only cardiovascular death and myocardial infarction, like GRACE, but also stroke, hospitalizations due to repeated ischemia, unscheduled coronary and non-coronary revascularization, developed on the basis of a survey of Russian patients, taking into account a one-year period, and not just the first six months, like GRACE, since there is a high risk of a fatal and serious non-fatal event in patients after MI persists for a year. The proposed formula makes it possible to predict the contribution of each risk factor to a long-term outcome, which implies personalized work with each patient and modeling the outcome in terms of time and changing components of its prognosis.

The GRACE model has three levels of risk - high, moderate and low. It turns out that patients with a moderate risk of an unfavorable outcome are a group that is not very clear for a practitioner in terms of secondary prevention, and this is the main goal of risk metrics.

It should be noted that the proposed calculator is easy to use, as it is implemented in an Excel spreadsheet processor, so any practitioner can use it.

Conclusion:

This study demonstrates the role of the proprietary calculator for the annual prognosis of the risk of unfavorable cardiovascular events with personal coefficients of risk factors in patients after undergoing STEMI. The author's calculator was developed on the basis of data from Russian patients and takes into account a one-year period, and not only the first six months, as when using the GRACE scale, since a high risk of cardiovascular events in patients after STEMI persists for a year. The calculator takes into account the total cardiovascular risk: cardiovascular death, acute myocardial infarction, stroke, hospitalization for ischemia, unscheduled coronary and non-coronary revascularization. The proposed method allows you to personally simulate the outcome in real time for each patient, which ultimately will affect the quality of life in patients who have had myocardial infarction.

PRINCIPLES AND CONSTANTS OF THE GOLDEN PROPORTION AS A CRITERION IN DONOSOLOGICAL DIAGNOSTICS OF THE FUNCTIONAL STATES OF THE BODY AND IN THE ASSESSMENT OF THE PROBABILITY OF THEIR CHANGES

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Abstract

A functional state is a complex of properties of an organism that determines the level of its vital activity. The construction of human functional structures is based on the laws of nature. The golden proportion is a universal natural law and the highest manifestation of the structural and functional perfection of the organism, and has properties and principles: self-development, self-organization and self-regulation, balance and stability. It is found in the anatomical and physiological parameters of the human body, is a method for finding an extremum in solving problems of their optimization. Proceeding from the fact that the functional state of the cardiovascular system is an integral indicator of the general state of the body and its adaptation, as a process of searching for the optimal functional state, we studied this indicator in 43 young people. At the same time, it was found that the subjects under conditions of functional rest and in a satisfactory state of compensatory-adaptive capabilities, i.e. in prenosological conditions, their adaptive potential lies in the range of two values of the golden proportions (F = 1.618; F2 = 2.618). Thus, the golden proportions form the boundaries of the functional corridor, outside of which there is a change in the prenosological state of the body, namely, with an adaptive potential of less than 1.618, a physiological norm takes place, and with more than 2.618, premorbid states. In this regard, it is proposed a scale for assessing the functional state, as well as an index of the likelihood of developing a premorbid state in an individual's body, based on the principles and constants of the golden ratio. The discriminatory ability and sensitivity of the proposed scale to the functional states of the organism were assessed.

Keywords: functional state, adaptive potential, health levels, golden ratio constants, harmonization, optimization, assessment scale.

The relevance of research

International standards for the provision of medical care provide for the implementation of preventive measures aimed at preventing the occurrence of diseases already at the stage of their initial manifestations. At the same time, the existing system of primary prevention is still devoid of the most important element - objectification of the assessment of the functional state of the body at the level of a pre-morbid state, when, as a result of the inconsistency of the body's capabilities, the prerequisites for the development of the pathological process arise. Such a gap in the system of primary prevention is intended to fill the methodology of prenosological diagnostics, according to which the development of clinical forms of diseases is preceded by quite definite disorders of the functional state (FS) of the body, in which the nonspecific component of the general adaptation syndrome manifests itself in the form of varying degrees of tension in the regulatory systems. FS is a systemic response of the body, ensuring its adequacy to the requirements of the activity. The assessment of the FS of a practically healthy person is an object of prenosological diagnostics, in which the main criterion of health is not the presence or absence of diseases, but the level of the organism's adaptive capabilities [1,2]. At the same time, two levels of degrees of tension of adaptation mechanisms are used as objective signs:

- prenosological, which is characterized by the tension of regulation mechanisms;

- premorbid, which is characterized by a decrease in the adaptive capabilities of the body.

