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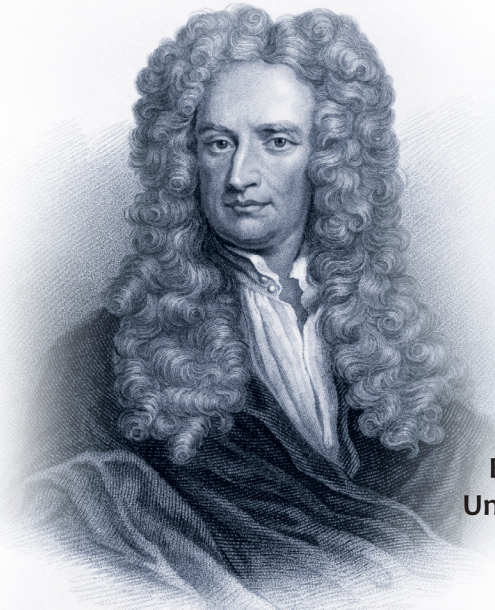

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MEDICAL SCIENCES

SUBMISSION OF FINANCIAL STATEMENTS AND ITS COMPOSITION

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Annotation. The article notes that international financial reporting standards (IFRS) is a holistic creative worldview system that requires specialists applying it, special mentality, courage to formulate sound professional judgments, have sufficient confidence that the decisions made will lead to the formation of high-quality financial statements. The main objective of IFRS is the adoption by its users of effective management decisions.

The authors emphasized that in the face of high investment risks, the recognition of international financial reporting standards in the Republic of Tajikistan would be an important step both for attracting foreign investment, which is so necessary for the development of many areas of activity, and for improving the financial reporting system in the Republic of Tajikistan.

Keywords: International financial reporting standards, financial statements, company, financial information, economic decisions, balance sheet, profit and loss, capital flows.

The objective of IAS 1 Presentation of Financial Statements is to disclose the basic requirements for the content of financial statements. These requirements are primarily aimed at ensuring comparability of information contained in financial statements.

For the first time, an entity applying IFRS should explain how the adoption of IFRS has affected its announced financial position, financial performance and cash flows. This is done in its first financial statements prepared in accordance with IFRS, as well as in the interim financial statements for the periods covered by the first financial statements.

If an entity did not present financial statements for prior periods, then it shall disclose that fact. The requirements of IAS 8 regarding the disclosure of changes in accounting policies do not apply to the first financial statements prepared in accordance with IFRS, with the exception of the requirements for IAS 32 and IAS 39. [3, p. 23]

Financial statements are a structured presentation of data on the economic activities and financial position of a company. The main objective of financial reporting is to satisfy the needs of a wide range of users in the financial information necessary for making economic decisions.

To accomplish this task, the financial statements must include data on assets, liabilities, equity, income and expenses (including profit and loss), cash flows. These materials, contained in the appendices to the financial statements, help users in predicting the ability of an enterprise to accumulate economic benefits.

A complete set of financial statements includes: - balance sheet (Balance Sheet); - statement of profit and loss (Income Statement); - statement of capital flows (Charges in Equity Statement); - cash flow statement (Cash Flow Statement); - accounting policies and explanatory material (Accounting Policies).

IAS 1 discloses the structure and content of each of the reporting forms. It should be noted here that the standard under consideration was revised in 1999 and entered into force in 2000. The contents of the revised standard will be further disclosed to avoid obsolescence of information.

The balance sheet should include indicators such as fixed assets, intangible assets, cash and cash equivalents, inventory, receivables and payables, financial assets, investments, income tax and tax liabilities, capital and reserves, minority interest (for consolidating companies).

Additional materials disclosing the contents of the listed items are provided in the balance sheet or in the annexes to the financial statements in accordance with the requirements of IFRS.

The main idea of compiling the balance sheet, as you know, is to disclose the company's funds and their sources in the context of the main items of assets and liabilities, as well as to compare data for the reporting period with data for the previous period.

The profit and loss statement should include information such as: financial result from operating activities, expenses, part of the income and expenses of associates and joint ventures, tax expenses, profit or loss from main activities, unforeseen income or expenses, minority interest (for consolidating companies) and net profit or loss for the reporting period.

Additional information disclosing the contents of the listed items is given in the balance sheet or in the annexes to the financial statements in accordance with the requirements of IFRS. [6, p. 126]

For income statement, IAS 1 provides two alternative forms, one of which classifies expenses according to their origin, the other according to their functions.

Classification of expenses by origin means that items such as salaries, depreciation, etc., reflected in the income statement, are simply the sum of the uniform costs. Classification of expenses by function implies their analysis according to three main articles of the cost of sales, commercial and administrative expenses. This approach is considered the most common.

The main idea of the income statement is to adjust the revenue received in the reporting period by adding the amount of income received and subtracting the amount of expenses incurred, which ultimately gives the amount of net profit for the reporting period.

The statement of capital flows is also an integral part of the financial statements. The presentation form of this report contains separate information for each element of share capital and reserves (for example, share capital, additional issue, reserve for revaluation of values, reserve for exchange rate differences) and lines with a list of their possible changes (for example: changes in accounting policy; changes, arising from the revaluation of fixed assets and investments; other changes not reflected in the income statement).

A separate line shows the data on net profit for the reporting period, which is an integral part of equity and forms the final data on the capital of the company.

The main idea of the statement of capital flows is to sequentially adjust the balance of capital for the previous reporting period (except for the consequences of changes in accounting policies) by subtracting accrued dividends and the result of revaluation of investments and adding the result of revaluation of fixed assets, net profit for the reporting period and additional issue, which gives the total capital of the company at the end of the reporting period.

The contents of the cash flow statement will be disclosed when considering the relevant IAS 7 standard.

Accounting policies and explanatory material reflect the main methodological principles for preparing financial statements adopted by this organization.

The standard provides a list of material information that must be included in the balance sheet and income statement.

The following data should be provided in the reports: company name, country of location, date of preparation of the financial statements and the duration of the reporting period, a brief description of the nature of the company's activities, its legal form and the currency in which the statements were prepared (for comparison, data for the previous reporting period are also indicated). [5, p. 214]

The balance sheet should disclose restrictions on asset ownership; guarantees for obligations; methods of providing pension programs; funds intended for future investments.

Information on the financial position of the enterprise is presented in the form of a balance sheet. This reporting form reflects the resources and requirements for these resources or the share of participation in them, and also serves as an indicator of the financial stability of the enterprise.

It is designed to help the user in assessing the ability of the enterprise to fulfill its obligations. The resources of the enterprise are attributed to its assets; from the data on resources, to a certain extent, one can judge its potential for generating future resources. The requirements for these resources are called liabilities, or liabilities. The difference between assets and liabilities, representing the share of shareholders in the total capital of an enterprise, is called equity.

There are two sources of this capital: funds provided by shareholders (for example, paid-up part of share capital), and funds received from the activities of an enterprise (for example, income minus payments to shareholders, unrealized reserves).

Thus, the following elements are included in the balance sheet of the enterprise:

a) assets are resources that are controlled by the reporting entity that arose as a result of past events and that could bring economic benefits to the entity in the future;

b) liabilities (obligations) - obligations of the reporting entity that arose as a result of past events and the fulfillment of which is expected to result in the disposal of resources embodying economic benefits (assets);

c) capital - the balance obtained by deducting the amount of liabilities from the amount of assets of the reporting entity. It can be divided into capital, which the company receives from shareholders, and capital, which it generates through its own efforts and distributes to shareholders or uses for future operations.

In addition, in practice, certain objects that do not fall within the definition of assets or liabilities and which are not reflected as part of equity (for example, deferred expenses and deferred income) are shown separately in the balance sheet.

Thus, the balance sheet compiled in accordance with the requirements of IFRS does not have two elements, but three, and the liabilities here do not mix the company's own and borrowed funds, which gives more opportunities for analyzing the financial stability of the company.

Consider the above elements of balance in more detail. The future economic benefits embodied in a particular asset can be realized in different ways. The following ways to use assets are: - the actual use - individually or together with other assets - in the production of goods and services that will be sold by the enterprise; - exchange for other assets; - use for repayment of one or several obligations; - distribution among the shareholders of the enterprise.

Assets include buildings, structures and equipment, financial leasing, investments in subsidiaries and other enterprises, long-term receivables, acquired patents, trademarks and similar intangible assets, liquid securities, current receivables (commercial) debts, inventories, cash funds and funds in bank accounts, advanced expenses.

Assets arise from past events, which may be transactions involving or not related to the use of cash. Assets can be acquired, exchanged for other assets, generated or provided in the form of subsidies, subsidies.

Assets are taken into account when there is sufficient confidence that the economic benefit embodied in them will be received by the enterprise, and also when they meet the requirements for the accounting unit (see above). The mere implementation of certain costs is not enough. There must also be sufficient confidence that these costs will bring future economic benefits. In the absence of such certainty, costs are considered as expenses, and not as assets (in accordance with the concept of prudence). [3, p. 84]

In a number of countries, intangible assets, such as concessions, patents, licenses, trademarks, and similar rights and assets, can be recorded in the balance sheet only if, at the time of the acquisition, monetary value satisfaction was provided for them. In some countries, it is permitted to show assets in the balance sheet only if the reporting entity is the rightful owner.

Settlement of obligations can be carried out in several ways, such as: - cash payment; - transfer of assets; - provision of services; - replacement of this obligation by another obligation; - the conversion of the obligation in the capital of the enterprise.

Liabilities include long-term loans and debentures, short-term loans and bank overdrafts (negative balances on the current account of the company), accounts payable, reserves of the estimated appropriations, pension

plans and similar financial obligations. IFRS liabilities cover both liabilities whose cash amount can be accurately determined and liabilities for which it is not possible. Therefore, liabilities include elements that, in some countries, are commonly called reserves of estimated appropriations. [1, p. 101]

Reserves of estimated appropriations are understood as liabilities, the amount of which cannot be determined with accuracy or of which there is no certainty (for example, reserves for doubtful debts). In some countries, it is not permitted to use reserves of estimated appropriations to adjust the value of assets (for example, using an allowance account for doubtful debts as a contract).

In other countries (mainly with the Anglo-American accounting model), this practice is generally accepted. Provisions for anticipated appropriations should be distinguished from contingencies for contingencies, which are amounts reserved from equity for future use to pay off obligations that might arise from probable or probable events (for example, workers taking a vacation).

Liabilities are accounted for when there is sufficient assurance that, as a result of the settlement of a specific obligation, there will be a decrease in economic benefits in the future and when they meet other requirements for the unit to be accounted for; however, the assessment of liabilities should not be underestimated (the concept of prudence).

Capital is defined above as the remainder of subtracting the amount of liabilities from the amount of assets of the reporting entity. This amount usually differs from the total value of the shares of the company in the stock market or from the amount that can be obtained by selling the company as an operating company or selling its net assets in parts.

A deeper understanding of the essence of capital contributes to its separation: a) on the capital that the reporting entity receives from shareholders; b) the capital that it generates through its own efforts (profit).

Issues related to capital are regulated in many countries on the basis of a significant number of legal requirements, many of which affect the breakdown of capital into funds that can be distributed, and funds that can be distributed only if certain conditions are met.

Legislative acts or the charter of a joint-stock company determine the need to create official or regulatory reserves, the purpose of which is to provide some protection against future losses.

The regime applicable to accounting for the paid part of the share capital varies from country to country. In some countries, all amounts paid by shareholders are classified as paid part of the share capital without further breakdown into smaller categories.

In other countries, the paid part of the share capital is divided into two types: the amount constituting the face value of the shares offered for sale, and the amount representing a premium to the shares, or additional capital. In the consolidated balance sheets, the amount of equity should be indicated separately for the shareholders of the parent company and other shareholders. [4, p. 136]

Profit and loss statement gives a quantitative assessment of the enterprise, an idea of the financial results of its activities. The essence of filling out this reporting form is to display the net result of operations of the enterprise in the reporting period.

It reflects the changes associated with the work of the enterprise that have occurred in its own share capital over this period.

Elements of the performance reporting form reflect the inflow and outflow of financial resources that contributed to a specific outcome for a given period. Income is called income, and disposal is called expense. The terms “income” and “expenses” are used to describe the ordinary business operations of an enterprise.

The inclusion of income and expenses in the form of the results of operations is determined by the choice of the concepts of capital conservation, which were mentioned above.

Thus, the form of reporting on the results of operations (profit and loss statement) includes the following elements:

a) incomes increase in the economic benefit of the enterprise for the reporting period in the form of a quantitative or qualitative increase in the value of assets or a decrease in liabilities, resulting in an increase in capital, but not at the expense of the contributions of the founders;

b) expenses - a decrease in the economic benefit of the enterprise for the reporting period in the form of a quantitative or qualitative fall in the value of assets or an increase in liabilities, resulting in a decrease in capital, but not due to payments to the founders.

The profit and loss statement contains information relating to: sales; results of operations; interest income and investment income; shares in net income (loss) of associates; gains and losses on non-core activities; interest expense; depreciation, decrease in value and depreciation; income taxes; unusual (non-operating) debit and credit items; rental expenses; profit or loss on transactions in foreign currency and on transactions related to the conversion of foreign currencies; volume of used or sold inventory; labor costs; net income and research and development.

Revaluation of assets and liabilities leads to an increase or decrease in the capital of the enterprise. However, while this increase or decrease

meets the definitions of income and expenses, it is not included in the income statement in accordance with the capital protection concepts mentioned above. Instead, these measures are included in equity as adjustments for capital conservation, or revaluation reserves. Currently, this concept is reflected in accounting (using the account “Additional unpaid capital from revaluation of fixed assets” to reflect the revaluation of fixed assets). [2, p. 248]

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MEZZANINE FINANCING AND PROBLEMS OF ITS APPLICATION IN RUSSIA

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Abstract. The article reveals the role of mezzanine financing as one of the effective investment tools that can solve the problem of attracting financial resources to expand the company's production capacity or in cases of implementation of large infrastructure projects, mergers and acquisitions or allotment of a part of the business. A comparative analysis of mezzanine financing transactions in Russia and foreign countries has been carried out. Prospects for the development of mezzanine financing in Russia are highlighted.

Keywords: mezzanine financing, financing, own funds, leveraged financing.

Mezzanine financing is a special form of leveraged financing where conventional bank lending cannot be provided due to the increased risk profile of the transaction [4]. Moreover, the loan repayment period usually exceeds five years, provided the principal amount is repaid at the end of the loan term.

The foreign market for mezzanine financing is currently quite developed, but the domestic market remains at an extremely low level, as the legislation is imperfect and the lack of financial institutions makes its development impossible.

We consider the mezzanine financing tools that are most common in international financial practice [6].

1) First of all, it is a mezzanine loan, which is unsecured and subordinated in the EU countries or the United States.

The subordination of mezzanine debt is realized by granting the creditor the right to subsequently withhold or pawn the property with inter-creditor agreements. There may also be "structural subordination" in which senior lenders enter into loan agreements with the asset holders on security of these assets or guarantees (security) of such companies, and the mez-

zanine lender provides a loan to the holding or sub-holding company of the borrower under the collateral of shares (shares) of companies that own real assets. Additional income, providing an overall return on mezzanine capital of 15-25%, is received by the lender from deferred interest, participation in the borrower's profits, sale of warrants or options on the borrower's shares and other mechanisms [7].

2) The next tool, which has become widespread in international practice, is "financing with the registration of unspoken investor participation." Its peculiarity is that the investor acquires a stake in the borrower's company, but does not accept responsibility to the creditors. Investor participation information remains unknown to third parties.

3) Financing for the issuance of convertible bonds, which provide for fixed payments and repayment of the main credit body at the end of the financing period with the possibility of the investor acquiring of the borrower's shares on a predetermined conversion price instead of repaying the principal debt.

4) Financing for issuing bonds with warrants on the shares of the borrower's company, which can be traded separately from the bonds.

5) Financing for the issuance of preferred shares of the borrower's company, providing preferential rights to participate in the profits and liquidation value over the owners of other shares of the company.

The Russian experience differs from the world practice in the fact that only a few funds specialize in mezzanine financing. The most popular tool in Russia remains mezzanine lending (the first tool in the classification list of mezzanine instruments in world practice) [2].

A feature of mezzanine transactions in Russia is the use of foreign elements in their structuring, even if all sides of the deal are Russian entities. Also, a significant feature in Russian practice is considered to be the lack of legal development of this financial instrument, at the moment there are no mechanisms for financing of subordinated loans in their classic form. Characteristics of mezzanine finance types in Russia are shown in Table 1 [3].

Table 1 - Mezzanine financing instruments in Russia

Mezzanine financing type	Term (years)	Interest payments	Instrument	Exit mechanism
Equity stake (500 mil rub. or more)	Up to 7	None. Dividends are paid	A separate class of shares with reserved matters	Liquidity event; Right to compel the sale (drag along)

Mezzanine financing type	Term (years)	Interest payments	Instrument	Exit mechanism
Pre-project funding (250 mil rub. or more)	Up to 5	Every three months	Loan and additional yield agreements conclusion (warrant) Ordinary shares with put option	Refinancing by senior loan at the project or operational stage; Repayment from flows from the project; Repayment by the sale of part of the project's property
Pay Once (500 mil rub. or more)	Up to 5	At the end of term payment. No interest payment and body of debt during the deal term	Loan and additional yield agreements conclusion (warrant) Preferred shares or ordinary shares with put option	Repayment from the sale of the company, its part (IPO) or individual assets; Repayment from accumulated flows from the project; Refinancing by senior loan
Shareholder mezzanine (500 mil rub. or more)	Up to 10	Every three months and at the end of term payment	Preferred shares or ordinary shares	Repayment from flows from the project and/or existing business; Repayment from the sale of individual assets of the project; Repayment using the funds of shareholders
Joint ventures (500 mil rub. or more)	Up to 10	Every three months and at the end of term payment	Ordinary shares / share in JV	Repayment from flows from the project/business; Liquidity event; Repayment by sale of individual assets; Repayment using the funds of partner
Loan with warrants (250 mil rub. or more)	Up to 10	Every three months and at the end of term payment	Loan and additional yield agreements conclusion (warrant)	Repayment from flows from the project/business; Refinancing by senior loan; Repayment using the funds of shareholders; Liquidity event
Venture funding (300 mil[1] rub. or more)	Up to 5	Every three months and at the end of term payment	Loan and additional yield agreements conclusion (warrant)	Mandatory repayment; Liquidity event

[1]Hi Capital, AlfaBank and Sberbank

Currently, most of the mezzanine financing deals in Russia are made by Sberbank PJSC.

The fee for the use, depending on the type of financing, is:

- equity stake: up to 50% of the equity;
- pre-project funding: up to 50% of the cost of pre-project works;
- Pay Once: up to 70% of the project cost (including senior debt);
- shareholder mezzanine: up to 50% of the shareholding;
- joint ventures: 50% of the joint venture's total capital;
- loan with warrants: up to 85% of the project/business value budget (including senior loan);
- venture funding: up to 20% of the funds previously raised.

This high fee is due to the fact that the investor takes a high level of risk. It can also be said that though mezzanine financing in Russia is only developing, a fairly wide range of tools of this financing is available. Comparing three sources of financing: bank credit, direct investment and mezzanine financing, we note that in Russian practice the expected return when choosing mezzanine financing is 1.5 times greater than in case of bank lending. However, the return is less than the return in case of direct investments [5].

It should be noted that the requirements for mezzanine financing are lower than for the other two financial instruments, as the collateral for this type of lending is the company's shares, which are occasionally secondary collateral of assets. If the company accepts a mezzanine loan as a source of financing it will increase the return on equity and reduce costs.

In Russia, there is a paradox of undervalued enterprise, which is why the development of mezzanine financing is difficult. Since this type of investment assumes an increased risk profile of the transaction, all the calculations suggest that the contribution to the Russian project will not pay off at all or in a short period of time. However, below are examples of real deals that show the opposite.

As an example of Russian projects using this tool, we can cite “Nord Stream 2”, where the creditors received a controlling interest in the project. Also in March 2007, Kaliningrad “Vester” retailer signed a loan agreement with Sberbank PJSC, which stipulates that within four years the bank will be able to acquire 10% of the company's shares [8].

This article examined the possibilities and challenges of using mezzanine financing in Russia and analyzed existing financing tools.

Analyzing the presented data, it was concluded that the full range of mezzanine financing tools existing in Russia will increase the implementation of major projects in the next decade.

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THE IMPACT OF CORRUPTION ON RUSSIA'S ECONOMY

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Annotation. The article addressed the problem of corruption from an economic point of view. Analysis of statistics on the committed corruption crimes allowed to highlight the most corrupt areas of activity of the Russian Federation, as well as draw conclusions about the impact of corruption on Russia's economic security.

Keywords: corruption, corruption crimes, bribery, embezzlement, Russian economy

In social terms, the concept of corruption is the broadest. Corruption can be described as an official's use of his power and trusted rights for personal gain, which are contrary to established rules.

Today, corruption is seen as one of the most important obstacles for both Russia's political and economic development. Statistics show that the number of corruption violations has been increasing in recent years, but the number of anti-corruption tools is also growing.

The Accounts Chamber found that in 2018, when analyzing public procurement for two years, the amount of violations increased by 5.5 times. And these violations are mainly related to the overestimation of contracts and violation of the requirements for acceptance and payment of works [2].

In order to see the number of violations, let's turn to the diagram 1.

