimate of the force of influence of the SBP (b_1) on the value of Pcvd can not be given until the values of TC are indicated.

Similarly, the reliable value of b_2 is determined only when the values of the SBP are taken into account. The ranges of changes in the values of b_1 and b_2 are shown in Fig.3.4..

d) the coefficients b^2_{11} and b^2_{22}, taking into account the nonlinearity of the influence of the SBP and TC on the value of P_{cvd}, are constants in each of the models constructed. The accelerated change in P_{cvd}, characterized by the magnitude of these coefficients, reaches the maximum values for smokers of 65-year-olds.

Conclusions.

1. The developed models allow to quantify the values of the investigated risk factors and their interactions by the magnitude of the probability of fatal outcome of the cardiovascular disease.

2. The effect of interaction excludes the possibility of the only numerical estimation of the degree of influence of risk factors on the probability of the outcome of the cardiovascular disease until the level of values of other factors is specified.

3. In all combinations of the investigated risk factors the force of negative influence of systolic pressure is more influence of cholesterol.

In each specific set of risk factors, each has its own target level value.

5. Developed models, unlike tables SCORE allow to calculate the probability of fatal outcome for any values of systolic arterial pressure and general cholesterol.

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POSSIBILITIES OF THE X-RAY METHOD IN THE DIFFERENTIAL DIAGNOSIS OF ACUTE ADHESIVE INTESTINAL OBSTRUCTION

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ВОЗМОЖНОСТИ РЕНТГЕНОЛОГИЧЕСКОГО МЕТОДА В ДИФФЕРЕНЦИАЛЬНОЙ ДИАГНОСТИКЕ ОСТРОЙ СПАЕЧНОЙ КИШЕЧНОЙ НЕПРОХОДИМОСТИ

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Abstract
The article presents an analysis of the literature on x-ray differential diagnostic criteria, presents and justifies the main ones. The advantages and disadvantages of x-rays in diagnosing this condition and predicting its outcome are indicated.

Аннотация
В статье приведен анализ литературы по рентгенологическим дифференциально-диагностическим критериям, приведены и обоснованы основные из них. Обозначены преимущества и недостатки рентгена в диагностике данного состояния и прогнозировании его исхода.

Keywords: acute adhesive intestinal obstruction, radiography, computed tomography, magnetic resonance imaging, diagnostics, prediction, algorithm.

Ключевые слова: острая спаечная кишечная непроходимость, рентгенография, компьютерная томография, магнитно-резонансная томография, диагностика, прогнозирование, алгоритм.

Проблема оптимизации диагностики и тактики хирургического лечения пациентов с острой спаечной кишечной непроходимостью (ОСКН), несмотря на большие успехи, остаётся одной из самых сложных и актуальных в мировой хирургии [1, 115]. Это обусловлено неуклонным увеличением количества больных с кишечной патологией, запоздалым обращением за медицинской помощью, серьёзными диагностическими ошибками на догоспитальном этапе, большим удельным весом послеоперационных осложнений, высокой летальностью [2, 159].

На долю ОСКН приходится около 87,5% среди всех видов острой кишечной непроходимости (ОКН), что свидетельствует о постоянном росте количества хирургических вмешательств на органах