At the same time, under the influence of negative factors that go beyond the functional and adaptive capabilities of the body, the presence of qualitative transitions in the state of physiological functions is also a regularity. They cause a number of changes in functional systems, change the regulatory and adaptive status of the body, determining the state of human health. Thus, the transition to each new gradation of adaptation is accompanied by qualitatively new changes in the FS.

In general biological terms, health can be defined as a harmonious unity of all kinds of metabolic processes in the body and manifested in the optimal functioning of its organs and systems [5]. The human body adapts to environmental conditions by changing the level of functioning of individual systems and the corresponding tension of regulatory mechanisms. At the same time, the FS of the body is a complex and integral characteristic reflecting the level of adaptation of regulatory systems in the current conditions of existence. In essence, the principle of the mechanism of physiological adaptation is to ensure the harmony of opposites, as a result of which the optimization of the relationship of the organism with the environment and the efficiency of functioning is ensured.

Thus, the concepts of "functional state" and "regulatory-adaptive status of the organism" in modern physiology are considered as an integral part of individual health and as one of the important criteria of health.

Monitoring the health of healthy people, that is, prenosological control, is a practical step towards dynamically assessing the state of adaptation and regulatory systems, identifying the very initial manifestations of their overstrain and, through their prevention, ensuring the preservation of the health of healthy people. The level of formalization of knowledge in prenosological diagnostics is currently quite high, therefore it is possible to use strict mathematical procedures and statistical methods for recognizing states in it. However, the existing approaches to the synthesis of criteria and algorithms for prenosological diagnostics do not fully use the capabilities of modern methods of mathematical data analysis. When developing integral criteria for assessing FS (functional state), empirical approaches prevail, in which the criteria are built by arithmetic combinations of recorded indicators. Classes of states according to individual criteria are distinguished by an expert method, and there is still no unified methodology and criteria for a reliable assessment of the levels of functioning of the human body [3]. Therefore, they are highly specific to any one state of the organism, and the revealed information does not allow, in most cases, to integrally assess the state of the organism as a whole. These shortcomings are largely due to the lack of scientifically substantiated methodologies, criteria and decision-making algorithms in the prenosological assessment of human FS, taking into account the principles and mechanisms of their formation, optimization, stability and change. The solution to this problem requires taking into account that the functioning of multilevel systems, to which a person belongs, is faced with the tasks of not only optimizing the opposites of a particular parameter, but also their optimal coordination. The body is a self-organizing system, it chooses and maintains the values of a huge number of parameters, changes them depending on the needs, which allows it to ensure optimal functioning. Harmony is a criterion for the viability of a system, a way of functioning of any system, which consists in the rhythmic flow of opposites into each other [4]. Thanks to the active and continuous work of regulatory systems, the body optimizes its relationship with the factors affecting it. And, in the case of a decrease in the adaptive reserves of the body, its unstable state is generated and the FS transition through the bifurcation point to a new level - to the corresponding maladaptive state. Thus, a living system is capable of restructuring, moving to a new homeostatic level, while activating some regulatory systems and inhibiting others. In other words, health can be considered as the severity of adaptive reactions. As you can see, in the issue under consideration, the influence of the principles and optimization factors is great. This is due to the fact that the essence of optimization, which underlies the development of the biological world [5], is the desire to obtain the maximum positive adaptive result with minimum energy and plastic costs. Maladaptive. Efficiency of functioning is the main feature of the adapted system, while the harmony of functional relationships is a universal fundamental principle that ensures the optimal functional state and maximum adaptive capabilities of the organism. In this regard, one of the most important tasks is to identify the criteria of harmony, in accordance with which individual "simple" systems are combined into stably functioning living systems. One of the manifestations of such a structural and functional balance is its compliance with the "Golden Section" rule [4]. Studies on the study of the morphological and functional balance of the body indicate that at various levels of organization of living systems, the specified golden proportion is revealed as an indicator of proportionality and harmony. It is believed that the principle of the "golden ratio" is the highest manifestation of structural and functional perfection in nature, including medicine. The mathematical principle of the proportion of the golden section, the unity of additivity and multiplicativity, fully corresponds to the law of harmony - the unity of form and content. To date, the laws of the golden ratio in many areas of medicine have been scientifically proven, in particular, it has been revealed [6,7,14] that the golden proportion is the criterion of optimality in the choice of the parameters of many morpho-functional indicators for the human body. For example, in anatomy, these are the vertical proportions of the body, the ratio of the linear dimensions of bones and other formations. Also, many studies have been carried out to determine the "golden section" of the cardiovascular, sensory, respiratory and other systems. The meaning of the harmonious functioning of the body, according to V.D. Tsvetkov [7] is that the systems subordinate to him, act on the principle of system optimization in relation to the minimum energy consumption. In the process of adaptation of the organism to changed conditions and while ensuring homeostasis, that is, during the period of self-organization and functioning, it tries to minimize its energy expenditures, aimed at ensuring stable states or functions, and searches for an energy extremum. At the same time, the optimal search algorithm is the natural partition of the space on which the search takes place, in the golden proportion (1 / F = 0.618). In the adaptation system, as in any "seeking", self-organizing natural system, a certain minimum number of search steps is "planned". To find extrema, he can use the Fibonacci number system depending on the numbers of the golden ratio. In work [8] it is shown that in the range from physiological rest, with characteristics of satisfactory adaptation, to the maximum allowable physical stress at the border of adaptation breakdown, the ratio of a number of functional indicators of the organism is in the range of two values of the "golden ratio". The revealed patterns give the author a reason to consider the golden proportions of the cardiorespiratory system as a universal tool for assessing the FS and the adaptive capabilities of the organism. Based on this, a fundamentally new idea of the boundaries of fluctuations of functional indicators, designated as a corridor reflecting the volume of the body's adaptive capabilities, was formulated:

Functional rest **0.618 + n ≫** **n - any integer**	***The proportions of physiological indicators*** ***Adaptation corridor***	**Failure of Adaptation** **0.618 + n + 1**

Thus, the golden proportions of physiological indicators act as markers of transient states. The revealed phenomenon of golden proportions represents a new direction in assessing the adaptive capabilities of the human body. In the light of the above, it can be argued that the problem of reliably determining a specific place of the functional state of a certain person in the space between norm and pathology, i.e. establishing the belonging of a given person to a certain class of functional states is an urgent task of prenosological diagnostics.

When solving this problem, it becomes necessary to use a special scale, which is the most important tool for processing and fixing information about the object under study and designed to ensure its optimal processing. Thus, the main purpose of the scaling procedure is the ability to assess the processes under study. The above facts and provisions made it possible to formulate the following objectives of our research:

Goals and objectives of the study and their practical significance.

-Development, based on the principles and constants of the golden ratio, scales and criteria for assessing functional states and verification of prenosological levels of the body's health; -Based on the survey data of the most informative, morpho-functional indicators of a practically healthy contingent of young people, to assess the possibilities of the proposed criteria and scale; - To develop methods and criteria for assessing the index of functional stability of the organism and the likelihood of its qualitative change. For practical health care, prenosological diagnostics, in accordance with the proposed scale, allowing an early assessment of the level of health and risk factors, opens the way to increasing the effectiveness of health-improving measures and significantly complements the preventive principle in medicine.

Subject of research: In accordance with the goals, the subject of our research was the levels of the organism's adaptive potential as markers for assessing its functional state, as well as scales and criteria for their verification and interpretation.Методы и объекты исследования.