After analyzing the data of the chart, we can conclude that for 2018 the volume of detected violations is 294.6 billion. rub. This is 2.5 times more compared to 2017 and 5.5 times more compared to 2016. In addition to breaking the law, this amount includes corruption violations.

The Accounts Chamber found that the unjustified increase in the value of contracts (about 40% of the total) prevails among corruption violations in public procurement. And violations of the requirements of the legislation, which are related to the acceptance and payment of backlogs, is about 20%. Public procurement is spent annually on about 30% of GDP.

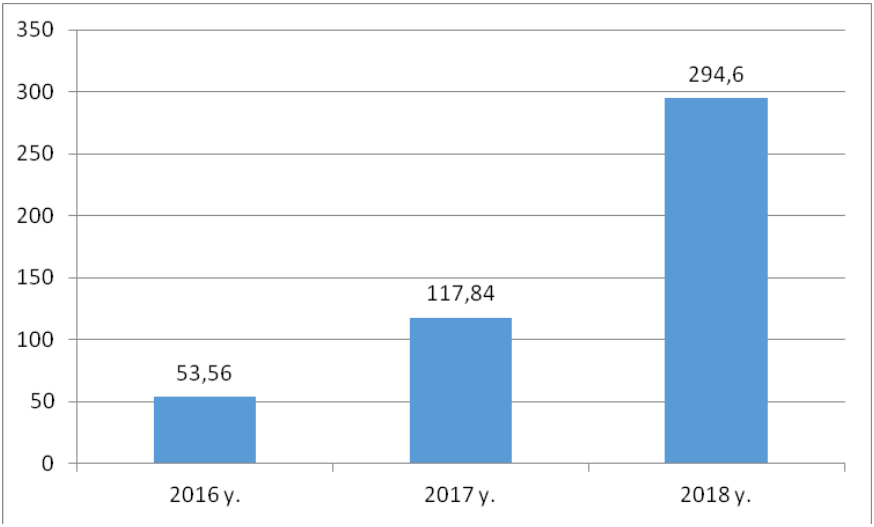

Figure 1- Amount of violations identified by the Accounts Chamber for the period 2016-2018 (billion rubles)

Last year, the Russian Prosecutor General's Office identified 150,000 violations in public procurement, of which about 6% had a corruption component. This was mainly due to the initial price of the contract, the restriction of competition, and the setting of unreasonable evaluation criteria.

In addition, 275 criminal cases were opened in 2018, 2.5 thousand cases. persons are disciplined and criminally liable. Violations related to kickbacks were detected more than 400, which is 84% higher than in 2017.

According to the Accounts Chamber, the number of FSB officers who were seen in corruption activities has more than doubled from 17 to 39. In 2018, the number of corrupt employees of the Investigative Committee increased from 21 to 29 (about 38.1%), internal affairs officers - from 956 to 971 (by 1.6%).

As for the number of corruption crimes in general, their dynamics are also increasing.

According to Figure 2, 26,114 corruption crimes were detected in Russia in the first nine months of 2019. There were 30,495 crimes recorded in all of 2018 and 29,634 in 2017.

The number of recorded facts of receiving and giving bribes is also growing. As of September 2019, 11,283 crimes had been identified. For the first nine months of 2018 -10,179. For all of 2018 -12,527.

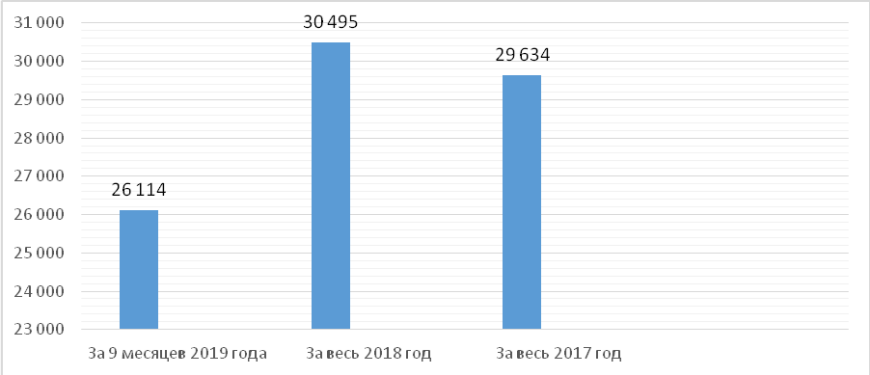

Figure 2 - Statistics of corruption crimes for the period 2017-2019

In October 2019, the Prosecutor General's Office summed up the results of a sociological survey, during which Russians chose the most corrupt areas.

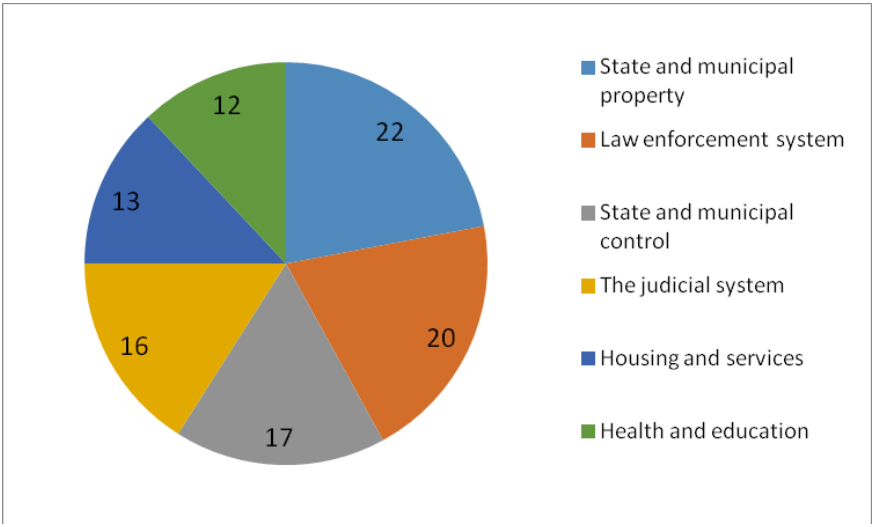

Figure 3 - The most corrupt areas, according to citizens (in %)

Having analyzed the data of Figure 3, we can say that the most corrupt sphere is the sphere of state and municipal property.

Education and health care, where corruption rates do not exceed 12 per cent, pose the greatest threat, according to the respondents. Also, 81% of all respondents say that corruption is a very serious problem for Russia, and only 11% see progress in the fight against it.

The majority of citizens surveyed, namely 85% believe that the media keep silent a significant part of information about corruption crimes.

A total of 38,000 people participated in the survey of the Prosecutor General's Office, which was conducted in June 2019.

In 2018, the Prosecutor General's Office and the Investigative Committee of Russia (SKR) presented statistics on the number of corruption crimes. According to this information, Russia began to take bribes almost 10% more often than in 2017.

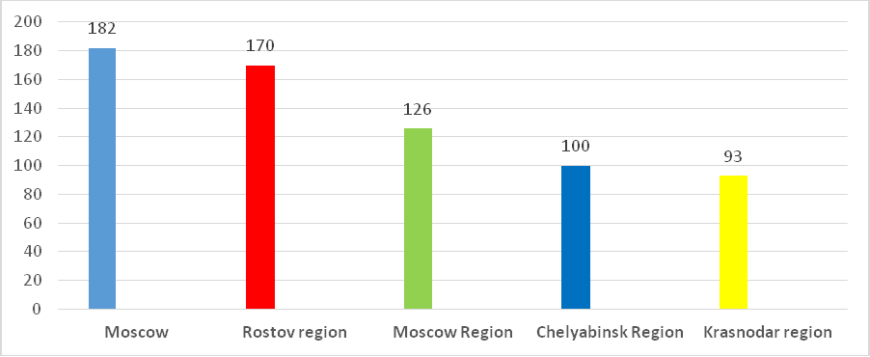

Figure 4 - Ranking of districts by the number of bribes in Russia

A total of 3,171 bribery cases were registered from January to October 2018, which is 272 more than in 2017. The number of bribes has also increased (in 2018 - 2251, in 2017 - 2037). The leaders are Moscow (127), Moscow (114), Krasnodar region (73).

A total of 27,143 corruption offences were committed in the first 19 months of 2018. This is due to tougher legislation and anti-corruption propaganda.

According to the chart, the Chelyabinsk region takes the first place, Moscow is in 3rd place, Krasnodar region - in 4th place, which indicates a high level of corruption.

Among the cases in the field of corruption crimes coming to court, the following cases prevail:

The department also specified that the following groups of employees were under suspicion in 2018:

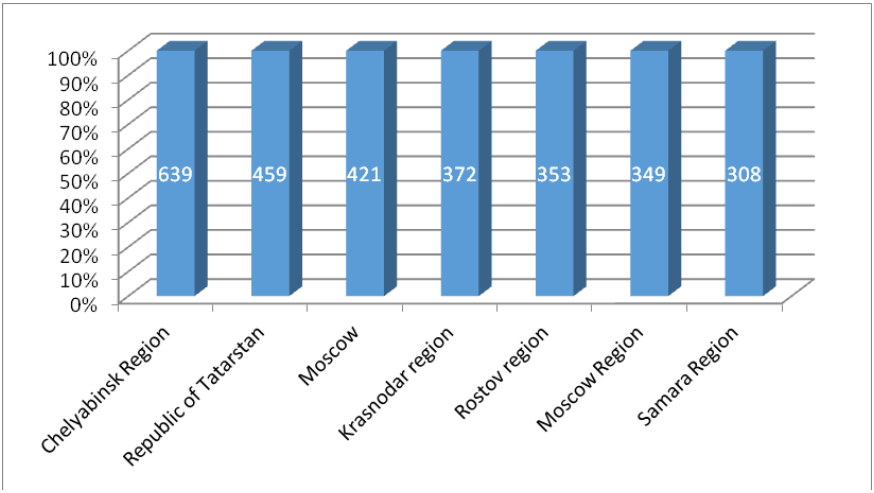

Figure 4 - The most corrupt regions of Russia by the end of 2018 (number of criminal cases)

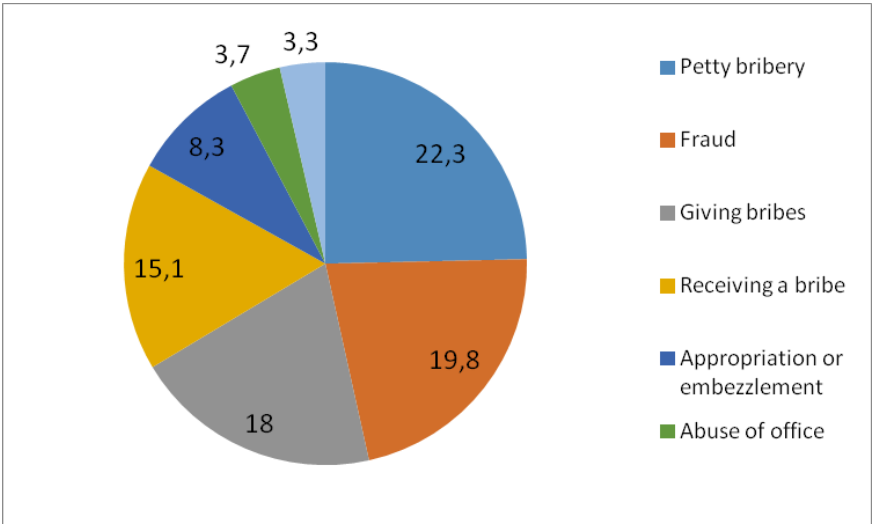

Figure 5 - Ranking of cases in corruption crimes (%)

Table 1- Number of employees suspected of corruption crimes in 2018

	Number of people brought to justice
Internal Affairs Officers	790
Local government officials	502
Soldiers	495
Government officials	483
Ministry of Justice	334
Health and science workers	178
State and municipal officials	69

If we talk about real losses for the national economy from such corruption crimes as: bribes, kickbacks, abuses, the damage is not less than 8-10 trillion rubles. That is, they are approaching the size of the budget (about 16 trillion rubles).

«In fact, according to experts, the volume of budget theft in Russia is about 3.5 times higher than the Accounts Chamber records. Imagine how many trillions have not reached the economy and settled in the pockets of stealing bosses?!» — said the former State Duma deputy, adding that the nomenclature has withdrawn from the country at least 1.2 trillion dollars USA (more than 70 trillion rubles), of which about 500-600 billion dollars USA - in the U.S., the rest - to the EU and Switzerland. This is reported by "Rambler" [4].

Thus, corruption poses a real threat to The Russian economy, as it leads to the loss of a significant part of the budget, the inhibition of economic growth, the lack of market competition, etc. One of the important steps in the fight against corruption must be ratified 20 UN Convention against Corruption, which penalizes illegal enrichment. At present, the declaration of officials' income is not effective, as expenses exceed incomes and do not require explanation of the sources of their occurrence.

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THE CONCEPT AND NUMERICAL ALGORITHM FOR SELECTING AN EFFECTIVE FINANCIAL PORTFOLIO FOR MODERN STOCK MARKETS

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Abstract. The ability of an investor to choose a portfolio from several alternatives that satisfy its preferences in terms of profitability, risk and liquidity significantly improves the quality of an investment decision in the absence of an optimization model adequate to the market. The author's concept provides for: the formation of a set of alternative financial portfolios with different characteristics in a priori given quantity; selection of an integral indicator of the quality of the investment portfolio; the formation of the priority sequence of portfolios using the game theory method “against nature” and the synthetic “game” Wald-Savage criterion, which allows to take into account the investor's predisposition for risk-return pair. A comparative analysis of investment decisions based on the “classical” portfolio theory and the author's concept allowed concluding that the proposed approach and the numerical method are correct and high in comparison with traditional methods and efficiency algorithms in the application to the tasks of portfolio investment.

Keywords: portfolio theory, stock market, non-institutional investor, Sharpe ratio, game against nature, Wald-Savage synthetic criterion.

It should be reminded that the financial portfolio model proposed by H. Markowitz was based on the “risk-return” dilemma: a dispersion of return adjusted for covariance and standard deviation of return of each pair and individual financial assets was proposed as a measure of change in return on securities in portfolio. Transaction costs and taxes are not taken into account in the model for the sake of simplification [4]. The portfolio of securities can be made of several assets, which in aggregate maximize profitability at the set level of risk, regardless of individual preferences of the investor. Also, it is possible to create a portfolio with the lowest possible risk, taking into account the desired level of profitability. All existing

asset combinations can be depicted on a graph: “risk-expected return”, which limits the portfolios preferable for the investor under a certain curve - efficient frontier. In real conditions, portfolios along the efficient frontier are easily found on stock exchanges, which meet the basic conditions of H. Markowitz model.

To illustrate the current involvement of countries in stock market operations, we present the World Bank data concerning the ratio of capitalization of the stock market of countries to GDP in 2017 (data for countries where this value exceeds 40%) (Fig. 1). This indicator became significant in the financial analysis after W. Buffet’s (one of the most famous investors) statement that it is the best for conclusion about overestimation or underestimation of the market as a whole [5]. A value above 100% indicates the first phenomenon, and a value of about 50% indicates the second one. Therefore, market efficiency condition is not met for all countries [1, pages 302-305].

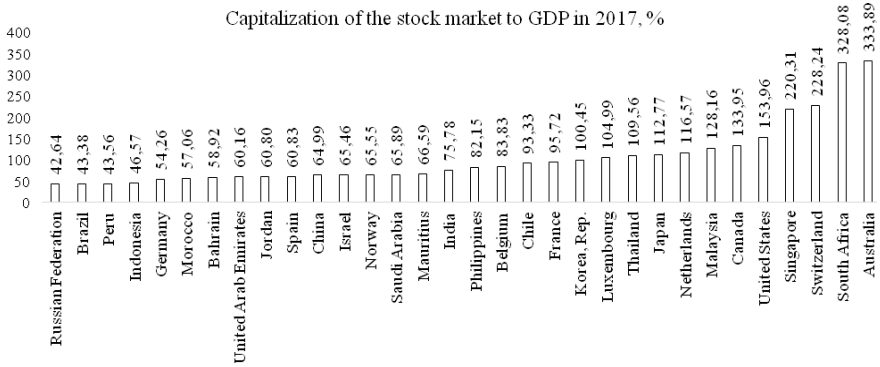

Figure 1 - Ratio of Capitalization of the Country’s Stock Market to its GDP in 2017 [6]

For developing stock markets characterized by low liquidity, which does not provide protection of operations, low efficiency of the market and other problems, the possibility of forming effective portfolios can be considered only with modification of H. Markowitz theory and method and improvement of portfolio theory algorithms.

In this regard, the problem of improving the tools of models and methods of formation and management of financial portfolios of both professional players and non-professional (non-institutional investors) agents of the stock market is relevant.

In view of newly emerging needs of investors and market “movements”, the classic H. Markowitz model can be supplemented. However, such approach can not be recognized as effective. We chose another approach, namely: formation of a financial portfolio, taking into account the preferences of investors, which in this case can be called “additional”.

We demonstrate the possibilities of this approach in the appendix to the task of formation of a medium-term investment portfolio of a moderately aggressive investor with a low investment budget. Such investors include non-institutional investors whose aim is to keep money under the conditions of inflation. Expectations of return on investment in the portfolios under consideration are not higher than the market average; however, requirements to reliability of financial instruments in the portfolio are more stringent: investor is tolerant to risk, but the value of risk may not exceed a priori set level. Also, timely withdrawal from the transaction requires appropriate level of liquidity of instruments. This group of investors focuses on medium-term investment horizon (from 6 months to 2 years [3, pages 38-39]).

It is proposed to consider the prospects of using Wald-Savage synthetic criterion suggested by L. Labsker (a professor at the Financial University under the Government of the Russian Federation. He is the author of 165 scientific, educational and methodical publications in the field of the theory of approximation in banach spaces, Chebyshev’s systems, waiting line theory and game theory).

Wald-Savage synthetic criterion allows us to evaluate the optimality of behavior strategies considered by the subject - agent of market interaction (in this case - non-institutional investor) from the perspective of both winning and risk. It is a linear combination of Wald and Savage criteria with coefficients, which determine quantitative assessment of the subject’s preference to winnings and risk [2, page 19].

It is proposed to build a variant of traditional H. Markowitz model for non-institutional investor, according to the results of which it is planned to get at least *m* alternative portfolios of financial instruments homogeneous in terms of liquidity, investment terms, size of the investment budget and different in profitability and risk.

H. Markowitz model of forming an optimal portfolio for the group of non-institutional investors, which would form the basis of the solution of the task, is briefly described below with introduction of a formal definition of Wald-Savage synthetic criterion.

The model of portfolio consisting of *n* securities is as follows:

$$\begin{cases} \sum_{k=1}^{n} r_k w_k \to max; \\ \sqrt{\sum_{k=1}^{n} \sum_{l=1}^{n} w_k w_l \sigma_{kl}} \leq \sigma_p; \\ \sum_{k=1}^{n} w_k = 1; \\ w_k \geq 0, \end{cases} \quad (1)$$

where: k, *l* - asset indices; r_k - average expected return of the *k*-th asset of the investment portfolio; σ_{kl} - covariance of returns of the *k*-th and *l*-th assets in the securities portfolio; σ_p - risk level acceptable for the investor; w_k - share of the *k*-th financial asset in the investment portfolio [4].

Wald-Savage synthetic criterion includes:

- Wald criterion, which allows to determine the optimality of the strategy from the perspective of winning;

- Savage criterion, which allows to choose a strategy from the perspective of gaming risk.

The strategy, which provides W-maximum winning among minimum winnings in pure strategies is optimal in a set of pure strategies by Wald criterion, or W-optimal strategy. The optimal solution selected in this manner eliminates the risk, and regardless of the state of "nature", the obtained result cannot be lower than W.This criterion is called "the principle of guaranteed result" in the literature and defined as the criterion of "extreme pessimism about the winnings" [2, pages 115-117], which is applied in cases when the subject is aimed at unwillingness to lose rather than winning, which corresponds exactly to formalization of preferences of the group of non-institutional investors under consideration.

The strategy, which provides minimum risk among maximum risks in S pure strategies, is optimal in a set of pure strategies by Savage criterion, or S-optimal strategy. This criterion is also defined as "the criterion of extreme pessimism" in the literature, since when choosing such strategy, the subject is focused on the highest risk, namely, that the "nature" would be in the worst condition for the player [2, pages 125-126].

Their linear combination, as mentioned above, will allow to approach selection of the optimal investor strategy from the perspective of winning and risk.

Let's introduce coefficients characterizing the degree of the investor's preference for winning and risk: $r \in [0,1]$ and $(1-r)$ - for formal description of synthetic criterion. The choice of numerical value of the *r* indicator is subjective, depending on the required expected return and risk tolerance [2, page 138].

Wald-Savage criterion with a winning indicator $r \in [0,1]$ will be defined as follows:

$$Q_{WS_i}(r) = rW_i - (1-r)S_i, \quad (2)$$

where: W_i - efficiency of A_i strategy according to Wald criterion; S_i - efficiency of A_i strategy according to Savage criterion, $i \in I$.

$$Q_{WS_s}(r) = \max\{Q_{WS_i}(r): i \in I\}, \quad (3)$$

where $Q_{Ws}(r)$ the value of game in pure strategies.

Let's call strategy A_f on the set of s pure strategies optimal provided that:

$$Q_{WS_f}(r) = Q_{WS_s}(r). \quad (4)$$

A set of $Q_{WS}(r)$ - optimal n the set of s pure strategies is defined as $S_{opt.}^{Q_{WS}(r)}$.