When developing methods for quantitative assessment of the level of health, the correct assessment of the functional states of the body and systems that ensure the vital activity of the body as a whole is an important task. Since medicine deals with physiological processes, it operates, as necessary, with different numerical indicators, and connections between different characteristics. Currently, in medicine, many scales and criteria for assessments and classifications are used, for various conditions [9,10]. Back in the 10th century, Avicenna gave a comprehensive classification of health levels [11], considering six classes of the functional state of the body. This classification is consistent with the modern one, which is based on the degree of tension of regulatory mechanisms (normal, moderate, pronounced, pronounced and overstrain) [1,12]. If we take into account that the assessment of the prenosological status is aimed at objectifying the adaptive activity of the organism in the process of maintaining health and the formation of prenosological states, then the position of the theory of adaptation can be used as the basis for predicting the development of health. Adaptation as a functional property of biological objects, along with homeostasis, is one of the basic concepts of biology. RM Baevsky and AP Bersenova proposed a classification of the FS of the body, according to the index of functional changes, based on ideas about homeostasis and adaptation [1,2], providing for the allocation of four levels of health and criteria for their assessment - the higher the conditional IFCh (index of functional changes) score, the higher the likelihood of developing pathological abnormalities. On their basis, they were the first to create a scale for prenosological assessment of functional states and the degree of tension of regulatory systems.

Note that measurement in its broadest sense can be defined as assigning numbers to objects or events according to some rules. These rules should establish a correspondence between the properties of the objects in question and the numbers. In the theory of measurements, it is customary to distinguish four main types of scales: names, order, interval and relations. In this case, measurements carried out using the first two scales are considered qualitative and nonparametric criteria are used for their processing, and measurements made on the last two scales are quantitative in this case, parametric criteria are applied. In each scale, the properties of numbers assigned to objects or phenomena are strictly defined. In this regard, we have chosen the interval scale as a model of the scale for assessing FS.

In mathematical statistics, interval estimation is the result of using a sample to calculate the interval of possible values of an unknown parameter, the estimate of which must be constructed. This should be distinguished from a point estimate, which gives only one value. An interval scale is a scale that classifies according to the principle "more by a certain number of units - less by a certain number of units." The use of an interval scale is also possible in the case when, using a certain criterion (measurement standard), it is possible to determine the magnitude of the difference in features not only by the type of more or less, but also by how many units one object or phenomenon differs from another. A unit of measurement is set for this measurement. The number assigned to the research object in this case represents the number of units of measurement that it has. The scale of intervals is a fully ordered series with calibrated intervals between ranks, with the counting starting from an arbitrary value from the chosen value (there is no absolute zero). As a result, a conclusion on the state of health is formed.

Below is one of the options for the scale, such a simplified interpretation of prenosological diagnoses.

Standard rating scale Simplified rating scale

Physiological state:

1. Norms High level of health;

2. Optimum Optimum level of health;

3. Pre-nosological Good health with some

condition - 1 deviations that can be easily corrected;

4. Prenosological The level of health is mediocre, yet

condition - 2 complete recovery of health is possible;

5. Premorbid Poor health with signs

Condition of diseases that are still compensated due to high voltage regulation systems;

6. Pathological condition The probable presence of pathology.

As you can see, medical rating and prognostic scales have their own characteristics, principles and approaches to construction. Drawing up a scale for assessing the functional state, first of all, requires the choice of its model, type, criteria and quantitative indicator of the boundaries of the intervals. As a rule, many of them are of the interval type. An interval scale also has a characteristic of the distance between individual scale gradations, measured using a certain unit of measurement, that is, quantitative information is used. From the existing scales of functional states, we have adopted an interval scale and built its following model, which follows from modern concepts and corresponds to the views of Avicenna:

Modern Option [1,2]	Physiological norm	Physiological optimum	1-prenosology Condition stress	2-prenosology Condition Overvoltage	Premorbid fortunes	Pathology
Avicenna's version [11]	body is healthy to the limit	body is healthy, but not to the limit	the body is not healthy, but not sick	body easily accepting health	the body is sick but not to the limit	the body is sick to the limit

Thus, the scale we recommend has 6 physiological states - “corridors” and 5 possible qualitative transitions.

The next task is to determine the indicators characterizing these intervals, i.e. translate this verbal scale into a numerical one. It should be taken into account that the construction of a scale for assessing the functional state should be based on indicators acting on the principle of optimization and harmonization of the state of the body. Therefore, as an indicator of the scale of verification of the functional state of the organism, we have chosen the adaptive potential of its cardiovascular system that meets these requirements.

Since the functional state of the organism is subject to the hierarchical principle, i.e. Since a qualitative transition from one state to another is continuous, the upper boundary of each interval of the corridor is simultaneously the lower boundary of the next. Therefore, the scale proposed by us, with 6 intervals of states, is characterized by 12 boundaries, of which 5 are combined values. In accordance with the objectives of the study and taking into account the conclusions of [8], the numerical characteristics - the boundary indicators of the intervals of the proposed scale, we have determined based on the principles and constants of the golden ratio. In this case, we were guided by the fact that the n-step Fibonacci plan (Fn) is the optimal plan for finding the local minimum of the free energy consumption of the system in n-steps. Using this plan, biological systems receive the smallest errors in their work (in the search for and adaptation to the changed conditions of existence). This position explains the fact of the extraordinary frequency of finding in the structures and functions of biological systems of the "golden ratio" and the corresponding "golden" numbers. The number system for various structures and functions of a living organism cannot be determined by any one proportion, but it can use many different options, which are based on the golden ratio. Based on these provisions, in order to establish the values of the minimum and maximum boundaries of the functional corridors of the projected scale, on the basis of the constants of the golden ratio, we built two harmonic series of variability numbers, namely:

$F^0, F^1, F^2, F^3, F^4, F^5$ (1)

$F^2/2$, $F^3/2$, $F^4/2$, $F^5/2$ (2)

Taking into account the above principles of constructing the proposed scale, from the numbers of series (1) and (2), we have compiled the following boundaries of the projected 6 intervals of functional states:

$(F^0 \div F^2/2)$; $(F^2/2 \div F^1)$; $(F^1 \div F^3/2)$;
$(F^3/2 \div F^2)$; $(F^2 \div F^4/2)$; $(F^4/2 \div F^3)$.

Taking into account the values of the constant of the golden ratio F = 1.6180033, the following numerical indicators An of the boundaries of 6 intervals of the scale are established:

A_1 A_2 A_2 A_3 A_3 A_4 A_4 A_5 A_5 A_6 A_6 A_7
(1÷1,309); (1,309÷1,618); (1,618÷2,118);
(2,118÷2,618); (2,618÷3,427); (3,427÷4,236)

Thus, the scale we propose has the following criteria for the indicators of assessing states (table 1.):

Table-1

function. intervals	1 interval	2 interval	3 interval	4 interval	5 interval	6 interval
FS: modern option 1]	physiological norm	physiological optimum	1-prenosology	2-prenosology	premorbid fortunes	pathological fortunes
Avicenna's version [11]	body is healthy to the limit	body is healthy, but not to the limit	the body is not healthy, but not sick	body easily accepting health	the body is sick but not to the limit	the body is sick to the limit
Adaptation levels [13]	excellent	Good	Satisfactory	Tense	Unsatisfactory	breakdown adaptations
Indicators the proposed scales in conditional units	A_1 A_2 1,0÷1,309	A_2 A_3 1,309÷1,618	A_3 A_4 1,618÷2,118	A_4 A_5 2,118÷2,618	A_5 A_6 2,618÷3,427	A_6 A_7 3,427÷4,236
Functional corridor, in conditional units	0,309	0,309	0,500	0,500	0,809	0,809

The values of the boundary indicators of the scale presented in Table 1, as well as the intervals of functional states generally correspond to the principles and constants of the golden ratio and the golden wurf [6-8], namely:

1. There is a constancy of the ratios of the values of the boundary indicators of each state of the scale, equal to the constant of the golden ratio - An / An-2 = 1.618 = F,

where n is 3,4,5,6,7;

2. The ratio of the values of the maximum and minimum boundaries of odd intervals correspond to the numbers of the golden wurf-1.309; and even intervals are 1.236, i.e. the ratio of the constant of the golden ratio to the golden wurf.

3. The width of the functional corridors of the scale also has its "golden" features, namely, the ratio of the width of the subsequent, even interval to the previous even interval and, similarly, the ratios of odd intervals correspond to the constant of the golden ratio - F = 1.618.