It is proved in the cited paper that each strategy, which is optimal on the set of s pure strategies by the Wald-Savage criterion, is optimal on the set of s by both Wald and Savage criteria. Also, when $r \in (0,1)$ the structure of the set of $S_{opt.}^{Q_{WS}(r)}$ strategies optimal on the set of pure strategies by the Wald-Savage criterion with the winning-coefficient r does not depend on the values $r \in (0,1)$ [2, pages 147-155].

For practical use of the model described above we suggest to use the following algorithm, originally proposed by L. Labsker and improved for the purposes of this paper.

We believe it is necessary to introduce the following assumptions: a non-institutional investor chooses a strategy of investment from the ranked order of at least *m* securities portfolios obtained by calculations; risk limits are set externally; no restrictions on the liquidity of financial instruments are imposed, as it is assumed that the portfolios are formed in stock markets from assets with high liquidity.

Algorithm:

1. Form investment portfolios according to the "classical" H. Markowitz model (1) using financial instruments, which meet the investor's requirements to risk, profitability and liquidity, in calculations, to define characteristics of portfolios.

Use of Wald-Savage synthetic criterion requires identification of an indicator for comparative evaluation of portfolios. It is proposed to use Sharpe ratio for this purpose.

2. Form a matrix of A winnings, the elements of which will be Sharpe's ratios of formed portfolios in the periods under consideration;

3.Using the formula

$$W_s = \min\{a_{ij}: i = 1, \dots, n\}, j = 1, \dots, m. \quad (5)$$

we find efficiency indicators $W_i, i \in I$, of strategies $A_i, i \in I$, by Wald criterion, value of game W_s in pure strategies by Wald criterion.

4.Determine a set of strategies, which are optimal in a set of pure strategies by Wald criterion: $S_{opt.}^{Q_W(r)}$.

5. Create R risk matrix on the basis of matrix A.

6. On the basis of R matrix data calculate indicators S_i, determine game value by Savage criterion in pure strategies, S_s by formula:

$$S_s = \min\{r_{ij} : i = 1, \dots, n\}, j = 1, \dots, m. \quad (6)$$

7. Determine a set of strategies, which are optimal in a set of pure strategies by Savage criterion: $S_{opt.}^{Q_S(r)}$.

8. On the basis of data from steps 4 and 7 check feasibility of condition:

$$S_{opt.}^{Q_W(r)} \cap S_{opt.}^{Q_S(r)} = \emptyset;$$

If it is not met, a set of strategies, which are $Q_{WS_s}(r)$ - optimal on s set, has the following structure:

$$S_{opt.}^{Q_{WS}(r)} = \begin{cases} S_{opt.}^{Q_S(r)}, r = 0 \\ S_{opt.}^{Q_W(r)} \cap S_{opt.}^{Q_S(r)}, r \in (0,1) \\ S_{opt.}^{Q_W(r)}, r = 1 \end{cases} \quad (7)$$

Otherwise, we move on to the next step.

9.On the basis of data from steps 4 and 6 determine the value of game $S_{S_{opt.}^{Q_W(r)}}$ in strategies of set $S_{opt.}^{Q_W(r)}$ by Savage criterion.

9. On the basis of data from steps 3 and 7 calculate the value of game $W_{S_{opt.}^{Q_S(r)}}$ in strategies of set $S_{opt.}^{Q_S(r)}$ by Wald criterion.

11. On the basis of data from steps 4 and 7 determine a set of strategies, which are not optimal on a set of pure strategies by both Wald and Savage criteria.

12. For each strategy determined in step 11, check correctness of inequality using steps 3, 6, 9, 10:

$$\left(S_{S_{opt.}^{Q_W(r)}} - S_s\right) W_i - \left(W_s - W_{S_{opt.}^{Q_S(r)}}\right) S_i < W_{S_{opt.}^{Q_S(r)}} S_{S_{opt.}^{Q_W(r)}} - W_s S_s. \quad (8)$$

If this inequality is not correct for at least one strategy, the calculations are completed, and the structure $S_{opt.}^{Q_{WS}(r)}$ is not clear. If the inequality is correct, we move on to the next step.

13. On the basis of data from steps 3 and 7 determine a set $(S_{opt.}^{Q_S(r)})_{opt.}^{W}$, optimal on $S_{opt.}^{Q_S(r)}$ by Wald criterion.

14. On the basis of data from steps 4 and 6 determine a set $(S_{opt.}^{Q_W(r)})_{opt.}^{S}$, optimal on $S_{opt.}^{Q_W(r)}$ by Savage criterion.

15. On the basis of data from steps 3, 6, 9, 10 calculate value $r_{Q_{WS}}$ using formula:

$$r_{Q_{WS}} = \frac{S_{S_{opt.}^{Q_W(r)}} - S_s}{(S_{S_{opt.}^{Q_W(r)}} - S_s) + (W_s - W_{S_{opt.}^{Q_S(r)}})}. \quad (9)$$

16.On the basis of data from steps 4, 7, 13, 14, 15 determine a structure of a set of optimal pure strategies $S_{opt.}^{Q_{WS}(r)}$ using formula:

$$S_{opt.}^{Q_{WS}(r)} = \begin{cases} S_{opt.}^{Q_S(r)}, \text{при } r = 0 \\ (S_{opt.}^{Q_S(r)})_{opt.}^{W}, \text{при } 0 < r < r_{Q_{WS}} \\ S_{opt.}^{Q_W(r)} \cup S_{opt.}^{Q_S(r)}, \text{при } r = r_{Q_{WS}} \\ (S_{opt.}^{Q_W(r)})_{opt.}^{S}, \text{при } r_{Q_{WS}} < r < 1 \\ S_{opt.}^{Q_W(r)}, \text{при } r = 1. \end{cases} \quad (10)$$

Let's consider the following example, in which the data on Sharpe's ratios at successive time intervals (six observable periods) is used to select the priority sequence from pre-compiled six investment portfolios. Initial data are represented by a matrix of winnings

A_i \ $П_j$	П1	П2	П3	П4	П5	П6	W_i
A1	0.0953	0.2681	0.1750	-0.2681	0.0729	-0.0807	-0.2681
A2	0.0221	0.2213	0.1871	-0.2631	0.0612	-0.1127	-0.2631
A3	0.0217	0.2205	0.1866	-0.2630	0.0611	-0.1135	-0.2630
A4	0.4458	0.0611	-0.1195	-0.2393	0.0832	-0.2587	-0.2587
A5	0.0451	0.2366	0.1886	-0.2658	0.0643	-0.1057	-0.2658
A6	0.1583	0.1243	0.2144	-0.2184	0.0742	-0.0702	-0.2184
βj	0.4458	0.2681	0.2144	-0.2184	0.0832	-0.0702	Ws= -0.2184

(11.1)

Efficiency indicators W_i, i=1.2,..., i=1.2,..., 6 of strategies A_i, i=1.2,....6 are calculated In the last column of the matrix by Wald criterion. The last line contains the indices of favorability β_j, i=1,2,...,6 of states of nature Π_j, i=1,2,...,6.

Let's determine the structure of the set $S_{opt.}^{Q_{WS}(r)}$ of strategies, which are optimal in a set of pure strategies by Wald-Savage synthetic criterion, in accordance with the above algorithm.

Recall that the winnings matrix in used interpretation consists of Sharpe ratios for six portfolios and for various "states of nature" (the latter means the periods, for which these coefficients were calculated).

Efficiency indicators of strategies by Wald criterion are found and shown in the last column of the matrix (11.1). Value of the game in pure strategies by Wald criterion: $Ws = -0{,}2184$.

It follows from the last column that $W6 = Ws = -0{,}2184$, which means that strategy A6 is optimal by Wald criterion and, consequently, $S_{opt.}^{Q_W(r)} = \{A6\}$.

Let's form a risk matrix generated by the winnings matrix (11.1):

Ai \ Πj	П1	П2	П3	П4	П5	П6	Si
A1	0.3505	0.0000	0.0394	0.0497	0.0103	0.0105	0.3505
A2	0.4237	0.0468	0.0273	0.0447	0.0220	0.0426	0.4237
A3	0.4241	0.0476	0.0278	0.0446	0.0221	0.0434	0.4241
A4	0.0000	0.2070	0.3339	0.0209	0.0000	0.1886	0.3339
A5	0.4007	0.0315	0.0258	0.0474	0.0189	0.0355	0.4007
A6	0.2875	0.1439	0.0000	0.0000	0.0090	0.0000	0.2875

(11.2)

The indicators are calculated and presented in the last column of the matrix (11.2). Value of the game by Savage criterion $S_s = 0{,}2875$. A set of strategies $S_{opt.}^{Q_S(r)}$, which are optimal in a set of pure strategies by Savage criterion, consists of a single strategy A6, consequently, $S_{opt.}^{Q_S(r)} = \{A6\}$.

Using (11.1) and (11.2), we find the value of the criterion for each strategy at the ends of the segment [0.1] by formula (2) and present the obtained values in Table 1.

Table 1 - Efficiency at the Ends of the Segment [0.1]

i	1	2	3	4	5	6
$Q_{WS_i}(0)$	-0.3505	-0.4237	-0.4241	-0.3339	-0.4007	-0.2875
$Q_{WS_i}(1)$	-0.2681	-0.2631	-0.2630	-0.2587	-0.2658	-0.2184

The results of the calculations show: the left end $Q_{WS_4}(0)$ of section $Q_{WS_4}(r)$ of strategy A4 is less than the indicator at the left end of the strategy A6; the right end $Q_{WS_4}(1)$ of strategy A4 is more than the right ends of the strategies A1, A2, A3, A5. Therefore, it is possible to determine the mutual intersections of the segments $Q_{WS_i}(r), i = 1, \dots, 6$, which look as follows (Table 2):

Table 2 - Intersections of Segments $Q_{WS_i}(r)$

No. of section i, j	1	2	3	4	5	6
1		x			x	
2	x		x		x	
3		x			x	
4						
5	x	x	x			
6						

"x" in the cells indicates intersection of segments. Next, we find $Q_{WS_i}(r) = Q_{WS_j}(r)$ section of each segment, solving the equation. Let's get the following *r* values for each intersection: $r_{12} = 0{,}9350; r_{23} = 0{,}9738; r_{15} = 0{,}9552; r_{25} = 0{,}8939; r_{35} = 0{,}8950$.

Values of efficiency indicators $Q_{WS_i}(r), i = 1, \dots, 6$ at $r = 0, r_{12}, r_{23}, r_{15}, r_{25}, r_{35}, 1$ and strategy numbers in order of priority are presented in Table 3.

Table 3 - Determination of the Priority Order of Investment Portfolios by Wald-Savage Criterion

Value of r indicator	Values of efficiency of $Q_{WS_i}(r) = rW_i - (1-r)S_i$ pure strategies Ai					
	A1	A2	A3	A4	A5	A6
0	-0.35048	-0.42373	-0.42408	-0.33390	-0.40072	-0.28753
	3	5	6	2	4	1
$0 < r < 0{,}8939$	3	5	6	2	4	1

0.8939	-0.27688	-0.28010	-0.28013	-0.26671	-0.28010	-0.22574
	3	4	6	2	4	1
$0{,}8939 < r < 0{,}8950$	3	4	6	2	4	1
0.8950	-0.27679	-0.27993	-0.27996	-0.26663	-0.27996	-0.22566
	3	4	5	2	5	1
$0{,}8950 < r < 0{,}9350$	3	4	5	2	5	1
0.9350	-0.27350	-0.27350	-0.27351	-0.26363	-0.27455	-0.22290
	3	3	5	2	6	1
$0{,}9350 < r < 0{,}9552$	3	3	5	2	6	1
0.9552	-0.27184	-0.27026	-0.27027	-0.26211	-0.27184	-0.22151
	5	3	4	2	5	1
$0{,}9552 < r < 0{,}9738$	5	3	4	2	5	1
0.9738	-0.27031	-0.26728	-0.26728	-0.26072	-0.26933	-0.22022
	6	3	3	2	5	1
$0{,}9738 < r < 1$	6	3	3	2	5	1
1	-0.26815	-0.26306	-0.26305	-0.25874	-0.26579	-0.21841
	6	4	3	2	5	1

Therefore, efficiency indicators have been calculated for each strategy. The strategies are ranked in a non-growing order (the numbers are specified in the table under efficiency indicators). If the numbers of several calculated efficiency indicators are the same in the line, the numbers in the priority order may change for corresponding strategies. If you look for a pure strategy number in the priority sequence for *r* in the interval, a priority sequence position number will be assigned for the strategy, which would be general for the ends of this interval. For example, for the strategy A1, the general priority sequence position number is 6, if the value of the winning-indicator at the end of the interval is (0.9738;1). Therefore, at any value of *r* from this interval the strategy A1 will take the 6th place.

Obtained sequences allow to offer recommendations to a non-institutional investor. By choosing the least risky option, the following priority sequence of strategy selection is formed: $A6, A4, A1, A5, A2, A3.$

Conclusion.

Development of a reliable investment strategy is a complex process that requires a comprehensive analysis of available information about the dynamics of stock markets and decision-making with due account for individual preferences of the group of investors under consideration. The possibilities of “classical” portfolio theory do not allow to solve this problem correctly under the conditions of the turbulent markets and markets with

low efficiency. The theoretical approach and numerical method of forming a priority sequence of financial assets portfolios proposed in this paper allow to expand the possibilities of portfolio theory taking into account the prospects of changing not only the parameters of securities selected as investment instruments, but also such an important integral characteristic of the portfolio as the Sharpe ratio.

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TEAM BUILDING AND TEAMWORK EVALUATION IN PROJECT MANAGEMENT ON THE EXAMPLE OF THE NUCLEAR INDUSTRY

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Abstract. The article presents the authors' view on the evaluating teamwork process in project management on the example of the nuclear industry. It reflects the relevance of the project approach in the nuclear industry enterprises management, presents the authors' approach to team building and teamwork evaluation in the framework of project management. The approach presented by the authors includes the algorithm for team building divided into two blocks: teamwork diagnostics and team interaction effectiveness improving. The teamwork efficiency components and the process of the team building efficiency level evaluating based on the authors' algorithm are determined.

Keywords: Team, methodological approach, team building, teamwork, project management, nuclear industry, team performance components, team performance evaluation.

Currently, project management is becoming one of the key tools for effective management in companies of various industries and activities. However, managers are faced with the problems of project teams work organizing, ensuring group members, their cohesion involvement, when optimizing projects timing, quality and cost. The typical problems analysis in project management allowed us to formulate our study hypothesis: a united project team creating is an opportunity to solve these problems in project management.

The author's algorithm of team building for project managers and project team members is proposed as a part of the methodological approach to teamwork evaluating in project management. The algorithm consists of 6 consecutive stages, divided into two semantic categories: teamwork diagnostics and team interaction effectiveness improving.

There are a lot of papers devoted to teamwork evaluating issues. J. Hackman built a three-dimensional concept of the group's effectiveness, R. Schwartz formulated the factors that affect the group's effectiveness. R. Likert identified the effective teams' characteristics, focused on the process and the team internal dynamics. K. Argiris investigated the influence of work situation type on the individual personal development in the organization. Most authors highlight satisfaction of team members personal interests, trust, successful team members interaction and tasks solving set for the team as the main elements of effective teamwork [7]. We need to note that, currently, there is no unified approach to the teamwork effectiveness evaluating process within project management.

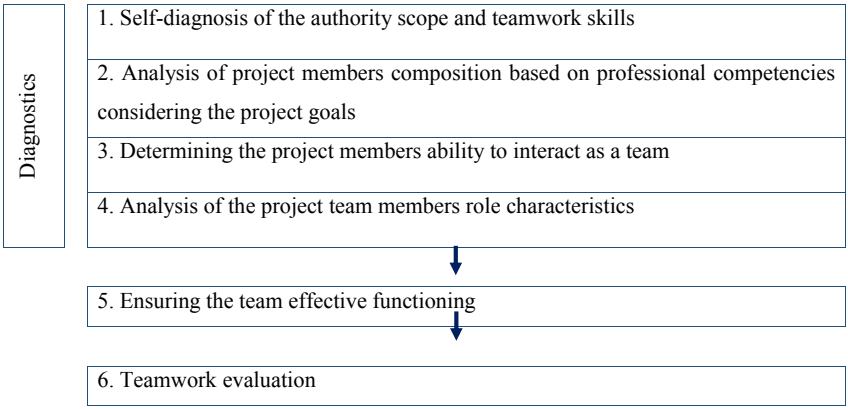

Figure 1. Team building algorithm for project managers and project team members

Teamwork is the ability of group (team) members to interact effectively and purposefully to achieve a common goal. Accordingly, the group (team) members ability level (degree) to work together effectively and purposefully (with colleagues), achieving a common goal, can be taken as an indicator of teamwork effectiveness (team performance indicator).

The team performance indicator is the target at every project life cycle stage, since the pursuit of the indicator ideal state / value is a mandatory and necessary condition for the team successful functioning.

Considering the logic of the team building algorithm developed by the authors, the following components of team performance were defined as:

- Necessity and sufficiency of a project manager's authority.
- Compliance of the professional competencies actual composition (set) of project team members with the required composition (set), in terms of achieving project goals (terms, costs, quality).
- The cohesion of a project team.
- Motivation of project team members.
- Involvement of project team members.

We defined the efficiency criterion (C) for each selected component to assess the teamwork effectiveness level:

1. Ca – the level of a project manager's authority sufficiency;
2. Cp – the compliance level of the professional competencies actual set of project team members with the required set;
3. Cc – the level of a project team cohesion;
4. Cm – the level of project team members motivation;
5. Ci – the level of project team members involvement.

The generalized model for evaluating the teamwork effectiveness level is proposed in the framework of the author's approach to team building and teamwork organization:

L = {Ca, Cp, Cc, Cm, Ci},

L is the level of team performance (teamwork effectiveness).

This model can be visualized using a radial diagram (web-like model), where the current state of each team performance criterion is displayed on each radius.

The criterion value is defined as the ratio of the indicator current value at the evaluation time to the ideal value of the indicator (full compliance of the professional competencies actual set of project team members with the required set). Ci = 1 is in full compliance with the ideal state, Ci = 0 is in full non-compliance with the ideal state, where i is the criterion number. since the pursuit of the indicator ideal state / value is a mandatory and necessary condition for the team successful functioning.

According to the proposed algorithm the process of team building effectiveness evaluating begins with the team's starting conditions evaluation (diagnostics). This allows to identify problems that hinder the effective teamwork and to choose team building tools more constructively.

The evaluation procedure can be presented in 3 stages:

1. Defining of the optimal team model parameters.
2. Diagnostics of the teamwork primary (initial) effectiveness.
3. Diagnostics of the teamwork effectiveness after improvements according to the proposed teambuilding algorithm.

4. Conclusions based on the results of diagnostics.

Let's consider an example of using the proposed procedure for the teamwork effectiveness evaluating. A group of employees of the Russian nuclear industry was selected as the object of the study. The author's team-building algorithm was implemented as part of the teamwork efficiency improving. At the first stage, the target parameters of the optimal teamwork model were determined:

1. The project manager's authority and skills sufficiency that can be defined at every project life cycle stage and within each functional area. This parameter is determined based on the authority matrix and is calculated as the extent of its completion.

2. The compliance of the professional competencies actual set of project team members with the required set. This parameter is determined based on the professional competence matrix and is calculated as the degree of its completion.

3. The cohesion of a project team. This parameter is calculated using a score based on the test performed.

4. Motivation of project team members. This parameter is calculated using a score based on the survey conducted on the team members motivation level.

5. Involvement of project team members. This parameter is calculated using a score based on the test performed.

At the second stage, the current teamwork effectiveness was diagnosed. The team performance indicators values were found to be unsatisfactory. It was decided to take measures to improve the team efficiency. The authors' team conducted trainings on improving the interaction, cohesion, interpersonal communication, leadership level.

At the next stage, after conducting teambuilding activities, the teamwork effectiveness was re-evaluated. The results obtained are presented in the table 1.

As can be seen from the table 1, the team performance indicators improved as a result of the trainings. Graphically, the model is shown in the figure 1.

Table 1. The dynamics of team performance indicators

Criteria for effective teamwork	The dynamics of team performance indicators		
	The indicator optimal value	The indicator current value	The indicator achieved value
Ca	1	0,4	0,6
Cp	1	0,4	0,6

Cc	1	0,2	0,8
Cm	1	0,2	0,8
Ci	1	0,4	1

In the diagram below, the area indicated in red is the indicator optimal value, yellow is the indicator current value, and green is the indicator achieved value.

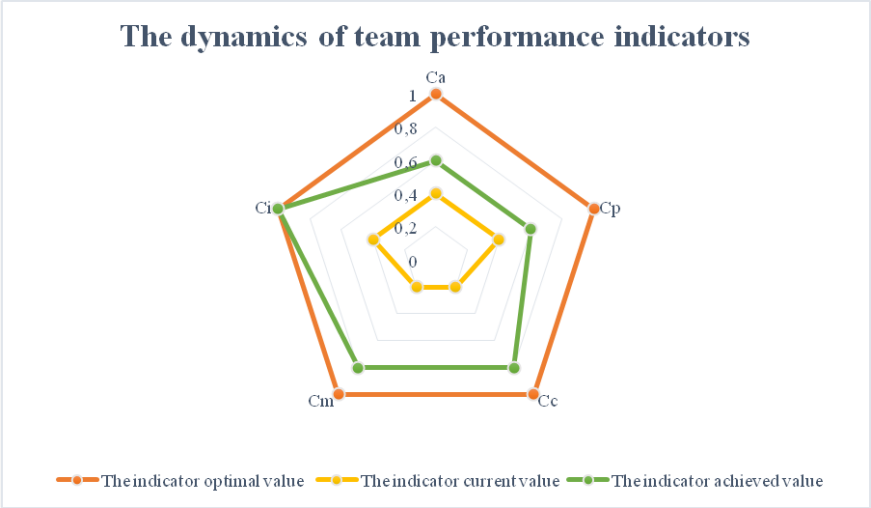

Figure 1. The dynamics of team performance indicators

The model within the framework of the authors' methodological approach to teamwork evaluating in project management on the example of the nuclear industry is quite universal and can be adapted to various projects (situations, industries). Each element of the model is a sub-elements collection that can also be evaluated if necessary.

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ONE APPROACH TO THE PROBLEM OF MULTI-OBJECTIVE OPTIMIZATION SOLUTIONS IMPROVEMENT

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Annotation. the given work considers a one of possible approaches for improvement of multi-objective optimization solutions; key definitions and theorems are given, necessary and sufficient criteria for solution improvement is also given, and in addition a condition under which the improvement is impossible, is also presented.

Keywords: Multi-Objective Optimization, Mathematical Optimization, Decision Making Theory, Solution Improvement.

Part 1.

Let us consider some problem of multi-objective optimization, for which we have a vector of estimation criteria:

$$f(x) = (f_1(x), \dots f_n(x)),$$

where x is a solution, which belong to set X of space $\tilde{X}$, and let us note, that this elements are random. In addition, we suppose every component $f_i(x)$ to reflect elements of space $\tilde{X}$ to elements R^1 and measured in the one and only grade.

Let us consider a case when all the elements of vector $f(x)$ is given in such order, so if we choose x from X the values of it will raise only. It is necessary to define an ordered binary relation $n^{\geq}$ on a space of n-dimensions vectors. For that, some definitions are to be made.

Definition 1. Solution x^0 is better than solution x^1 (note that $x^0, x^1 \in X$) on vector $f(x)$ and ordered binary relation $n^{\geq}$ only if it satisfies the next condition:

$$f(x^0) \geq f(x^1) \Leftrightarrow f_i(x^0) \geq f_i(x^1), \forall i \in I = \{1, \dots n\} \quad (1)$$

which may be represented as:

$$f_i(x^0) \geq f_i(x^1), f_j(x^0) \geq f_j(x^1) \quad (2)$$

for all i and at least one j of I.

We name it as 'preference order' and denote it as $n^{\succ}$. After giving these definitions, there is an interesting question appears:

$$\text{for } \forall x^1 \exists\, x^0 \in X\colon x^0 n^{\succ} x^1?$$

We need to make a few new definitions for it.

Definition 2. Solution $x^0 \in X$ is improvable on set X on vector criteria $f(x)$, if exists such solution $x^1 \in X$ for which the following binary relation is fair:

$$x^0 n^{\succ} x^1$$

We may make an assumption, that there is no f_i, which does not reach an extremal values on set X. Therefore, we need to state the next theorem:

Theorem 1. Solution $x^0 \in X$ is improvable on vector criteria $f(x)$ on set X if and only if it is an n-dimensions vector $u = (u_1, \dots, u_n) \in R^n$ exists, for which the following inequalities:

$$f_i(x^0) \le a_i(u),\ f_j(x^0) \le a_j(u) \quad (3)$$

are held for every i and at least one j of I. The $a_i(u)$ parameters are defined as:

$$a_i(u) = a(u) - u_i,\ a(u) = \max_{u \in X} \min_{i \in X} [f(x) + u_i] \quad (4)$$

However, the problem of definition of vector u without any constrains may be extremely difficult. Therefore, making some constrains to this set may help us to simplify it. Let us show some definitions for that (which do not disturb theorem 1).

Theorem 2. To find such $u \in R^n$ which satisfies inequalities (1) and (2) with some $x^0 \in X$, the following inequalities are to be held:

$$\max_{x \in X} f_i(x) - \min_{x \in X} f_j(x) \ge u_i - u_j, \quad (5)$$

for every i, j $\in I$.

In addition, let us define one more set:

$$U = \{u \in R^n\colon \max_{x \in X} f_i(x) - \min_{x \in X} f_j(x) \ge u_i - u_j,\ \forall i,j \in I\} \quad (6)$$

where $u_1 = 0$.

Taking that into account we may state that if for $u \in R^n,\ x^0 \in X$ inequalities (3) are held, then such $u^0 \in U$ exists for which inequalities (3) are held for x^0 and u^1.

Let us show definition of set U for a case of two components of vector criteria $f(x)$:

$$U = \{(u_1, u_2) \in R^2\colon f_1(x^2) - f_2(x^2) \ge u_2 - u_1 \le f_1(x^1) - f_2(x^2)\},$$

where x^1, x^2 is defined by the next rule:

$$f_i(x^i) = \max_{x \in X} f_i(x),\ \text{i=1,2}$$

Having equations for multi-objective solutions improvement defined, we can consider an 'unimprovable' case.

Part 2.

Theorem 3. Pareto optimal (unimprovable) solution is that solution $x^0 \in X$, for which on vector criteria $f(x)$ there is an n-dimensional vector u $\in U \in R^n$ exists, for which and only which the following equalities are fair:

$$\min_{i \in I}[f_i(x^0) + u_i] = \max_{x \in X}\{\min_{i \in I}[f_i(x) + u_i]\} \quad (7)$$

Let us define inequalities for all elements of vector criteria $f(x)$, so we may define improvability solution x^0 criteria.

Theorem 4. If for $x^0 \in X$, u $\in U \in R^n$ inequalities (7) are held, then x^0 is unimprovable and the following inequalities are fair:

$$f_i(x^0) \geq a_i(u^0), i = 1, \dots, n \quad (8)$$

Using similar method, we may proof the next theorem.

Theorem 5. For $x^0 \in X$ and also for an n-dimensional vector u $\in U \in R^n$ such solutions, for which the following inequalities are held, do not exist:

$$f_i(x^0) > a_i(u^0), i = 1, \dots, n \quad (9)$$

Thus, theorems №1-4 set upper and lower limits for values of vector criteria $f(x)$ by the parameter $a_i(u)$ values provided the relations u $\in U \subseteq R^n$ are held.

Let us summarize considered theorems, and give it in one. It is to define inequalities not only about improvable solutions or about about Pareto optimal, but also define limits for the improvements on these criteria.

Theorem 6. If the following inequalities is inconsistent, it is necessary and sufficient for solution $x^0 \in X$ to be improvable (Pareto optimal) on vector criteria $f(x)$:

$$f_i(x^0) \leq \max_{u\ in\ U}\{\max_{x \in X}[\min_{j \in I}(f_j(x) + u_j)] - u_i\},\ i \in I \quad (10)$$

As on the right side of this inequalities there are values, which do not depend on solution x^0 and computed only for component $f_i(x)$, set X, vector criteria $f(x)$ as is, and set U by itself is defined only using vector criteria $f(x)$ и set X. Considered statements are proofed at a work [1] of author.

In addition, let us consider the following construction:

$U(X^1) = \{u(x) = (u_1(x), \dots, u_n(x)) \forall x \in X^1: u_i(x) = f_1(x) - f_i(x)\ \forall i \in I\}$, therefore we have this conclusion

$$U: U(X^1) \subseteq U \text{ для } \forall\ X^1 \subseteq U.$$

According to this definition let us give a new equation, which allows us to change from U to U(X), without disturbing theorem 3.

Theorem 7. For any u $\in R^n$ there is such $u^1 \in U(X^1)$ that $a_i(u^1) = a_i(u)$ for all i $\in I$.

Denote $[-f_i(x)]$ as $f_{\bar{i}}(x)$ for all $x \in X$ and all $\in I$:

$$a_{\bar{j}}(u) = \max_{x \in X} \min_{i \in I} [u_i - f_i(x)] - u_i \quad (11)$$

We define dual solutions as the following.

Definition 3. Dual solution on set X on vector criteria $f(x)$ is such solution, for which exists $u \in R^n$ for which the following is true:

$$f_i(x^*) \geq a_{\bar{i}}(u), f_j(x^*) \geq a_{\bar{j}}(u) \quad (12)$$

for all i and at lest one j of I.

If we denote through set X^0 another set of improvable solutions of set X, and set X^* - is a set of dual solutions X, it is not difficult to proof, that

$$X^* \cap X^0 = \emptyset,\ X^* \cup X^0 \subseteq X, X^e = X \backslash X^0, X^* \subseteq X^e,$$

Where set X^e is a set efficient solutions (Pareto optimal), for which the following is true:

$$X^e = \{x \in X | \exists x^1 \in X: f(x^1) n^{\succ} f(x)\} \quad (13)$$

If we take into account properties of vector criteria $f(x)$ and set X, we will see, that sets X^0 *and* X^* are not empty. According to that, we may make conclusions, which is below, and by doing that, summarize all the work:

1. Inequalities (2) are feasible for x^0 and $u(x^*)$, $x^0 \in X$, $x^* \in X^*$ if and only if for x^* and $u(x^0)$ inequalities (12) are held.

2. There is such u $\in U(X^*)$ exists, for which inequalities (2) are held for any $x^0 \in X$.

3. Set X^* empty if and only if set X^0 is empty.

4. If dual element $x^* \in X$ exists for which inequalities (2) are held at $u = u(x^*)$, it is necessary and sufficient for solution $x^0 \in X$ to be improvable on vector criteria $f(x)$.

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ONE APPROACH TO RESEARCHING THE PRIORITY PROBLEM IN THE TASKS OF MULTI-OBJECT OPTIMIZATION

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Abstract. in this paper, the priority problem in multi-object optimization problems is considered, the problem of determining the selection principle is described, the importance scale is determined, and relations are presented that determine the equivalence of elements of the set of permissible elements.

Keywords: decision theory, multi-purpose optimization, mathematical optimization, priority in multi-purpose optimization.

The priority problem in multi-object optimization is quite complex, many authors understand it in their own way. Perhaps this is because now the theory of multi-purpose optimization is in its infancy: there is no holistic understanding of the priority problem from its definition and task to its consideration. However, this work is not intended to bring final clarity to this issue, this task should be solved in the near future.

Definition 1. Under priority in the task of multi-purpose optimization by indicator $f(x) = \{f(x|y)\}, y \in Y, x \in X$ we will understand the assignment of the priority relation to:

- set $\mathbf{Y}$ of importance;
- components $f(\cdot|y)$ multipurpose indicator f while $y \in Y$ by preference;
- values $f(x) \in \Phi$ multipurpose indicator f while $x \in X$ by efficiency;

where x – optimal element of the set of optimal elements X, y – term of the set of target terms for fixed $X \subseteq \check{X}, Y \subseteq \check{Y}, f \in F$. The above definition should be supplemented by the fact that on the elements themselves $x \in X$ a preference relation can be specified. However, often in tasks of the type under consideration, priority is on X is not set, since in this case the principle of choice will be understood.

Given the absence of priority on Y, f (x) for x ∈ X, Φ and setting the priority on X using the selection principle, the only task remains to search for the extremum (or maximum). Therefore, the determination of a given preference makes it difficult to solve the problem of identifying the selection principle that satisfies a given (or not) set of axioms and properties for which this priority must be fulfilled on the optimal elements.

Definition 2. We call the component importance scale C_Y *a certain order or a list of indices on a given set of Y target terms* generated by defining the elements x ∈ X. This order determines the importance of either between target terms or subsets of Y.

Priority relationship determination is based on a comparison of target terms $y \in Y$ in scale C_Y component importance $f(x|y)$ while $x \in X$ for fixed $y \in Y$ multipurpose indicator f in scale $C_{f(\cdot|y)}$ significance of quantitative values $f(x|y)$ qualities y, received at assignment $x \in X$, and values $f(x) \in \Phi$ inscale C_F the effectiveness of the totality of quantitative values $\{f(x|y)\}, y \in Y$ of all obtained qualities y ∈ Y when choosing x ∈ X.

In the case where the order of importance on a scale C_Y absent, the whole terms y ∈ Y of the partition of the set of indices by importance should be indexed. In this case, a one-way correspondence of the quality - index type is established. It is possible that such an order can be set in a mixed way, while the task of the importance of whole terms as qualities and the importance of these subsets for terms as indices must be agreed upon.

Definition 3. Under scale $C_{f(\cdot|y)}$ we will mean the set of obtained different gradations of quality y in the amount $f(x|y)$ different elements x ∈ X, the ordering on which is called the significance of some quantitative values of quality $f(\cdot\,|y)$ compared to others.

If Y is a set of quality indices in the form of terms and in scale C_Y if there is no addressing of importance when comparing different target terms y from Y, then in the above scale it is possible to represent significance in the form of identifying priority values of quality y from Y compared to others. Moreover, in this case, priority can be set when comparing with many quantitative values $f(\cdot\,|y)$ other quality y' which will not coincide with the original y ∈ Y.

Definition 4. Let $C_f = \{C_{f(\cdot|y)}\}, y \in Y$. In this case, under C_f we will understand the task of the natural order N^d on values $f(x)$ multipurpose in the following form for $x^1, x^2 \in X$:

$$f(x^1)\, N^d f(x^2) \Leftrightarrow f(x^1) \rhd f(x^2) \Leftrightarrow f(x^1|y) \geq f(x^2|y)\ \forall y \in Y$$

either as a relation of order N^v kinda

$f(x^1)\ \overline{N^v} f(x^2) \Leftrightarrow \{[f(x^1)N^v f(x^2)] \wedge [\exists y^0 \in Y: f(x^1|y^0) \succ f(x^2|y^0)]\}$

In a number of problems, due to additional restrictions on the values of the multipurpose indicator, the target set is replaced X on a subset of it X' such that $X' \subseteq X$.

When comparing the target terms y from Y, the component $f(\cdot\,|y)$ multipurpose indicator $f(\cdot) = \{f(\cdot\,|y)\}, y \in Y$, values $f(x)$ while $x \in X$ multipurpose indicator $f \in F$ of a set of $\Phi = \{f(x)\},\ x \in X$ equivalence of the target terms y, the component $f(\cdot\,|y)$ and values $f(x)$ accordingly in their scales.

Definiton 5. By equivalence $y^1\ \overline{C_Y} y^2$ *target terms* $y^1, y^2 \in Y$ according to scale $\overline{C_Y}$ we will understand such a situation that the importance of these target terms is the same or each of them is included in equivalent subsets Y^1 и $Y^2 \subseteq Y$, the equivalence of which in this scale will mean the equal importance of generalized quality Y_1, Y_2 in the form of a combination of qualities expressed in terms $y \in Y_1,\ y \in Y_2$.

Definiton 6. By the equivalence f (x | y^1 (C_F) f (x | y^2) under the condition of the inequality y^1, $y^2 \in$ Y for some element x ∈ X we mean the fulfillment of the following relations:

$$f(x|y^1)\ \overline{C_F} f(x|y^2) \Leftrightarrow \{\left[y^1\ \overline{C_Y} y^2 \vee y^1\ \overline{C_y} y^2\right] \wedge (C_{f(x|y^1)}\ \overline{C_F} C_{f(x|y^2)} \vee [(C_{f(x|y^1)}\ \overline{C_F} C_{f(x|y^2)} \wedge [f(x|y^1) \in K_1) \wedge f(x|y^2) \in K_2): (K_1\ \overline{C_F} K_2), (K_1 \wedge K_2) \subseteq C_f]]\}$$

so it is $f(x|y^1)$ equal $f(x|y^2)$ while $y^1 \neq y^2, y^1, y^2 \in Y$ then and only then, when $y^1\ and\ y^2$ equivalent or incomparable on a scale C_Y, scale $C_{f(\cdot|y^1)}$ and $C_{f(\cdot|y^2)}$ equivalent or incomparable on a scale C_f set of a $K_1, K_2 \in C_F$, where via $\overline{C_Y}$ is denotes the binary relation of incomparability.

In the same time, equality $f(x^1)\ \overline{C_Y} f(x^2)$ corresponds to the following relationships:

$$f(x^1)\ \overline{C_F} f(x^2) \Leftrightarrow [f(x^1)N^v f(x^2) \wedge f(x^2)N^v f(x^1)] \vee [f(x^1)\overline{N^v} f(x^2) \wedge f(x^2)\overline{N^v} f(x^1)]$$

in other words, the meanings $f(x_1), f(x_2) \in \Phi$ equivalent in scale C_f if and only if these values are equivalent either with respect to order N^v, or to $\overline{N^v}$. an example of equivalence is $y^1 = y^2,\ f(x^1|y^1) = f(x^2|y^2)$ although maybe $x^1 \neq x^2$.

However, another formula for comparing terms can be assumed $y \in Y$, component $f(\cdot|y)$ multipurpose indicator f and values $f(x) \in \Phi$ while $x \in X$, where there is an ambiguity, by which we mean such a position that there is at least one of the types of equivalence in the scales C_Y, C_f, C_Φ.

In case of ambiguity in the task $y^1 \neq y^2 \in Y, x^1 \neq x^2 \in X$ и $f \in F$ define the relations $\ddot{C}_Y$, $\ddot{C}_f$, $\ddot{C}_\Phi$ in the following way:

$y^1 \ddot{C}_Y\ y^2$ if y^1 is more important y^2 on the scale C_Y;

$f(\cdot|y^1)\ddot{C}_f f(\cdot|y^2)$ if y^1-th component is more important on the scale C_f than y^2-th;

$f(x^1)\ddot{C}_\Phi f(x^2)$ if value $f(x^1)$ multipurpose indicator f on the element x^1 more effective than $f(x^2)$ on the element $x^2 \in X$.

So binary relationships are preferences $\ddot{C}_Y$, $\ddot{C}_f$, $\ddot{C}_\Phi$ на шкалах C_Y, C_f, C_Φ accordingly, they allow one to introduce similar relations between an element and a set of elements from $Y, \{f(\cdot|y)\}, y \in Y, \Phi$ sets of elements of these sets, both separately on each scale, and together. This is one of the approaches to the study of the priority problem in multi-purpose optimization.

A multipurpose optimization problem can be considered given when sets are defined $X \subseteq \hat{X}$ valid items x, $Y \subseteq \hat{Y}$ target terms y, $f \in F$ targets, Φ – values $f(x)$ multipurpose indicator for x ∈ X, and the set of relations $\left\{\hat{C}_0^l\right\}_{l \in L}$, either the scales themselves $\{C_0^l\}_{l \in L}$, or parts thereof.

After the task of multi-purpose optimization is formulated, the problem arises of determining the principle of choosing the elements that are optimal according to this principle according to a given priority, or taking into account a given priority when using any principle, depending on which of the following sample set of cases is implemented:

- There is a scale C_Y on Y or it is not? If so, is the order of importance given? Is priority given on target terms and subsets from Y using this order and scale?
- Is there a scale C_f on the components of the multipurpose indicator $f \in F$ or not? If so, is the order of importance given? Is priority or not given using this order and scale on the components of the multipurpose indicator f and the multipurpose indicators from F defined by different sets of these components (particular indicators on f)?
- Is there a dominant element $x^0 \in X$ in relation to order N^d according to given X, Y, f ∈ F? if 'yes', then x^0 – multipurpose optimum; if

"No", is there an Pareto optimal element $x^0 \in X$ in relation to order N^v according to the given conditions? If there are no Pareto optimal elements, then the task of multi-purpose optimization has no solution.

If the Pareto optimal element is unique, then it is a solution to the problem of multi-purpose optimization; if the set of Pareto optimal elements contains a significant number of elements, then it is here that the problem of narrowing this set arises on the basis of priority, restrictions, etc., finding optimal and super-optimal elements. The material presented in this paper should help solve this problem.

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THE CONTENT OF TRACE ELEMENTS IN THE BLOOD OF NEWBORNS WITH LOW BIRTH WEIGHT IN MOTHERS WITH A BURDENED SOMATIC AND GYNECOLOGICAL STATUS

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Relevance of the topic: It is known that in nature there are more than 92 chemical elements. In the human body, there are about 81 of them. Some bioelements in small quantities are useful for the life of the body.

Calcium – is one of the essential trace elements that are required by the body in relatively large quantities. Calcium is a structural component of the inorganic matter of bones. Calcium is involved in the formation of dentin, tooth enamel, in the process of muscle contraction, homeostasis. Calcium ions regulate the activity of the nervous system, play a large role in the production of structural elements of connective tissue, in the regulation of heart rhythm. Especially great is the need for calcium in children (intensive growth of bones, teeth), in pregnant and lactating women. Calcium deficiency is observed in children with cerebral palsy, autism, and is also noted in individuals with hyperthyroidism.

Potassium is the main element of each cell, an activator of the functions of a number of enzymes, regulating the intracellular exchange of water and salts, supporting the osmotic pressure and the acid-base state. Potassium is necessary for the “nutrition” of cells, the normal function of the myocardium, the neuroendocrine system, and the conduction of nerve impulses to the muscles

Magnesium is an intracellular element that leads to such neurological disorders as increased tendon reflex activity, ataxia, tremor, disorientation, convulsive state, nystagmus, paresthesia, heart rhythm disturbance. The clinical expression of magnesium deficiency is behavioral disorders manifested by hyperactivity, impulsivity, and attention deficit.