The most important characteristics of rating scales are their discriminatory ability and calibration, the first of which characterizes the ability of the scale to divide the subjects into groups, depending on any factor, and the second, the degree to which its indications correspond to the actual results, i.e. the reliability of the assessment. For these purposes, in accordance with the criteria of the developed scale, the individual indicators of the examined persons were analyzed - their adaptive potential, health levels according to Apanasenko and the state of the cardiovascular system (CVS) according to the Robinson index, assessed using the following methods. Among the entire spectrum of methods for analyzing the adaptive potential of a person, based on the assessment of various parameters of vital activity, the most informative are those that characterize the activity of the CVS - the main indicator of all events occurring in the body. The formation of other systems largely depends on the state of this system, since, participating in metabolic processes, the circulatory system determines the further viability of the entire organism as a whole. In addition, this system plays a leading role in providing adaptation processes.

We calculated AP, in arbitrary units - points, according to the formula of R. Baevsky [1], which uses data on pulse rate (PR), blood pressure (SBP - systolic, DBP - diastolic), age (A), height (H) and body weight (BW):

AP= 0,011 PR+0,014 SBP+0,008 DBP+0,014 A+0,009 -0,009 H-0,27.

This version of the formula for calculating AP was obtained by the author as a result of applying the regression analysis technique on an information array in 2000 surveys. The AP values reflect the result of the organism's adaptive reactions and its value, using the proposed criteria, make it possible to classify PS and health levels of the examined. To assess the level of physical health, we used the express method of GLApanasenko [13].

A scale of somatic health that distinguishes five levels of health: low, below average, average, above average, high, calculated in terms of body mass, VCL / mass, lung capacity, hand dynamometry, heart rate and systolic blood pressure.

The results obtained for all of the above indicators are evaluated in points. Summing up the scores for all five indicators and comparing them with the scale, determines the level of physical health.

We determined the quantitative assessment of the body's energy potential by the Robinson index (IR) [13]. IR = (HR x BP syst.) / 100, characterizes the level of metabolic and energy processes occurring in the body and systolic work of the heart and, together with the adaptive potential, is the most sensitive marker of the state of the CVS and the adaptive mechanisms of the human body. At the same time, the IR score - excellent indicates, accordingly, a high; good - about the normal functional reserve of the CVS; average - insufficient, bad and very bad - different levels of dysregulation of the CVS.

The individual indicators of the surveyed, obtained by us, in terms of their adaptive potential, health levels and CVS state, were analyzed and verified based on the criteria of the proposed FS scale. The results of this analysis are presented in Table 2.

Table 2

Functional corridor boundaries		Classification Functional Corridor	Levels Adaptive Potential	Quantities surveyed with indicators given corridor			Of them									
							Health levels according to Apanasenko					The state of the cardiovascular system according to Robinson				
				Total	Of them		Low	below the average.	average	above the average.	high	Very bad	bad	average	good	Exellent
Min	max				Boys	Girls										
1,0	1,309	FN	optimal	-	-	-	-	-	-	-	-	-	-	-	-	-
1,309	1,618	FN	good	6	1	5	-	-	6	-	-	-	-	-	1	5
1,618	2,118	DS	Satisfactory	27	11	16	7	8	12	-	-	-	2	6	18	1
2,118	2,618	DS	tense	10	7	3	10	-	-	-	-	2	4	1	3	-
2,618	3,427	premorbital state	unsatisfactory	No	-	-	-	-	-	-	-	-	-	-	-	-
3,427	4,236	Pathological condition	Breakdown	No	-	-	-	-	-	-	-	-	-	-	-	-
Total				43	19	24	117	8	18	-	-	2	6	7	22	6

Personalized analysis of these data, in the light of existing ideas about the functional state and adaptation mechanisms, allow us to state the following:

1. Of the 43 examined, only 6 (13.9%) individuals, the FS of the body corresponds, according to our scales, to the physiological norm with good adaptation and a normal level of regulatory mechanisms. At the same time, they all have an average level of physical health according to Apanasenko and high CVS reserves according to the Robinson index. Among the girls surveyed, 20.8% are in this state, and 5.3% of the boys..