Zinc takes an active part in the synthesis of immune bodies, is necessary in the structure of connective tissue, and is part of more than 80 enzymes, DNA and RNA polymerase. Against the backdrop of Zinc deficiency, there may be a delay in sexual development in boys (hypogonadism), growth (dwarfism), and spermatogenesis in adult men (male infertility). With chronic zinc deficiency, memory, attention worsens, appetite, smell, vision, wound healing decrease, and depression-like conditions occur. In women, preterm birth is weakened by a small child who will subsequently suffer from immunodeficiency.

Phosphorus - in the circulation is closely associated with calcium, therefore, its role in bone formation is very significant. The circulation of these elements in the body is parallel. Phosphorus, as a biogenic element, plays a significant role in the activity of the central nervous system, heart and skeletal muscles. Malnutrition (reduced intake of protein products) also leads to phosphorus deficiency. Phosphorus indirectly takes part in the antioxidant defense of the body. Phosphorus in circulation is closely associated with calcium, therefore, its role in bone formation is significant. The circulation of these elements in the body is parallel. Phosphorus, as a biogenic element, plays a significant role in the activity of the central nervous system, heart and skeletal muscles.

Copper - plays a role in the transmission of a nerve impulse, which manifests itself in deficiency of its various disorders of the central nervous system. A lack of copper leads to a defective synthesis of collagen, to brittleness and deformation of the skeleton, psycho-emotional exhaustion, leukopenia, anemia, vitiligo, allergies of the upper respiratory tract, impaired synthesis of thyroid hormone. In children, there is a delay in psycho-speech and motor development, epilepsy, and genetic diseases.

In the early neonatal period, in the serum of healthy newborns who have undergone encephalopathy, symptoms of disadaptation and an imbalance of trace elements due to the influence of hypoxia and severe damage to the central nervous system are observed.

Purpose of the study: Examine the content of trace elements in the blood serum of small infants born to mothers with a burdened somatic and gynecological status.

Materials and research methods: Under our supervision, there were 52 lightweight newborns born from mothers with a burdened somatic and gynecological status.

Newborns were divided into 2 groups: the 1st group consisted of 27 newborns with signs of chronic intrauterine hypoxia without signs of perinatal damage to the nervous system. Group 2 - 25 lightweight newborns with signs of perinatal damage to the nervous system of varying severity.

The control group consisted of 19 healthy newborns born in satisfactory condition, with an uncomplicated course in the prenatal and early neonatal period.

In the 1st group, from the first pregnancy, 9 children were born, from repeated pregnancies - 16, 2 of them from primogenous mothers. In the second group from I pregnancy there were 4 children, from repeated pregnancies - 17, 4 of them from primiparas. Somatic and gynecological status in women of both groups was burdened. Pathology of the cardiovascular and urinary system, diseases of the gastrointestinal tract, endocrine-metabolic disorders and gynecological diseases. In the control group, only 9 women showed signs of vegeto-vascular dystonia, and one showed chronic gastritis.

The course of this pregnancy was complicated in all women of both groups - toxicosis of the 1st and 2nd half of pregnancy, anemia, threat of abortion, exacerbation of chronic diseases, in 71% of cases in the first group and in 78.4% of the second, combined forms of pregnancy pathology were observed. In the control group, only 2 women had toxicosis of 1 half of pregnancy, in 3 - slight anemia, and in the 1st - ARI.

All children were born full-term at a period of 38 weeks or more, but with intrauterine malnutrition. The body weight of newborns at birth in the first group is from 1800.0 to 2200.0, body length from 42 cm to 47 cm; in the second group, body weight from 1500.0 to 2400.0, body length from 41.2 cm to 47.8 cm. In the control group, body weight from 3000.0 g to 4000.0 g body length from 49 cm to 55 see. Apgar score was 6-8 points in the first group; 5-7 points in the second group; and 7-9 points in the control group. A high risk of intrauterine infection was observed in 12 children of the 1st group and 6 children of the 2nd group, in the control group - 3 children.

The severity of the condition at birth in newborns of group 2 was due to a hypoxic - traumatic lesion of the central nervous system. Of the newborns of group 1, 3 children were transferred to the neonatal pathology department with a diagnosis of aspiration pneumonia, of the newborns of 2nd group of children, 2 died on the 7th-9th day of life (aspiration pneumonia, cerebrovascular accident).

Blood was taken from newborns at birth from peripheral veins, on days 1, 3, and 5 of life. Blood was taken from newborns at birth from peripheral veins, on days 1, 3, and 5 of life.

There were no differences in the potassium content in newborns at birth in all the studied groups, on the 1st day of life there is an increase in its level in both groups, and in children of the control group, the potassium content decreases, reaching minimum values on the 3rd day of life. The level of

potassium decreases on the 3rd day - in newborns of groups 1 and 2, but remains above the control values. On the 5th day of life, the potassium level rises in all groups, significant differences between them remain. The high potassium content in newborns of groups 1 and 2 in the period of early adaptation is associated with its release from cells under the influence of hypoxia.

The sodium level is the same at birth in newborns of all groups, on the 1st day its content decreases, but its decrease is expressed in the control group. On the 3rd day in newborns of the control group there is an increase in sodium content to a level that is distinguishable in the 1st and 2nd groups. In children undergoing encephalopathy, on the 3rd day there is a tendency to a decrease in sodium levels. The most pronounced differences are noted on the 5th day of life: a significant decrease in the level of sodium in healthy newborns and a tendency to increase in children of the 1st and 2nd groups.

The level of calcium at birth is lower in infants who have had encephalopathy, lower rates are found in children with impaired cerebral circulation. However, in the future, the level of calcium has a similar dynamics in all groups: a decrease in its level on the 1st and 2nd day and a tendency to increase on the 5th day of life. A decrease in calcium levels on days 1-3 is defined as physiological hypocalcemia due to its distribution between organs and tissues and insufficient intake of the child during the first days of life. According to our data, newborns of the 1st group have a more pronounced decrease in calcium levels on the 3rd day, probably due to inadequate correction of metabolic changes in newborns who underwent chronic intrauterine hypoxia without perinatal damage to the central nervous system.

Healthy newborns are characterized by a decrease in the level of magnesium on the 1st day, followed by a slight increase in magnesium on the 3rd -5-6th day of life. Newborns of the 1st group had the highest level of magnesium, and after its decrease on the 1st day, they have a gradual increase in the level, which on the 5th day reaches the initial values in the blood. A similar dynamics is characteristic on the 1st day for the 2nd group, however, starting from the 3rd day of life, there is a gradual decrease in the level of magnesium, most pronounced on the 5th day.

The dynamics of the phosphorus level is similar to that of magnesium in the control group. In newborns of the 1st group, after a slight decrease on the 1st day, the phosphorus content rises and reaches its maximum values on the 5th day. An increase in phosphorus level is also characteristic of children with perinatal damage to the central nervous system, however, in contrast to children of the 2nd group, on the 5th day of life, they tend to decrease in its content.

A significant decrease in the level of iron is observed on the 3rd day in all groups, however, the minimum values are characteristic for healthy newborns. To some extent this can be explained by a more active mobilization of iron from blood serum by the circulatory organs in healthy newborns compared with children of the 1st and 2nd group. On the 5th day, the level of iron in the control group rises, while in the 1st and 2nd groups its further decrease occurs due to depletion of fetal iron stores.

The copper content increases compared to the level in umbilical cord blood from the first day of life during the entire period of early adaptation, with the highest rates characteristic of newborns of the 1st group. However, in the control group on the 5th day there is a decrease in the concentration of copper, partly due to its active utilization by tissues for its participation in metabolic processes.

The most significant fluctuations both at birth and during the entire period of early adaptation were found for zinc. This can explain the lack of significant differences in its level between groups. In newborns of the control group, on the 1st day, the level of zinc rises and reaches maximum values on the 3rd day, then on the 5th day it decreases to the initial level of umbilical cord blood. A trend towards an increase in zinc content was observed on the 1st day in both the 1st and 2nd groups, however, on the 3rd – 5th day its level decreases and reaches values in umbilical cord blood. An increase in the zinc content in the blood serum of healthy newborns, apparently, depends on its exit from the organs - the depot, while metabolic disturbances and depletion of fetal reserves observed in children undergoing encephalopathy can lead to an insufficient increase in the level of zinc in blood serum.

Thus, the results of the study indicate that for newborns who underwent chronic intrauterine hypoxia, both with damage to the nervous system and without it, the presence of an imbalance of bioelements, especially pronounced on the 3rd day of life, is characteristic. Correction of metabolic disorders in newborns after chronic intrauterine hypoxia without damage to the nervous system does not normalize the content of bioelements on the 5th day of life, which indicates the need for further development of treatment methods for newborns.

Based on the foregoing, we come to the following conclusion:

1. The content of bioelements in the blood serum of healthy newborns has a number of features that largely reflect the processes of metabolic adaptation of children to fetal life.

2. In the early neonatal period, infants who have had encephalopathy often have symptoms of disadaptation and a pronounced imbalance of

bioelements, mainly due to the influence of hypoxia, and to a lesser extent, perinatal damage to the central nervous system.

3. Despite intensive infusion therapy, normalization of the content of bioelements in the blood of newborns after encephalopathy does not occur on the 5th day of life, which indicates the need for further development of methods for correcting metabolic disorders taking into account the characteristics of mineral metabolism.

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THE ROLE OF IRON IN THE HUMAN BODY AND THE ENVIRONMENT

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Introduction. In the XIX century, the Frenchman Mary made a sensational discovery - he discovered iron in human blood. People ignorant of medicine were struck by Mary's message. Someone even suggested minting medals made of iron isolated from the blood of famous people to perpetuate their memory. In the history of medicine, such a sad case is known. One chemist student decided to give his lover a ring made of iron of blood itself. By releasing blood from time to time, he received compounds from which he obtained iron chemically. The young man died from the onset of anemia. He never collected the right amount of iron to make the ring. The poor fellow did not know that the total iron content in the blood of an adult is low and averages 3-4 grams, which is only enough for two shoe cloves.

As part of hemoglobin, iron determines the red color of this substance and, therefore, the color of the blood of humans and animals. Iron is necessary for each of us, since it is involved in all redox processes that occur in the body.

Discussion. Iron enters the body with food, mainly in the form of animal proteins. Per day, 1 milligram of iron is excreted from the body, the same amount must be received with food. However, the body usually assimilates no more than one tenth of iron taken with food. Therefore, the daily food intake should contain at least 10-15 milligrams of this element. In food, iron is mainly in the oxidized state (Fe 3+) and is a part of proteins or salts of organic acids. The release of iron from salts of organic acids contributes to the acidic environment of gastric juice. The greatest amount of iron is absorbed in the duodenum. Ascorbic acid contained in food restores iron and improves its absorption, since only Fe2 + enters the cells of the intestinal

mucosa. The daily amount of food usually contains 15-20 mg of iron, and only about 10% of this amount is absorbed

The development of iron deficiency anemia, in particular, is facilitated by poor nutrition: too long adherence to a sparing diet, passion for fashionable fasting days, addiction exclusively to dairy food, not always justified restriction of meat, eggs, vegetables and fruits.

If iron deficiency is detected, its balance can be restored by selecting food products correctly. Most iron is found in liver, cottage cheese, apples, melon, plums, apricots, pumpkin, tomatoes, potatoes, rye bread.

In the Philippines and Puerto Rico, the production of rice is only legally permitted with the addition of vitamins and iron. The same law was later adopted in some southern states of America. These changes have to be made due to the imperfection of grain in the biochemical sense.

The lack of iron in the human body must be compensated by drugs containing salts of organic acids. Modern medicine can offer many different preparations containing readily soluble iron compounds.

In case of anemia, loss of strength, after infectious diseases, iron preparations are used - reduced iron, lactic acid ferrous iron, carbonic acid ferrous iron with sugar, ferrous acid sulfate, ascorbic acid and others.

In the plant world, the role of iron is no less important. With the exception of iron bacteria, all living organisms, from plants to humans, bind inhaled oxygen to complex compounds. At the center of these molecules is a metal atom. For plants, this is a magnesium atom, for animals, an iron atom. Iron is necessary for the formation of chlorophyll, which causes plants to absorb carbon dioxide through the energy of sunlight absorbed by them. Although iron is not part of chlorophyll, this pigment does not form without it.

The lack of iron in the soil causes iron starvation of plants and the disease - chlorosis. The most sensitive to iron deficiency are fruit trees - apple, pear, plum, peach, citrus fruits, as well as raspberries and grapes. The use of complex preparations containing iron has helped to increase the yield of apples and other crops.

At the end of the nineteenth century, the German scientist Lidge published a study on the dependence of the growth of various tree species on the content of known minerals in soils. He noted that in the Rhine provinces, iron deposits are mainly covered by birch forest, while in the vicinity, which does not have iron ore, oak, beech and other tree species grow. The scientist established the dependence of the growth of known tree species on the presence of certain mineral salts in the soil.

About green scouts of the bowels of the earth, about ore-bearing plants have been known for a long time. Even MV Lomonosov noted that the

vegetation above the ore veins changes its usual appearance. Using the "botanical formula" of the great scientist, geologists discovered copper deposits in the center of Kazakhstan.

The search for ores in plants is now being studied by a special science - biogeochemistry. There are more than 40 species of such geological plants. The companion of iron ore deposits is Saussure or Bitter, a perennial herb growing in Central Asia, Siberia, and the Far East. Scientists also found that ash from birch leaves is brown in color if it grew in an iron ore deposit. The ability of some plants and living things to accumulate chemical elements from the environment is sometimes amazing. So, biologists have discovered in a sea cucumber the "ability" to synthesize ordinary iron in the form of round balls directly under the skin. The diameter of these balls does not exceed 0.002 mm. This phenomenon is evidence that living organisms are capable of carrying out processes that require high temperatures and high pressure to proceed normally.

Conclusion. Under the conditions of a water-air situation in ore mines, minerals are oxidized and enrich mine water with iron and sulfuric acid. When pumping water on the surface everywhere you can see a tan precipitate of iron oxide hydrates. Iron in these waters was oxidized much faster than under laboratory conditions. It happened because of bacteria from the genus thiobacillus; due to their ability to oxidize ferrous iron in acidic solutions, they have been called ferroxidans (iron oxidizing). For the first time, they were reported back in 1888 by the Russian microbiologist S.N. Vinogradsky. It took a lot of time to study them.

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PHENOMENON: "FOUND WHERE NOT SEARCHED"

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Abstract. Over thirty years, in different years, in the form of separate casuistic observations in medical practice, about 200 clinical observations have been collected. At one time, they themselves remained as single clinical episodes, and naturally did not have general conclusions. With the passage of time, these unique clinical observations are compiled into one solid monograph, entitled "Force Majeure in Surgery" with an international bookmark – LAPLAMBERT/ Internation Book Market ServiceLtd., member of OmniScriptium Publishing Group.2018. They even attracted the interest of people far from medicine to this book. Now they are studied, summarized and systematized. The purpose of this study was: is there any material basis for these unusual observations, and what is the peculiarity and attractiveness of this work?

Materials and methods. Clinical materials, which collected unusual observations and cases from practice, are based on 6 observations.

Keywords: Unusual and casuistic cases in the practice of a doctor, epistemology methodology

First there was nothing, and then we found gold

A nephrologist was visited by a middle-aged woman complaining of an increase in the abdomen. She noticed this literally 3-4 months ago. Occasionally she was nauseous, weakened. No other complaints. Blood and urine tests – all right. But the stomach was enlarged. Ascitic fluid in the abdominal cavity did not seem to be detected. The other day, she was at the reception of a surgeon who did not find any pathology.

When listening carefully to the heart, the doctor heard subtle, additional cardiac tones coming from somewhere in the distance. These strange sounds do not resemble accents or heart murmurs, which are usually heard in heart pathology. “Strange”, - the doctor thought, and lowered the stethoscope to the side of the abdomen, where a faint cardiac impulse came. Suddenly, heart sounds began to be heard clearly in the projection of the uterus.

– Oh my goodness! .. you are pregnant ... – hearing this, woman was so horrified that the doctor felt uneasy.

– Are you laughing at an old woman! My doctors have long recognized my infertility. My husband and I broke up because of this, having lived together for more than ten years. I got married a second time two years ago, i just didn't want to live alone. I've got enough of that! – her thumb passed across the neck, imitating complete disappointment in life. - And in addition, now you talking nonsense, shame on you. They said that you are a competent doctor, rubbish…

However, the doctor did not doubt the diagnosis. She explained the essence of the matter and sent her to the ultrasound study. A few minutes later the door of the doctor's office opens wide, the patient walked with a smile and began to kiss the hands of the benefactor.

She was then 48 years old. The birth ended with a Caesarean section. The daughter bears the name of the doctor, who instantly freed her mother from years of suffering.

Explanation of the situation: *A middle-aged woman at first came to the nephrologist's office with hope. Was at the reception of a surgeon who ruled out a surgical disease. One of the doctors recommended a nephrologist general practitioner. In the usual routine, physical examination, the doctor discovered pregnancy in a woman, being, as we say, of "not childbearing" age. The doctor was surprised and immediately told her. Then, there was a commotion. Full resentful protest from the woman. The theme of the plot was not medical, but most likely it was scandalous for the first time. Nevertheless, the doctor, confidently, not embarrassing and not counting the "not tactfulness" of the doctor, solemnly manifested that she was not sick, but pregnant. A super unique situation where the experience and knowledge of the doctor worked unerringly, paradoxically! The main thing is that she revealed the truth with her fanatical ordeal in search of an uncertain diagnosis. An "insulted" woman dreamed of having a child her entire life. And here it is, instead of a diagnosis ..., she thought, she said that she was thinking about the doctor in a harsh tone. Then all problems were triumphantly resolved!*

A situational diagnosis stated: 1. There is no pathology in the abdominal cavity. 2. Pregnancy of 5-6 weeks. Thus, with in-depth study: something simple - the search for pathology revealed a socio-medical problem. This is what a scientific approach and a new diagnostic methodology are.

Here a socio-psychological problem is solved simultaneously. 1. The diagnosis is established. 2. Chronic mental and psychological depression of a woman is eliminated. Moral - Doctor, be thoughtful! ***References [6,11]***

Unprofessional intervention of high authorities

A girl, 14 years old, was delivered to the surgical department at 23 hours. An hour and a half ago, dancing barefoot on the carpet, she felt a stitching pain in the foot. On the roentgenogram between 1 and 2 metatarsal bones of the right foot, a shadow of the gramophone needle was found.

The surgical team was busy performing emergency abdominal operations, and the responsible surgeon decided to hospitalize the patient and operate on her in the morning under fluoroscopic control.

At 3 a.m. a telephone rang. The secretary of the regional committee, who turned out to be a friend of the girl's parents, demanded that the operation be performed immediately.

The surgeon on duty, having finished the next operation, at 5 a.m. took the patient to the operating table, cut the skin over the alleged localization of the foreign body and did not find the needle. The operation was supposed to continue in the X-ray room.

Introducing the patient to the department head in the morning, the surgeon on duty turned pale and barely audibly said: "This is the wrong leg!" The morning shift removed the needle, and the girl was safely discharged.

A day later, the surgeon was taken to the intensive care unit with myocardial infarction. A criminal case was instituted against him, which did not reach the court, as the investigator proved that a medical error had been committed due to overwork at the 19th hour of continuous work.

The surgeon recovered, but did not return to work by profession. *This story demonstrates the destructiveness of unprofessional interference in the treatment process of leaders of any rank.*

Situational context: The intervention of the "big boss" ended with a surgeon's myocardial infarction, followed by dismissal. The problem is legal. A situational diagnosis has established that the moral, ethical and legal violation by the head of the city administration is grossly violated. The result, which was a doctor's myocardial infarction. Unfortunately, did not sue the big boss for a well-known reason. The doctor is fired. The chief, apparently more than once violated the laws and continues. Thus, the mentioned socio-moral defect of the immoral leader is fixed only in this medical history. It did not spread further. Yes, the doctor is to some extent to blame, fortunately a colleague helped. However, he did not deserve such punishment. Morality, the honor of an official is far beyond the borders of his "patrimony". **References *[2]***

Foreign body of the stomach

In a surgical clinic in Bishkek, in a certain period of time, patients were

diagnosed: a foreign body of the gastrointestinal tract, which were hospitalized. The authors provide a review of the material.

Accidental ingestion of foreign bodies into the gastrointestinal tract was observed in 19 patients admitted to the clinic, *and in other cases (8 people)* people intentionally swallowed various objects for the purpose of suicide. The assortment of foreign bodies entering the gastrointestinal tract turned out to be very diverse: needles, blades, nails, fish bones, weights (from the wall clock), tampons, rubber tubes, wire, etc.

Situational epistemology: A person walking intentionally such a step is by and large a pest not only his health. With its stupid and harmful effect, inflict economic damage on the state in the form of an aimless loss of medical materials, as well as moral damage to medical staff, relatives, distracting from employment by noble activities. Recommendation: in these cases, the patient should reimburse all financial services that went to treatment. This applies to those patients who deliberately conducted this act.

Epistemological issues: professional, legal and social.

References [3,8,9]

Esprit de corps

An obese man, 29 years old, soon after a hearty dinner arrives at the surgical hospital, where acute pancreatitis is diagnosed, and the patient begins to be prepared for surgery. The patient's mother, a doctor, consults a doctor with a request to invite a surgeon from another hospital for a consultation. She is refused counseling, the patient is sedated and taken to the operating room.

Then the mother decides on a risky act. She took her son off the stretcher and took him to the surgeon, whom she sought advice. When examining in another hospital, there was no indication for emergency surgery. Detoxification therapy was carried out, and on the third day the patient was discharged in satisfactory condition.

Everything in this story is unethical - the refusal to consult, the refusal to a colleague, and the unreasonable haste in determining the indications for surgery. Contrary to the principles of medical ethics, the "esprit de corps" was put above interests. The moral code of medical workers is under consideration.

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Cavinton soap

In recent years, pharmaceutical companies have begun to pay attention to doctors in order to effectively distribute their products. They quite often make small gifts: pens, calendars, napkins, and any other trifle. This time, representatives of "Gideon Richter" brought liquid soap in a plas-

tic container with a label advertising their most popular drug, “Cavinton”. And one day, an old friend comes to the professor who began to complain about his health. According to a friend, his memory decreased, he began to tire, get annoyed faster, i.e. the whole complex of asthenic syndrome. The doctor listened carefully and was about to write him the usual course of a general strengthening, improving brain metabolism and blood circulation. He suddenly drew attention to that plastic container with liquid soap with a Cavinton advertising label left on the table by representatives of the pharmaceutical company. He decided to joke: this is what the businessmen are doing, they have produced a new dosage form of the popular drug also in the form of soap, in addition to tablets and parenteral form. That this "new" form is very convenient, you wash your face three times a day, the drug is absorbed through the skin of the face and immediately reaches the brain vessels and improves local blood circulation. And then the professor was going overboard, continued to talk about the fact that the tablets are not always well absorbed from the stomach, and when administered intravenously, there may be unforeseen allergic reactions, etc., etc. Apparently he spoke very convincingly, his friend “this dosage form” was clearly to his liking, he was already eagerly looking at the plastic bottle. He asked where this new drug could be purchased. Continuing his joke, he said that this form is experimental, so far it has been distributed only to doctors for clinical trials. But I give this exclusive copy to my friend, and from today he should participate in clinical trials. Saying goodbye to him, he also demanded that he periodically call back and keep up to date with the clinical trials of the “new drug”.

Suddenly a friend’s call. He very seriously began to talk about the miraculous properties of the "new dosage form", that his friends and relatives asked to "get" this drug. The professor promised him, he will definitely finish off the whole batch and include all his relatives, friends and neighbors in clinical trials without exception. He did not keep himself waiting long, a week later he was already in the office of his friend professor. As soon as he crossed the threshold of the office, the scientist miracle worker, seeing his face freshened up, could not hold back his laughter. Then they laughed with him for a long time at this rally.

Epistemology situation: the case was the best illustration of a placebo effect of conventional soap in clinical practice. Methodology of epistemology: an amazing example when the words of a doctor are powerful healing tools. This is a unique and very effective propaganda whether it is in medical practice or in the advertising and presentational field. **References *[7,8,12]***

The paired cases law

Everyone has long known that surgeons are somewhat superstitious. If suddenly something unusual happened in surgical practice, then this “something unusual” may happen again, and they are waiting for the next such case. This coincidence of two identical cases is called the "law of paired cases."

A young man, aged 25, was admitted to the emergency surgery clinic with a diagnosis of acute appendicitis. Clinical manifestations were obvious and the patient was operated on. The operation took place without technical difficulties, the process was changed phlegmonously. The next day, during a morning tour by a surgeon, it was noticed that the patient’s condition worsened overnight, abdominal pain intensified, and sharp weakness and dizziness appeared. The pulse was frequent. In the right iliac region, a positive symptom of Shchetkin - Blumberg.

...Relaparotomy for suspected intra-abdominal bleeding. Indeed, when opening the abdominal cavity in the ileocecal angle, a significant number of blood clots. By this time, the bleeding apparently stopped, a bleeding vessel could not be detected. After rehabilitation, suturing of the suspicious sections of the mesentery of the appendix and drainage of the abdominal cavity, the wound is sutured. Postoperative course without features. The patient was discharged with recovery.

After 2-3 months, the younger brother of the former patient, about 20 years old, also with signs of acute appendicitis, arrives at the hospital.

Remembering that his elder brother was operated on and that he had intra-abdominal bleeding after surgery, hemostasis was carefully performed in advance. The operation took place without technical features, the process was phlegmonous. Check for hemostasis, turunda dry. The operation was completed without alarm. On the morning of the next day, the patient's condition was unimportant, the abdominal pain intensified, the skin and visible mucous membranes were pale, the pulse was frequent, with percussion dullness in the right iliac region, intra-abdominal bleeding was suspected.

Repeated operation was performed. Blood clots were detected in the ileocecal angle, no source of bleeding was found. Remediation, drainage of the abdominal cavity, the wound was sutured. The outcome was favorable, the patient was discharged with recovery.

Disease coincidence - acute phlegm appendicitis: after an operational complication - intra-abdominal bleeding could not be explained in a reasonable way.

Paramedicine is a conditional concept that combines practical skills and theoretical concepts used for medical or diagnostic purposes, which

have no scientific justification and are not recognized by modern medicine. Paramedicine is completely unjustifiably defined as a field of medicine: a number of authors identify it with non-conventional, or alternative, traditional medicine. At the heart of a couple of medical concepts and practices lies a mystical belief in the supernatural powers of nature. (Internet) **References** ***[8,10,]***

CONCLUSION

The path to knowledge in medicine, as in other sciences, is not easy, especially when the question is about the patient's health. In establishing a specific diagnosis, sometimes faced with incomprehensible and not familiar phenomena. Some other things are also involved: social issues, there are elements of jurisprudence, law, psychology issues, etc. They are to some extent involved and intertwined in our everyday and professional life, naturally they create a certain network of complexity between themselves. Of particular interest: here is the work of the doctors themselves, and the patient's nature does not remain on the side.

The author of this work is an active surgeon, has more than 40 years of experience in the surgical service in search of: "amazing and unusual" situations in clinical medicine. Over 200 extraordinary observations were collected. In the same subject data are obtained on the Internet. The purpose of this study was: is there any material basis for these unusual observations, and what is the peculiarity and attractiveness of this work? Yes, it turns out from this group of observations, almost 13.5% of cases are accompanied with certain phenomena, i.e. a certain causal relationship between the objects was created, which makes them interesting and unusual. That's what their rarity is in published periodicals. The materials are analyzed from the point of view of the epistemology methodology [4], which is provided in the following formula: situation = pathology diagnosis + identification of the determinant of this "event". Thus, a simple search for "diagnosis of the disease" has become the subject of study of the methodology of epistemology, i.e. the scope of knowledge of the diagnosis of pathology along with other determining phenomena has been expanded. The concept of "diagnosis" has acquired a scientific connotation. A completely new approach in clinical medicine. It is used only in a specific situation and is found in about 4-13% in a complicated form of diagnosis of the disease and is a teaching material, not only in medical schools. In matters of jurisprudence, it should be taken into account or appropriately reflected in official documents from the point of view of situational epistemology. It is a concept of methodology in the search for pathology diagnostics.

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CHANGES IN THE CIRCADIAN RHYTHM STRUCTURE OF MEAN ARTERIAL PRESSURE IN THE ACUTE PERIOD OF SEVERE TRAUMATIC BRAIN INJURY IN CHILDREN

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Abstract

Relevance. Today, the leading concept in the treatment of STBI is to choose the right tactics for the prevention and correction of secondary brain injuries, which largely determines the outcome of traumatic brain injury. Statistically significant factors affecting the outcome of STBI are: hypoxia, hypotension, PC02 in arterial blood and intracranial pressure. Given these factors in the ongoing intensive care, especially by regulating pulmonary ventilation, it is possible to positively influence the outcome of STBI in the acute period. The authors recommend maintaining an average blood pressure of at least 90 mm Hg [2,3,4]. However, there is insufficient information in the literature on the characteristics of the dynamics of the reaction of the structural components of the circadian rhythm of mean arterial pressure (MAP) in the acute period of STBI in children [1].

Purpose of the study. To examine and evaluate changes in the phase structure of the circadian rhythm of mean arterial pressure in the acute period of severe traumatic brain injury in children.

Material and research methods. Patients with severe traumatic brain injury (STBI) (100) are presented in three age groups: group 1 - from 9 months to 3 years (30), 2 - 3.1-7 years (31), older than 7.1 to 18 years old (39). Depending on the severity of the condition, which we determined by the duration of intensive care in ICU conditions, we studied each age group, dividing them into 3 groups: in subgroup 1, the duration of treat-

ment in ICU ranged from 5 to 10 days - only 43 children (43%); in the 2nd subgroup included 29 (29%) patients (duration of stay in the ICU - 11-20 days); Subgroup 3 - 28 children (28%). We studied indicators of central and peripheral hemodynamics: systolic (SAP), diastolic (DAP), mean arterial pressure (MAP), heart rate (HR). All patients were monitored for laboratory and clinical indicators: general analysis, blood biochemical parameters, coagulography. The components of the circadian rhythm were studied: median (mesor), the value of acrophase, bathyphase, the range of diurnal fluctuations, the amplitude of oscillations. A detailed analysis of reliably significant deviations, intergroup differences of the studied indicators was carried out. The results were obtained by monitoring with hourly recording of the studied parameters. The research data were processed by the method of variation statistics using the Excel program by calculating arithmetic mean values (M) and mean errors (m). To assess the significance of differences between the two values, Student's parametric criterion (t) was used. In this case, the critical level of significance was taken equal to 0.05. The respiratory support was started upon admission in the first hours in 5 children from 12 in group 1 (41% of patients), in group 2 in 8 out of 9 (88%), and in 4 immediately upon admission in A/C mode (IPPV). In group 3, upon admission, all 7 patients by severity of condition immediately upon admission transferred to artificial lung ventilation (100%). The duration of apparatus ventilation in group 1 was 3.3±1.6 day (from 5.9 ± 1.5 days spent in ICU), in the 2nd group - 8.25±4.6 days (from 14.6±3.1 days). In the 3rd group, the duration of mechanical ventilation was 21.4±7.3 days (out of 39.8±15.5 days). Thus, the severity of the condition and the effectiveness of intensive care were determined by the duration of prolonged mechanical ventilation. So, in group 1, the duration of mechanical ventilation was 55%, in 2 group - 36%, in group 3 - 54% of the total duration of treatment in ICU.

Results and discussion. As can be seen from the results of the study presented in Table 1, on the 1st day, under the age of 3 years, the level of the MAP circadian rhythm mesor in the 1st group was 74.9±2.0 mm Hg, in the 2nd group - 73.5±5.0; in 3 - 78.2±6.3 mm Hg. In children with STBI at the age of 3.1-7 years, a significant increase was found in group 2 by 14% ($p < 0.05$) relative to the indicator in the group of the same name up to 3 years. The circadian rhythm mesor index av. BP in 1 day in the 1st group over 7 years old was higher than that in children under 3 years of age by 25% ($p < 0.05$), by 3.1-7 years of age by 21% ($p < 0.05$), amounting to 93.6±2.4 mm Hg in the 1st group, 83.7±3.2 mm Hg in the 2nd; 92.5±3.5 mm Hg in the 3rd;.

Keywords: severe traumatic brain injury, mean arterial pressure, circadian rhythm, amplitude

In the dynamics in infancy, the acute period in group 1 was characterized by an increase in mean blood pressure by 6.7.8 days by 8%, 6%, 8% (p <0.05, respectively). In the 2nd group up to 3 years, an increase in MAP mesor on 3.4 days was revealed by 13%, 13% (p <0.05), which was due to a systemic inflammatory response to STBI. In group 3 up to 3 years, an increase in the MAP mesor on the 12th, 27th day of the acute period was revealed by 16%, 16% (p <0.05, respectively), which was due to the compensatory reaction of hemodynamics to the increased need of the brain damaged by trauma, inflammatory process in oxygen, energy substrates.

Table 1

Dynamics of the mesor of the circadian rhythm of mean arterial pressure in the acute period of STBI in children (mm Hg)

	up to 3 years			3,1-7 years			7,1-18 years		
days	1 group	2 group	3 group	1 group	2 group	3 group	1 group	2 group	3 group
1	74,9±2,0	73,5±5,0	78,2±6,3	76,8±4,4	84,4±3,1°	81,0±5,7	93,6±2,4°ↄ	83,7±3,2"	92,5±3,5°ᵈↄ
2	77,5±2,1	79,6±2,4	83,6±2,0"	79,0±1,2	82,7±2,0	83,7±1,7	94,0±1,2°ↄ	87,0±2,1"°	92,8±1,9°ᵈↄ
3	79,2±1,7	83,3±2,5*	84,5±3,1	79,7±1,3	83,8±2,8	82,6±1,9	92,3±1,2°	90,2±1,4*°	92,6±2,0° ↄ
4	76,3±1,3	83,1±2,2*"	83,3±2,4"	83,2±1,5°	90,6±2,3"°	84,3±1,2	94,3±2,3°	90,0±1,3*°	93,0±2,2° ↄ
5	78,6±1,3	80,0±2,4	85,9±2,7"	80,2±1,8	89,7±2,2"°	87,6±1,8"	93,1±1,8°ↄ	86,5±1,5"°	93,8±1,7° ↄ
6	81,2±1,7*	79,4±2,1	80,9±1,7	86,6±2,3*	91,6±3,0°	87,2±2,4°	93,4±1,5°ↄ	88,1±1,7"°	93,2±1,9° ↄ
7	79,3±1,4*	76,4±1,6	82,0±1,8	78,2±1,7	92,8±1,6*°	86,7±1,8"	91,2±1,6°ↄ	88,8±1,5°	95,1±1,6°ᵈↄ
8	81,3±2,0*	77,4±3,1	83,6±2,7	81,7±3,2	92,1±1,8*"°	83,8±3,3	90,0±1,8°ↄ	87,4±1,2°	96,0±1,9"°ᵈ
9		77,3±3,1	82,0±1,9	79,0±2,6	94,7±6,1°	86,4±2,3"	95,0±2,4ↄ	90,0±2,5°	93,2±1,9° ↄ
10		72,9±1,8	87,1±3,2		87,6±1,3°	89,0±1,6	91,1±3,9	89,2±2,4°	93,9±1,7°
11		77,5±2,7	77,8±2,9		86,6±2,0°	88,3±2,1°		88,7±2,2°	93,0±2,6°
12		74,9±2,1	90,7±2,1*		83,3±2,6°	87,7±3,3		85,7±1,8°	93,5±2,7
13		80,3±3,1	81,3±1,8		84,4±5,4	83,9±1,8		86,1±1,7	90,7±2,9°
14			83,6±1,8		93,2±5,6	86,1±1,6		86,1±1,6	91,4±1,4°ᵈ
15			82,5±2,6			86,2±1,9		84,5±1,6	92,3±1,6°ᵈↄ
16			78,2±2,1			86,9±1,7°		85,4±1,9	93,1±2,5°ᵈↄ
17			77,5±2,4			87,5±1,4°		93,9±3,2*	92,5±2,7°
18			77,0±2,0			87,2±2,5°		89,4±3,8	92,9±1,6°
19			81,8±1,9			83,3±2,1			93,0±2,6° ↄ
20			79,2±1,8			87,5±2,9°			90,7±1,5°
21			80,9±2,1			86,5±2,0°			93,3±2,1° ↄ
22			80,2±1,6			85,2±2,2			96,1±2,4° ↄ
23			81,2±1,6			83,6±2,3			93,0±1,8° ↄ
24			78,3±1,9			83,9±1,5°			92,1±1,6° ↄ
25			75,0±1,0			81,2±1,2°			92,7±2,0° ↄ
26			77,2±2,7			82,3±1,8			91,0±2,4° ↄ
27			91,2±3,2*			85,3±1,8			91,5±2,6ↄ
28			83,0±1,8			87,9±2,2			92,9±2,5°
29			77,0±2,0			87,1±2,2			92,5±3,1°

30			73,4±3,1			87,1±1,9			92,5±3,1°
31						82,0±2,8			95,8±4,0ↄ
32						82,7±2,7			94,8±2,6ↄ
33						82,3±3,3			95,4±1,9ↄ
34						85,2±1,8			93,3±2,5ↄ
35						81,7±2,5			93,0±2,1ↄ
36						81,7±3,9			91,1±1,9ↄ
37						80,3±1,8			91,1±2,0ↄ
38						84,0±2,0			92,7±2,9ↄ
39						82,6±1,8			94,8±2,4ↄ
40						83,5±1,7			90,6±2,0ↄ
41									90,8±4,4
42									84,7±3,7

*- deviation significant relative to the data in the first day

"- significant relative to the indicator in the first group

°- age difference significant relative to the indicator in the group of the same name up to 3 years

ᵈ- significant relative to the indicator in the 2nd group of this age

ↄ- the difference significant relative to the indicator in the same group at the age of 3.1-7 years

In group 1 of children aged 3.1-7 years, an increase in mean blood pressure by 6th day was revealed by 12% ($p < 0.05$) as well as in children under 3 years of age, however, in older children, the MAP was higher than in children in the group up to 3 years by 6% ($p < 0.05$). The latter, apparently, is due to a more pronounced compensatory restructuring of hemodynamics in conditions of a systemic inflammatory response in older children. Already on the first day of the acute STBI period, the MAP mesor index in group 2 of children 3.1–7 years old was higher than in the group of the same name under 3 years old by 14% ($p < 0.05$). On the 7th and 8th days, an increase in the mesor of the circadian rhythm MAP by 9% was observed ($p < 0.05$). At the same time, higher MAP values were found in the 2nd group of 3.1-7 years relative to the results of the 2nd group up to 3 years on 1,4,5,6,7,8,9,10,11,12 days by 14%, 9%, 12%, 15%, 20%, 18%, 22%, 20%, 11%, 11% ($p < 0.05$, respectively), which can be explained by the age-related feature of the hemodynamic reaction to STBI of children 3.1-7 years old. In addition, in group 2, the indicator by 4.5.8 days was higher than in group 1 by 9%, 11%, 12% ($p < 0.05$, respectively). That is, the severity of the acute STBI period was manifested by a more pronounced mobilization of hemodynamics at the age of 3.1-7 years, in contrast to the younger group.

In group 3, 3.1-7 years, the circadian rhythm mesor MAP was higher than in group 2 of this age by 1 day - by 10%, 2 days - 7%, 7 - by 7%,

8 - 9%, 14- 6%, 15–9%, 16–9% ($p < 0.05$), that is, more significant STBI damage in children of group 3 was manifested by a significantly more pronounced compensatory increase in the MEP of the circadian rhythm MAP in children over 7 years of age. In addition, significant age-related features were revealed when the level of MAP mesor was higher than that in infants in the 3rd group up to 3 years of age at 6 days by 7%, by 11 days by 12%, 16 by 11%, 17 by 12%, 18 by 13%, 20 by 11%, 21 by 6%, 24 by 7%, and by day 25 by 8% ($p < 0.05$, respectively) of the acute STBI period. Thus, the age-related peculiarity of the hemodynamic reaction at an older age (3.1–7 years) in group 3 was expressed in a significantly more pronounced increase in the MAP circadian rhythm mesor by 6, 11, 16, 17, 18, 20, 21, 24, 25 days of an acute period of STBI in response to secondary damage caused by an inflammatory reaction, ischemia of brain tissue.

In the acute period of STBI in 1 group of children over 7 years of age, the MAP circulatory rhythm mesor index remained unchanged during the observation. However, significantly higher rates were found in comparison with infancy. So, the mesor of av. blood pressure in the 1st group was higher than the indicator in the same group for 8 days of the indicator of the 1st group under the age of 3 years by 25%, 21%, 16%, 23%, 18%, 15%, 15%, 10 % ($p < 0.05$). Also, the mesor of av. blood pressure in children older than 7 years of group 1 turned out to be higher during 8 days of the indicator of group 1 at the age of 3.1-7 years during the first 9 days: on day 1 by 10%, 18%, 16%, 13%, 16%, 9%, 16%, 10%, 20% ($p < 0.05$, respectively). In the 2nd group of STBIs aged 7.1–18 years, on the 1st day, the level of the MEP circadian rhythm mesor was lower than in the 1st group by 11%, by 2–8%, 5–8%, and 6 days by 6%. That is, in group 1 over 7 years of age, more pronounced compensatory mobilization of hemodynamics was found than in group 2 of the heavier. The latter is most likely due primarily to more massive stress-limiting therapy due to more severe brain damage in children of group 2. In children of the 3rd group over the age of 7 years, during almost the entire observation period, the MAP circadian rhythm mesor index remained at a consistently higher level than in the group of the same name under 3 years old and 3.1-7 years old, as well as in the 2nd group over 7 years old. Thus, a higher level of MAP circadian rhythm mesor was revealed in children over 7 years of age compared with indicators in the 3rd group in children under 3 years of age 1–9, 11, 13–26, and 28–30 days of the acute STBI period by 18%, 10 %, 9%, 10%, 9%, 15%, 15%, 14%, 13%, 7%, 19%, 10%, 9%, 10%, 19%, 19%, 20%, 10%, 13%, 15%, 17%, 23%, 18%, 11%, 20%, 26%

(p <0.05, respectively). In addition, the MAP circulatory rhythm mesor index in group 3 over 7 years old was significantly higher than in children of the same group at the age of 3.1-7 years for 1 day -14%, 2-10%, 3-12%, 4-10 %, 5 - 6%, 6 - 7%, 7 - 9%, 9 - 7%, 15 - 7%, 16 - 7%, 19 - 10%, 21 - 8%, 22 - 10%, 23 - 10 %, 24-9%, 25-14%, 26-15%, 27-7%, 31-16%, 32-14%, 33-15%, 34-9%, 35-13%, 36-10 %, 37 - 12%, 38-13%, 39-14%, 40-8% (p <0.05, respectively). The revealed feature in the heaviest 3 group of STBI children older than 7 years can be explained by the most pronounced compensatory mobilization of hemodynamics - an increase in the mesor of the circadian rhythm of the average blood pressure during adaptation in the acute period of STBI in children older than 7 years, when despite the most pronounced functional activity of organs and systems in conditions of practically functionally and structurally mature organs and systems, serious violations of homeostasis remain due to focal destruction and inflammatory response reaction in the CNS.