2. Of the surveyed, 27 (girls-16, boys-11) are in a prenosological state, with sufficient functional capabilities and satisfactory adaptation. However, the levels of their physical health have certain variations with the prevalence of the average level. Corresponding variations are observed in the states of CVS, where 67% of these individuals have normal values;

3. Of the surveyed 10 persons (girls-3, boys-7), have a prenosological level of functional state, but with a tense adaptation mechanism and significant mobilization of functional reserves to maintain homeostasis of the body. All of them have low levels of physical health and variations in the Robinson index, with the prevalence of the level of bad and very bad.

At the same time, for the criterion of such an analysis, we propose the functional state stability index (**FSSI**), and inversely proportional to it, the probability of a qualitative change in the functional state, the probability of a qualitative change in the functional state (**PQFS**), the value of which, in% can be calculated by the formulas:

FSSI=$\{(A_{max,i} – AP_{k,o})/ (A_{max,i} - A_{min,i}) \}$**x 100** (3) **; PQFS=(100- FSSI)** (4) , $A_{max,i}$, $A_{min,i}$ values of the maximum and minimum boundaries of the **i**-th functional interval, where the adaptive potential of the $AP_{k,0}$ is fixed, about **k**-examined. Note that quite often, when conducting expert assessments, it becomes necessary to use a special type of ordinal scales - *verbal-numerical scales*. Such scales include a verbal description of the selected gradations and the corresponding numerical values. The most famous and widely used in practice is the Harrington scale [15], which has universal application. So for example, adapted by us for any, separately taken, one functional interval, for the assessment of **FSSI** and **PQFS**, it has the following form.

№	Numerical value of FSSI (in%)	indicators FSSI	value PQFS	indicators PQFS
1	80–100	Very high	20-0	Very low
2	64–80	High	37-20	Low
3	37-64	The average	64-37	The average
4	20-37	Low	80-64	High
5	0-20	Very low	100-80	Very high

In accordance with these approaches, first of all, the individual indicators of the FSSI were assessed, which showed that 8 persons (girls-4 and boys-4), out of all surveyed, have very high; 1 (girl) - tall; 22 (girls-15 and boys-7) -medium; 1-low and 11 (girls-4, boys-8) - very low levels of functional stability of the body. Using the individual FSSI values obtained for each subject according to formula 3, the PQFS were estimated, which are presented in table. 3.

Note that the integral indicators of the FS, such as the levels of its reserve, stability and the probability of change are interrelated, namely - the more the reserve of the FS, the higher the levels of its stability and the less the probability of change (deterioration); and vice versa.

Табл.3

meaning VIFS on formula 4 v, %	Indicators VIFS on Harrington	Total of surveyed with data VIFS	Of these, the likelihood of quality transition have:			
			from FN in D-1	from D-1 in D-2	from D-2 to premorbid. condition	From premorbid to pathology
80-100	Very high	11	2	8	1	-
64-80	High	1	-	-	1	-
37-64	The average	22	-	-	-	-
20-37	Low	1	-	-	-	-
0-20	Very low	8	-	-	-	-

Based on these provisions, we analyzed the results of prenosological assessment of the FS of the surveyed presented in Table 3 and found that 12 (27.9%) of the surveyed individuals have high levels of probability of qualitative changes in functional states, namely: 2 of them transition from physiological norm in the D-1 state; 8- from D-1 to D-2 state; and in 2 surveyed there is a risk of developing pre-morbid conditions, that is, a transition to a premorbid state. At the same time, 31 (72.1%) persons from the surveyed contingent, having below the threshold levels of the probability of a change in FS, do not have a risk of deteriorating their health.

Conclusions

Thus, the developed scale and its criteria, and algorithms for assessing the indicators of the adaptive potential of the CVS, allow us to classify practically healthy individuals, according to the levels of the functional state. Its sufficient sensitivity and discriminatory properties are confirmed by the presence of a correlation between the scaling results and the indicators of those examined by the level of health and functional reserve of CVS.

The proposed scale, its criteria and methods of analysis, also make it possible to assess the levels of FS stability, within certain functional intervals and the likelihood of their qualitative changes in the direction of deterioration. As a result, it becomes possible to quantitatively assess functional states, their reserves and predict the occurrence of premorbid conditions, that is, to carry out prenosological monitoring of the health of healthy people and to determine the contingent of persons at risk of deteriorating health.

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