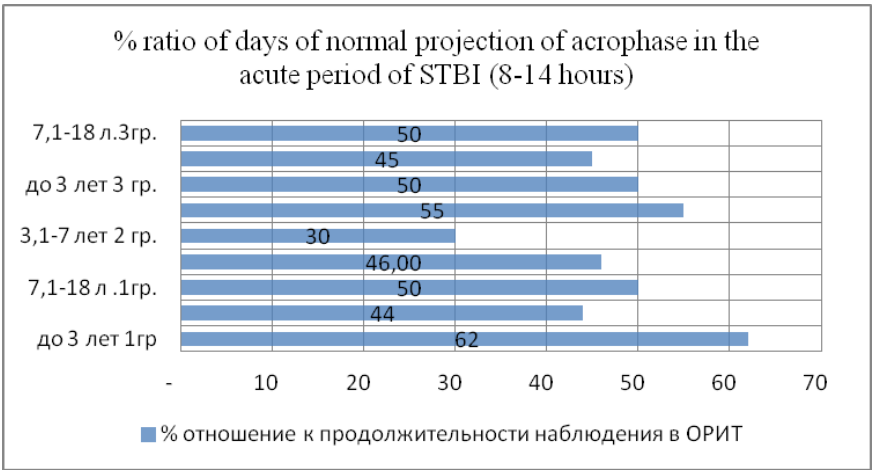

Fig. 1

The study of the percentage of the number of days with the normal projection of the acrophase of the circadian rhythm of the average blood pressure in the ICU in the morning hours (8-14 hours) revealed the longest prevalence in children of group 1 with STBI under the age of 3 years, which amounted to 62% (Fig.1).

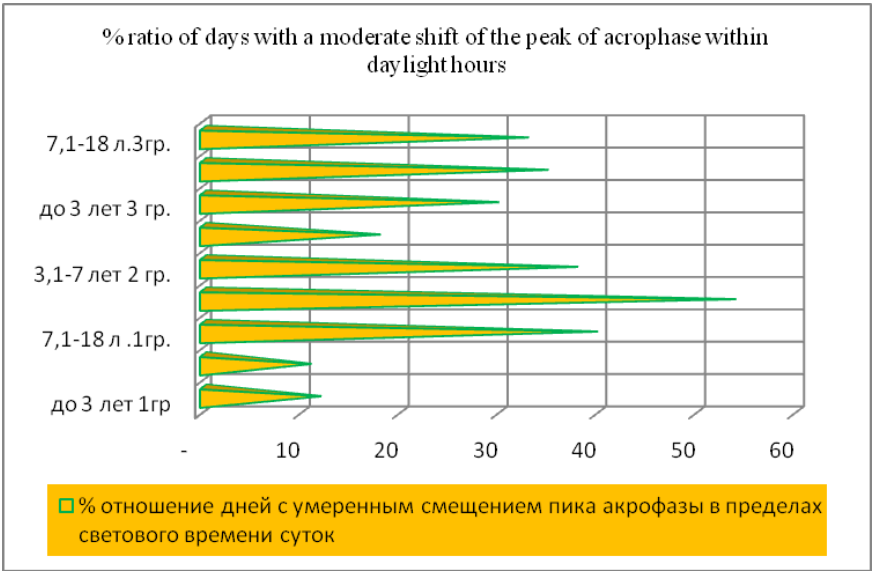

Fig.2

The shift of the acrophase peak within the daylight hours (moderate shift of the peak of acrophase clockwise) prevailed in the 2 group of children under 3 years of age, amounting to 54% (Fig. 2).

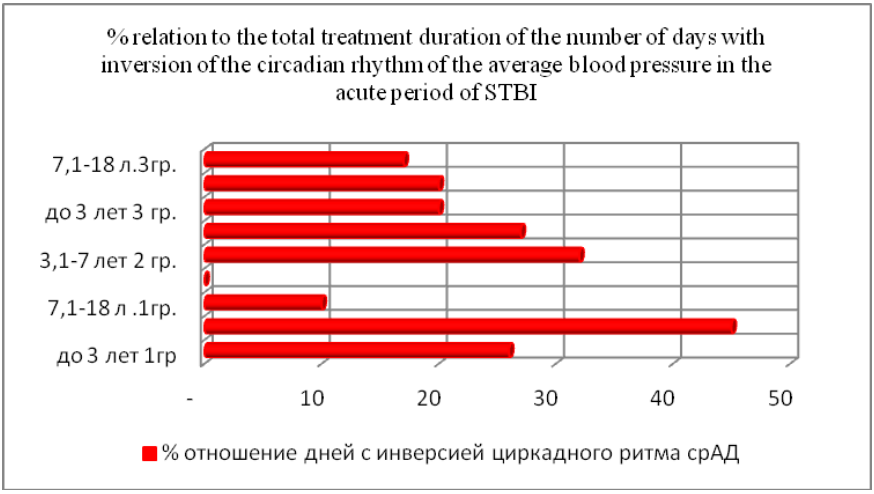

Fig.3

Displacement of acrophase circadian rhythm of mean arterial pressure by night hours
(rhythm inversion) is shown in Fig. 3. The most prolonged desynchronosis of the circadian rhythm of MAP was detected in children of the 1st group at the age of 3.1-7 years (45%).

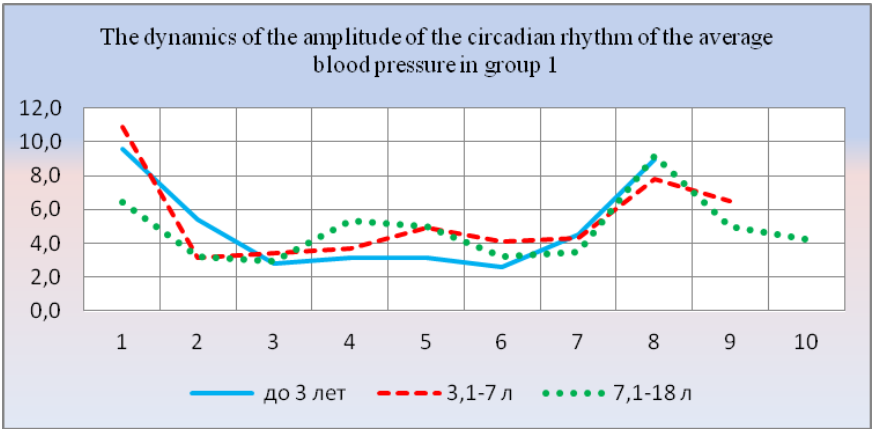

Fig.4

As can be seen from the data in Fig. 4, an almost synchronous change in the amplitude of diurnal fluctuations in the MAP level in group 1 was detected, regardless of age, with maximum values of 1 (up to 3 years -9.5 mm Hg, 3.1-7 years - 11 mm Hg, older than 7 years - 6.5 mm Hg) and 8 days (up to 3 years-9 mm Hg, 3.1-7 years - 7.8 mm Hg, older than 7 years - 9 mm Hg) acute period of STBI. Thus, the change in the amplitude of diurnal fluctuations in the mean arterial pressure index in group 1 in all children occurred in a near-weekly rhythm.

In the 2nd group of children, the maximum amplitude of fluctuations in the circadian rhythm of MAP was observed in children under 3 years of age on the 1st day (20 mm Hg), a repeated increase to 11 mm Hg on the 8th day (with more severe STBI in the 2nd group, the weekly period of fluctuations in the amplitude of the circadian rhythm MAP). In group 2 of children aged 3.1–7 years, the maximum value of the amplitude of the circadian rhythm of MAP was revealed on day 13 (15 mm Hg). That is, the weekly period of amplitude fluctuation increased to 13 days. It is known that a change in the period of oscillation is characteristic of the stress response of biorhythms in the process of adaptation to more severe conditions of existence. In the oldest group, the amplitude of MAP

oscillations in the circadian rhythm did not exceed 8 mm Hg. That is, the most stable indicators of MAP level in group 2 were observed in children older than 7 years.

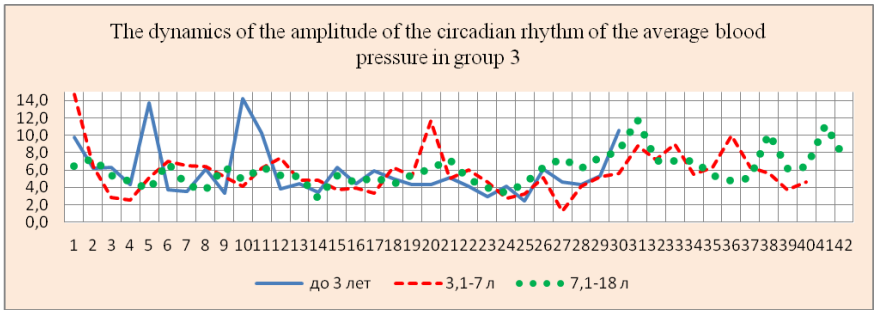

Fig.6

The most pronounced fluctuations in the amplitude of the circadian rhythm of MAP were observed in children of the heaviest 3 group (Fig. 6). So, in infancy, the most pronounced differences in MAP during the day were detected at 1.5.10, 30 days, amounting to 10 mm Hg, 13.8 mm Hg, 14.2 mm Hg, 10.8 mm Hg, characterizing the expressed instability of hemodynamics in the specified days. Two 5-day oscillation periods formed in the first 10 days are noteworthy. That is, the more severe condition of infants was characterized by fluctuations in the circadian rhythm of the MAP amplitude in the 5-day rhythm, at the age of 3.1-7 and in the group older than 7 years of age, a six-day period of MAP fluctuations. In the 3rd group of children admitted at the age of 3.1-7 years, the most pronounced MAP instability was observed at 1, 20, 31, 36 days, when the amplitude of the daily MAP fluctuation was 15 mm Hg, 11.5 mm Hg, 9 mm Hg., 10 mm Hg. In group 3 older than 7 years, unlike previous groups of this age, the amplitude of diurnal fluctuations of MAP increased to 12.10.11 mm Hg at 31, 38, 41 days, which was most likely due to secondary complications of STBI.

Conclusions. The compensatory hemodynamic reaction in conditions of a systemic inflammatory response was expressed by a more pronounced mobilization of hemodynamics at the age of 3.1-7 years, in contrast to the younger group. More significant STBI damage in children of group 3 was manifested by a significantly more pronounced compensatory increase in the MES circadian rhythm mesor in children over the age of 7 years. The most pronounced fluctuations in the amplitude of the circadian rhythm of MAP were observed in children of the heaviest 3 groups. Significantly

higher indices were found in older age groups compared with infancy. the change in the amplitude of diurnal fluctuations in the mean arterial pressure index in group 1 in all children occurred in a near-weekly rhythm. In group 2, the weekly period of amplitude fluctuation increased to 13 days. The most stable indicators of the amplitude of the circadian rhythm of MAP in group 2 were observed in children older than 7 years.

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6 - MONTH DYNAMICS OF MYOCARDIAL ELECTRICAL INSTABILITY IN PATIENTS WITH Q-WAVE MYOCARDIAL INFARCTION

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Abstract. The article presents data from 47 patients with CHD complicated by ventricular arrhythmia. 6 months after myocardial revascularization, a decrease in the number of ventricular extrasystoles, including high gradations, an improvement in heart rate variability was observed.

Keywords: coronary heart disease, ventricular arrhythmia, heart rate variability, myocardial revascularization.

Despite significant progress in medical and surgical treatment, coronary heart disease (CHD) remains the leading cause of sudden arrhythmic death (SAD) [1, 2, 3]. This is because one of the most dangerous complications of CHD is heart rhythm and conduction disturbances. That is why most research work is aimed at identifying the risk of development, studying etiopathogenesis, methods of treatment and prevention of life-threatening ventricular arrhythmias (VA) (paired ventricular ectopic complexes (VES), unstable and stable ventricular tachycardia (VT) and ventricular fibrillation (VF) in patients with this disease [1]. In almost all patients with CHD, a single ventricular ectopia of varying severity is recorded, and in 20-30% - VA of high gradations. The probability of developing SAD in the general population is 0, 1-0, 2%, however, with the accompanying VA myocardial ischemia, the risk of SAD increases tenfold [4, 5]. Current principles for the treatment of VA patients with CHD include drug therapy, including AA therapy, surgical myocardial revascularization (MR), radiofrequency catheter ablation (RFCA), and implantation of a cardioverter-defibrillator (CD). It is quite reasonable to assume that myocardial revascularization (ChKB or CABG) by improving coronary blood flow, eliminating or reducing myocardial ischemia, and improving LV function may have a favorable AA

effect (reduction in the number, complexity and gradation of VA, in some patients, until they are completely eliminated) [16]. However, the results of the studies are not so clear: MR can both completely eliminate ectopic activity and enhance or not affect it at all [7, 8]. Thus, the role of MR in the modification of the electrophysiological substrate and trigger factors, the dynamics of VA after MR and the factors influencing it are still debatable. The aim of the study was to track the dynamics of VA and HRV in patients with CHD after 6 months of myocardial revascularization.

Materials and methods. The study included 47 male patients with high grade CHD and VA (Lown-Wolf grade 2 and above), aged 36 to 70 years (mean age 57, 4 ± 8, 5 years). Exclusion criteria for patients from the study : Angina pectoris IV functional class; unstable angina pectoris, acute stage of myocardial infarction (MI) before surgery; left ventricular aneurysm (LV); CHF IV f.k. (NUNA); LV ejection fraction (EF) <35%; type 1 and type 2 diabetes; persistent and permanent form of atrial fibrillation; Sinus node weakness syndrome or a history of sinus node dysfunction; hemodynamically significant congenital and acquired heart defects.

Table №1
Clinical and demographic characteristics of the studied group of patients:

Indicators	n=47
Age, years	57,4±8,5
Men : women	34:13:00
Body mass index, kg/m2	28, 6±3, 9
IM in the history,%	41, 6
Duration of IM, years	3, 9±1, 6
Duration of CHD, years	7, 2±2, 9
Duration of arrhythmic history, years	3, 1±1, 7
Angina of tension I f.k.,%	3, 1
Angina pectoris II f.k.,%	43, 6
Angina of exertion III FC,%	32, 2
Painless myocardial ischemia,%	11, 6
Hypertonic disease, %	76, 5
Dyslipidemia,%	88, 4
Smoking%	57, 7
CHF I f.k.,%	28, 3
CHF II f.k.,%	65
CHF III f.k.,%	6, 7
EF	50, 1+3, 9

All patients undergoing standard therapy (beta-blockers, ACE inhibitors, calcium antagonists, antiplatelet agents, nitrates) underwent clinical examination, resting ECG in 12 leads, echocardiography, coronary angiography, 24-hour Holter monitoring (HM), treadmill test. In accordance with the study protocol, planned visits were carried out before myocardial revascularization, and then after 6 months. The Cardiosens complex (Ukraine) was used to perform a HM ECG, while analyzing daily recordings, the following was calculated: total duration of daily myocardial ischemia, maximum depth of ST segment decline, daily number of episodes of pain and painless ischemia, heart rate at the beginning of ischemic episodes. In the analysis of ventricular arrhythmias (VA), the morphology of arrhythmia, the adhesion interval of ventricular extrasystole (VE), the relationship with the load and ischemic episodes were studied [9, 10]. To assess the effects of autonomous NS on the heart and their relationship with the severity of VA, patients underwent HRV analysis. The analysis of HRV parameters in the time and spectral regions was carried out using the Cardiosens + software, which makes it possible to estimate HRV for any time intervals. From the analysis indicators in the time domain, the following were calculated: SDNN (ms), SDANN (ms), rMSSD (ms), pNN50. Assessment of normal values of HRV indicators was carried out according to Bigger JT, 1998 and Demidova M.M., Tikhonenko V.M., 2001 [9, 11]. The treadmill test was carried out using the Marquette hardware-software complex (USA) according to the Bruce protocol. The duration of each step was 3 minutes. ECG was recorded in 12 leads. Throughout the entire sample, constant monitoring was carried out for the maximum (among all 12 leads) displacement of the ST segment and the detectability and dynamics of VA [10]. The criteria for termination of the sample were: the appearance of frequent, polymorphic single and paired VES, VT paroxysms, as well as atrial fibrillation; the appearance of conduction disturbances (blockade of the legs of the bundle of His, atrioventricular block); achievement of submaximal heart rate; the appearance of horizontal or oblique depression or elevation of the ST segment by 1 mm or more; the occurrence of a sore throat; severe tiredness; increase in blood pressure over 220/110 mm Hg or its decrease by 20 or more mm Hg; the appearance of severe shortness of breath; the appearance of neurological symptoms. During a stress test, the quantitative and morphological characteristics of VA were compared at rest, against the background of the FN and in the recovery period. The increase in VE with the appearance of new gradations during the test, in the absence of preload, was a criterion for early termination of FN.

All patients included in the study underwent CAG according to the standard Judkins transradial access technique [12]. The criterion for hemodynamically significant lesions was narrowing of the coronary vessel more than 75% in diameter, with damage to the trunk of the left coronary artery (CA) - more than 50% in diameter. CA stenosis of 20% in diameter and less than CA was regarded as "the absence of signs of atherosclerotic lesion of the CA". The segmentation of CA was carried out in accordance with the ACC/AHA Coronary Angiography Guide [13]. Statistical analysis of the data was carried out using software packages “Statistica 6.0”. To obtain descriptive characteristics of the studied variables (frequencies, distributions, averages and standard), the corresponding procedures of the “Statistica 6.0” were used. To compare the qualitative characteristics, a percentage ratio was used, Fisher's exact test. Differences were considered statistically significant at $p < 0.05$.

Results and discussion. According to the results of HMEGG, all patients had a sinus rhythm with an average heart rate (HR) of daytime hours of 72+5, 6, night hours of 62+6, 2. According to the classification of B.Lown and M.Wolf (1971), 27.6% revealed frequent VE (more than 30 per hour), polytopic in 23.4%, paired in 27.6%, group and unstable VT 21.4% of patients. As for the quantitative characteristics of arrhythmias, single VESs were 2775, 3±485, 7, paired VES 19, 2±5, 9 and episodes of VT 1, 5±0, 2.

Table №2
The results of the treadmill test before myocardial revascularization:

Indicator	
Initial HR, beats/min	74, 5±10, 1
FN duration, min	6, 2±1, 1
The initial systolic blood pressure, mm Hg	126, 3±13, 2
Initial diastolic BP, mm Hg	80, 6±6, 9
Maximum Systolic BP, mm Hg	170, 1±19, 1
Maximum diastolic BP, mm Hg	95, 9±10, 1
Myocardial aerobic performance, MET.	6, 2±2, 2
TFN: below average,%	51
TFN: average, %	38,2
TFN: above average, %	10,8
Pain during the test with FN,%	64
Achieved HR, bpm	133, 2±14, 1
Achieved HR (% of maximum HR)	83±9
Double product	220, 5±52

Indicator	
Duke Index	
<-10, p	8
-10-+4, p	35
>+5, p	4
The advent of high gradations VA	
III	38, 3%
IVA	25, 5%
IVB	2, 1%

As can be seen from this table, the initial HR and BP indicators were 74, 5±10, 1 and 126, 3±13, 2 by 80, 6±6, 9, respectively. The duration of the load was 6, 2±1, 1. The average aerobic performance of the myocardium was 6, 2+2, 2 METS. During exercise, chest pain was noted in 64% of patients, and class III VA appeared in 38, 3% of patients, VA class IV in 25, 5%, and VA patients in 2, 1%.

During a stress test, VA appeared and progressed in 32 (68, 1%) patients; in the remaining 12 (31, 9%), they increased compared to the initial level. At the same time, in 28 (59.5%) patients, there was a clear connection between VA and the occurrence of ST segment depression and anginal syndrome.

According to the CAG, atherosclerotic lesions of CA were detected in 93.6% of patients, and only 6.4% of CAs were angiographically intact. Monovascular lesion occurred in 25, 5%,; bivascular lesion was detected in 23, 4% and multivascular lesion occurred in 44, 7% of patients, including damage to the trunk of the left CA. It is noteworthy that, with just the latter variant of CA lesion, VA of high gradations was significantly more often detected. With the cessation criteria were: the appearance of frequent, polymorphic single and correlation analysis revealed a direct relationship of weak strength between the degree of trunk stenosis LCA and AIA and the number of paired and group VES (r = 0, 397 and r = 0, 495, respectively) however, for other VA species, no association with coronary lesion was found. A weak force correlation was observed between the number of affected CA, the degree of coronary lesion and the degree of ischemic changes recorded during the stress test (ST depression, mm) - (g = 0, 401 and g = 0, 376, respectively). These data are consistent with the results of studies by AE Nikitin, in which it was shown that stenosing lesion of PK A as an independent factor does not significantly affect the arrhythmic activity of the heart, while hemodynamically significant stenoses of AIA and OA correlate with VA. [14]. Taking into account the history, the results of ob-

jective examination methods, the characteristics of coronary blood supply and atherosclerotic lesion CA 44 (78, 7%), patients underwent surgery. At the same time, from the group of operated patients, 30 patients underwent percutaneous intervention (PCI), and 14 - CABG.

When evaluating the AA effectiveness of myocardial revascularization 6 months after surgery, regardless of the type of surgical intervention, a 89.4% decrease in the total number of VES was revealed compared with the initial data. When analyzing changes in the frequency of occurrence of high gradation VA in patients undergoing MR using or other type of surgical intervention, its decrease was noted mainly due to a decrease in the occurrence of VT paroxysms. Thus, when analyzing the results of HM ECG after 6 months, a decrease in the number of patients with high-grade VA was revealed, and this was more pronounced among patients undergoing PCI. So after PCI paired VES were found in only 6, 6% (initially in 20% (p=0, 255)), VT paroxysms in 3, 3% of patients (initially - in 26, 6%, p=0, 03). In addition, 15% of patients after PCIVA with HM ECG were completely absent. In the CABG group, VT was initially registered in 2 patients; after surgery, it persisted in dynamics in 1 patient.

After 6 months, the results of the treadmill test after CKB showed a further decrease in the number of patients with VT paroxysms (2, 1%, p = 0, 01), however, paired VES again returned in 15% (in total, they were recorded in 27, 65% of patients). At the same time, among patients undergoing CABG, the number of patients with paired VES continued to decrease (by 17.6%). Perhaps this is due to the features of the examination - in the early postoperative period, the treadmill test was not performed, during which VAs of high complexity are often induced. Therefore, it would be more correct to evaluate the antiarrhythmic effect of MR no earlier than six months after the operation by combining the results of the HMEGG and stress tests. It should also be borne in mind that in some patients, complexity decreased by 1 gradation, i.e. paired VEC remained in patients with VT episodes after surgery, and therefore the incidence of these rhythm disturbances relatively increased after MR compared with the initial data. In general, the number of patients with VT decreased by 2.5 times. Nevertheless, in some patients there was still a complete suppression of ventricular ectopic activity in the early (in 3, 7% after CABG) postoperative period. Regarding the parameters of HRV, the statistically significant dynamics when performing myocardial revascularization concerned almost all of the analyzed numerical parameters of HRV: SDNN, SDANN, VLF and LF. Patients who underwent CKB showed a statistically significant decrease in the values of SDNN, SDANN, and LF in the early postoperative period,

which is explained by the adverse effect of intraoperative factors on the ENM (anesthetics, circulatory arrest, cardioplegic solution, contrast drug, intraoperative acute myocardial ischemia)), which are able to temporarily increase the dispersion of repolarization, which in turn stimulates the activation of sympathetic tone and autonomous NS. Subsequently, by 6 months after the operation, it was observed to increase to the initial level (p=0.03).

The values of the HF parameter, on the contrary, increased in the late postoperative period. In patients who underwent CABG, there was a statistically significant decrease in the values of all HRV parameters compared with the initial ones in the early postoperative period: SDNN (p=0,019), rMSSD (p=0,013), SDANN (p=0,05), VLF (p=0, 005), LF (p=0, 05), HF (p=0, 038). By 6 months after CABG, a restoration of HRV parameters was observed. However, it should be noted that, unlike other parameters, the SDNN values did not return to the initial values during the entire observation period.

Summarizing the above, it is possible to note the different influence of types of surgical intervention (PCI/CABG) on the parameters of HRV. So, 6 months after CHB, an improvement in HRV parameters (except for LF) was noted, while in patients after CABG the values of HRV parameters were restored to the indicated postoperative period (except for SDNN), approaching the initial ones after a sharp decrease in the early postoperative period.

Conclusion. In patients with CHD, the frequency of occurrence of high gradation VA is in direct proportion to the degree of CA lesion.

Coronary artery bypass grafting in the early stages after surgery causes a negative dynamics of heart rate variability with the restoration of indicators no earlier than 6 months, while myocardial revascularization by angioplasty with stenting helps to improve these indicators. Myocardial revascularization, regardless of the type of surgical intervention, has both anti-ischemic and antiarrhythmic effects. At the same time, the positive antiarrhythmic effect concerns both a decrease in the total number of ventricular extrasystoles and ventricular arrhythmias of high gradations.

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FEATURES OF VISUALIZATION OF FOCAL FORMATIONS OF THE LIVER ON THE BACKGROUND OF DIABETES MELLITUS

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Annotation. Often benign liver formations, among which it is important to note cavernous hemangiomas and cysts, which occupy the second and third places after metastatic lesions in frequency of occurrence, can imitate or hide malignant neoplasms.

The purpose of study. *Analysis of the diagnostic capabilities of methods of radiation diagnostics in identifying and recognizing pathological lesions in the liver with diabetes mellitus*

Material and methods. *To perform one of the main tasks of our study, i.e. determining the features of visualization of hemangiomas in the liver in various groups of patients, we in each group identified patients with these focal formations against the background of a normal liver and against the background of its metabolic lesions. The subjects were comparable by age and gender. The patients underwent the following instrumental studies: magnetic resonance imaging (MRI), computed tomography (CT) and ultrasound scan (US).*

The results of study. *As can be seen from the following generalized table for the detection of hemangiomas in the right lobe of the liver from all used methods of radiation diagnostics, b the analysis of the advantages of MRI, CT and US techniques in detecting hemangiomas in various lobes of the liver, the most informative is the MRI. But against the background of metabolic disorders, US is significantly more informative than CT and MRI in the study of the left lobe. The same imaging technique turned out to be the most informative in the case of the caudate lobe against the background of an unchanged liver. As for CT, it turned out to be more informative when examining the square fraction: against the background of both the affected and unchanged liver.*

Conclusions. *When comparing the information content of different methods of radiation diagnostics (MRI, CT and US) depending on the size of hemangiomas, it was found that, regardless of the background state of the body, MRI studies are most informative in detecting small formations of size*

Keywords: *liver, hemangioma, ultrasound, magnetic resonance imaging, computed tomography*

It should be noted that, in some patients, due to a number of features of the anatomical structure and functional role of the liver, with the localization of the tumor process in certain organs, in particular the organs of the gastrointestinal tract, it is diagnosed with metastatic lesion in almost half of the cases [1, 3]. Often benign liver formations, among which it is important to note cavernous hemangiomas and cysts, which occupy the second and third places after metastatic lesions in frequency of occurrence, simultaneously with the safety for patients themselves, can imitate or hide malignant neoplasms [2, 4].

The purpose of the study

Analysis of the diagnostic capabilities of methods of radiation diagnostics in identifying and recognizing pathological lesions in the liver on the background of diabetes mellitus.

Material and research methods

Patients with focal liver lesions were examined. The principle of selecting groups was based on the frequency of occurrence of the pathology, as well as the importance of their differential diagnosis for the selection of optimal tactics and the amount of further treatment. Some diagnostic criteria specific to each technique were also analyzed. In the process of this work, a total of three groups of patients with diabetes from 30 to 65 years old were examined. Group I - 178 patients with hemangiomas, Group II - 212 patients with metastatic lesions, and Group III –124 patients with non-parasitic liver cysts. To perform one of the main tasks of our study, i.e. determining the features of visualization of hemangiomas in the liver in various groups of patients, we in each group identified patients with these formations against the background of a normal liver and against the background of its metabolic lesions. The subjects were comparable by age and gender. The patients underwent the following instrumental studies: magnetic resonance imaging (MRI), computed tomography (CT) and ultrasound scan (US). Statistical analysis was carried out for individual groups of patients, depending on the methods used for radiation diagnosis and the presence of a normal liver and its dystrophic lesions. Statistical hypotheses when comparing samples under normal distribution conditions were tested using Student's t-test and nonparametric criteria. Nominal variables were presented in the form of absolute and relative frequencies (%).

Research results and discussion

To identify hemangiomas in the right lobe of the liver, of all the used methods of radiation diagnostics, b the analysis of the advantages of MRI, CT and US methods in detecting hemangiomas in various lobes of the liver has the most informative MRI. So, in the presence of metabolic lesions of

the liver, its information content is significantly higher than that of CT and US almost more than 1.5 times (Table 1). When hemangiomas were detected in the left lobe of the liver, there was no significant difference in the information content of these methods. But against the background of metabolic disorders, US is significantly more informative than CT and MRI in the study of the left lobe. The same imaging technique turned out to be the most informative in the case of the caudate lobe against the background of an unchanged liver. As for CT, it turned out to be more informative when examining the square fraction: against the background of both the affected and unchanged liver. Thus, the data obtained indicate the frequent detection of hemangiomas in the right lobe of the liver during MRI studies.

Table 1

Detection of hemangiomas in various lobes of the liver according to MRI, CT and US (%)

Liver lobes	Methodology					
	MRI		CT		US	
	norm. liver	FLD	norm. liver	FLD	norm. liver	FLD
right	66,7	80,0	56,3	57,1	62,5	51,4
left	23,3	15,0	18,8	19,0	22,5	37,1
caudate	6,7	5,0	9,4	9,5	10,0	5,7
square	3,3	0,0	15,6	14,3	5,0	5,7
Total (cases)	30	20	32	21	40	35

In studies on the comparative information content of different radiation research methods in the detectability of certain criteria, the quantitative indicators and the structure of hemangiomas were studied in detail. As a result, in most cases, structurally hemangiomas turned out to be mixed, and single hemangiomas significantly prevailed in quantitative indicators, regardless of background changes. The contours of hemangiomas were often clear; and uneven, they were diagnosed with US in patients against a normal liver and in all patients without exception against a background of overweight. In CT, the uneven contours of hemangiomas were present in most patients against the background of a normal unchanged liver. The best conditions for visualizing uneven contours against the background of dystrophic changes in the liver are explained, in our opinion, by the presence of a layer of unchanged liver tissue around the formations, which creates opportunities for a more clear differential diagnosis. According to

the results of a comparative analysis of the information content of various methods of radiation diagnostics (MRI, CT and US) depending on the size of hemangiomas, it is obvious that, regardless of the background state of the organism, MRI studies are most informative in detecting small formations up to 5 cm in size. Whereas, the other two methods in this plan were less informative, especially CT. With medium-sized hemangiomas, CT studies were the most informative. The best diagnostic method for detecting gigantic hemangiomas against the background of an unchanged liver was CT, and in the presence of metabolic lesions - CT.

Table 2
Detection of liver hemangiomas by size according to MRI, CT and US (%)

Neoplasm size	Methodology					
	MRI		CT		US	
	norm. liver	FLD	norm. liver	FLD	norm. liver	FLD
from a few mm to 5 cm	90,9	83,3	64,0	60,0	76,5	81,5
5 – 10 cm	9,1	16,7	24,0	33,3	17,6	11,1
more than 10 cm - giant	-	-	12,0	6,7	5,9	7,4

When assessing the echogenicity of hemangiomas, as hyperechoic formations were detected more often in patients with normal unchanged liver. Moreover, the criterion of echogenicity varies significantly with the development of metabolic disorders. So, hemangiomas, as isohypoechoic formations, were found in almost half of the examined patients with this pathology.

Conclusions

Thus, when comparing the information content of different methods of radiation diagnostics (MRI, CT and US) depending on the size of hemangiomas, it was found that, regardless of the background state of the organism, MRI studies are most informative in detecting small size formations.

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INFLUENCE OF EMBRYOTOXIC FACTORS ON THE FRUIT

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Uzbekistan

During the twentieth century, human life expectancy in Central Europe increased from 45 to 75 years. Such a drastically changed situation cannot be attributed only to improvements in social hygiene (improving the quality of drinking water and other environmental factors). Experts believe that the greatest increase in average life expectancy is associated with the use of drug treatment of patients.

There is not the slightest doubt that medications are often absolutely necessary during pregnancy, that is, during a period characterized by a clear danger to the life and health of the pregnant woman and the fetus. The use of drugs during this period, according to indications, is often mandatory. Without this, many diseases caused by pregnancy or occurring during pregnancy, as well as many life-compatible fetal malformations and postpartum complications can lead to the death of the pregnant woman and the fetus.

If a woman does not have chronic diseases, then the issue of using drug therapy will become relevant only if she suddenly gets sick acutely (flu, other types of respiratory infection, pneumonia, urinary infection, etc.), or if she is diagnosed with a gynecological examination, she will have a latent infection.

Regarding acute infection, we note that even a slight primary malaise is an occasion to see a doctor. It is important that this is not an accidental specialist for this situation, with whom the patient has not previously been in contact. In the issue under discussion, mutual understanding and trust on both sides are very important. Then the acute illness that has arisen (or only the patient's anxiety) will be properly evaluated and the patient will be given the necessary recommendations.

If during a gynecological examination already during pregnancy a patient will be diagnosed with one or another infection, then she should dis-

cuss this issue in detail with specialists - a gynecologist and family doctor and make an informed decision about further actions.

In some chronic diseases, pregnancy and an attempt to have a baby are extremely undesirable, since the chances of a favorable outcome are extremely small. This, for example, severe heart disease. The prognosis of a healthy baby is extremely problematic for a woman with a psychiatric pathology (for example, manic-depressive psychosis)

Chronic disease involves almost continuous or course medication. Is this compatible with guaranteed safety for the child? This issue requires detailed study with appropriate specialists and a family doctor.

In the event that fertilization occurred unplanned and during this period a woman took medication, nothing can be done. If the embryo is damaged by a medicine, it dies; if the embryo survives, then it is not damaged.

If a woman is planning a pregnancy, then after discussing all issues with doctors, she continues to take the necessary medications according to the scheme or takes a break. In the first 3-4 months of pregnancy, special care is necessary when deciding on the issue (together with a doctor) about the advisability of taking highly effective drugs. During this period, the child lays various internal organs, which in this case may be affected. Indications for drug therapy should be carefully discussed with doctors. In the last days and hours before the birth of the child, as well as during childbirth, doctors must do everything necessary to minimize the risk of harm to the mother and child.

If carrying a child during pregnancy is difficult, if a woman spends most of her pregnancy in a hospital, then one probably should not think about the details of drug therapy conducted almost continuously. You just need to be under the supervision of those doctors in the institution that you trust.

Electromagnetic radiation and mechanical energy

X-ray examination during pregnancy is unacceptable. Repeated ultrasound examination according to indications is not a risk factor. It is advisable to use a cell phone to a limited extent. The probability of a miscarriage in a pregnant woman working with a computer is 1.5 times higher than that of her “non-computerized" colleague. Excessive heat (temperature rise during infection, sauna, steam room) or cold exposure is a serious risk factor.

Viruses

If a woman has rubella during the first 90 days of pregnancy, it is almost 100 percent likely that she will have a baby with extremely severe malformations. All issues related to rubella disease in an adult woman (if she was not sick in childhood) should be addressed before pregnancy in a planned manner.

Regarding megalovirus infection, you need to be examined by a gynecologist before pregnancy in a planned manner. The same goes for herpes simplex virus infection.

In order not to get the flu during pregnancy, you must follow the appropriate regimen

(less contact with other people during the epidemic), eat completely, breathe the effect of willow and safe volatile (onions, garlic), etc.

Medicinal plants and mushrooms

Plants (both medicinal and all others) may contain highly active compounds that have an adverse effect on humans. Therefore, banal poisoning by poisonous plants is possible, which seems to be extremely undesirable, especially during pregnancy. It is necessary to use medicinal plants with very great care. The motivation that “at least they are harmless” is completely untrue. It is also necessary to exercise reasonable caution in relation to mushrooms, and it is better to abandon them completely during pregnancy.

Industrial teratogens

Certain insecticides have an embryotoxic effect. Therefore, it is advisable to refrain from attempts to destroy insects and dangerous animals (rats), in the living room where the pregnant woman is located, especially if insecticides are carried through the air.

Some food colors can have an undesirable effect on the fetus, so a pregnant woman should refrain from any food products in which food colors can be present in significant quantities.

Immunization during pregnancy

Passive immunization is carried out by administering a human immunoglobulin (i.e. antibodies against the corresponding infectious onset), which, according to indications, can be done at all stages of pregnancy (for example, by contact with a patient with hepatitis A or B and, accordingly, a real threat of the disease)

Active immunization is carried out with live or killed vaccines, as a result of which specific antibodies are developed in a person, and he is not likely to get the infection against which he is vaccinated.

During pregnancy, vaccination with killed vaccines, such as tetanus, rabies, diphtheria, polio vaccination, is not associated with a high risk. Vaccination with drugs that contain live rubella viruses is most likely contraindicated during pregnancy, except in special cases (emergency trip to an unfavorable ecological zone).

When discussing with a doctor about taking medications during pregnancy, you should

Adhere to the following rules:

- It is advisable to discuss all issues before pregnancy;
- the feasibility of prescribing any medicine should be questioned;
- the mode of administration of the selected drug should be effective and as gentle as possible.

If it is necessary to carry out drug therapy, you should use only such means that have long been widely used in pregnancy. Beware of new, unexplored drugs.

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INVESTIGATION OF THE COORDINATION COMPOUNDS OF CERTAIN D-METALS WITH BIOLOGICALLY ACTIVE LIGANDS BASED ON 2 (2 (-HYDROXYPHENYLAZOMETHINE) -1,3,4-THIADIAZOLE

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Annotation. The last time that scientists spend on Schiff bases is due to the fact that they are anti-inflammatory, antibacterial, anticonvulsant, except for pharmacological purposes, these compounds have been used as analytical reagents, corrosion inhibitors, vulcanization accelerators, etc. Therefore, the study of the transition metal complexation processes with Schiff bases promising and relevant. An analysis of the literature showed that among the complexes of transition metals with Schiff Bases, substances with new bioactive qualities unusual for the original organic substances were found [1-4].

In this work, we studied the effect of the ligand and its complex compounds on the tobacco mosaic virus (TMV). Test procedure: a TMV infected leaf of tomato is taken, it is kept in the cold for 24 hours (+ 4 °C), it is placed in a homogenizer and a 0.02 molar solution of phosphate buffer is poured on top. After grinding in a homogenizer, the mixture is filtered through four-layer cheesecloth, and the resulting viral solution is centrifuged at 6000 rpm for 20 minutes. The separated viral solution is divided into two parts. One part of the solution is mixed in a 1: 1 ratio with 0.1 and 0.01 M solutions of the studied chemical compounds and mechanically applied to the right side of the leaves of the tobacco plant Nikotiana glutinosa. The second part of the viral solution as a control (H) is also mechanically applied to the left side of the leaves of the plant. The charged leaves of the plant are stored in a desiccator until signs of the disease appear. After the onset of symptoms of the disease, points and spots on the leaves of the plant are counted. The test results are shown in the table. As can be seen from the table, a 0.1 M solution of the M-1 (L) substance in 30 minutes reduces the virus infection by 15%, and in 8 hours to 64.5%. A 0.01 M solution of this compound in 30 minutes reduces the effect of the virus by 27%, in 8 hours to 45.45%. A 0.1 M solution of the chemical compound M-2 [$CuLCl_2$] inhibited the virus by 95% for 6

hours, and no exposure to the virus was observed for 8 hours. 0.01M solution in 8 hours reduced the virus infection by 71.7%. In the infected virus solution mixed with 0.1 M solution of the complex compound M-3 [$CuL(NO_3)_2$] leaf after 30 minutes, the number of necrosis reached 15 pieces. In the part of the leaflet with the control solvent, 65 pieces of necrosis were counted. A 0.1 M solution of this substance reduced the virus infection to 98.4%, and a 0.01 M solution reduced it to 80%. An hour after infection with the virus, on the leaflet treated with a 0.1 M solution of a chemical substance, 4 necrosis were noted, and in the control 60 pieces. Infection with a 0.01 M solution of this compound led to 5 necrosis, while in the control - 66. A 0.1 M solution of the substance lowers the effect of the virus by 92.5%. After two hours of infection, no symptoms of the virus were observed on the leaves of the plant treated with solutions of both concentrations of complex compound M-3. In the control leaflets appear from 53 to 55 necrosis. After 4, 6 and 8 hours of experiment, the above position was observed. It was determined that a 0.1 M solution of the M-4 substance [$CuL(CH_3COO)_2$] in 8 hours reduces the virus infectivity by 62.5%, and a 0.01 M solution by 48.6%. Based on the studies and analysis of the results, it can be concluded that all the studied chemical compounds have the properties to inhibit the tobacco mosaic virus, but among them, compound M-3 exhibits the properties of a stronger inhibitor. The effect of inhibiting the virus is also exerted by the concentration of these compounds. A 0.1 M solution of the studied compounds is a stronger inhibitor of the virus compared to a 0.01 M solution of these compounds. It should be noted the feasibility of studies on the effects of the studied compounds on the plant enzyme system.

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THE INFLUENCE OF MUSIC ON THE AESTHETIC EDUCATION OF HEARING IMPAIRED CHILDREN

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Abstract. Music is one of the conditions for a child's full emotional development. Emotions regulate a person's behavior and influence his mental development. Music contributes to the harmonious development of the motor sphere of the child. When listening to music in children, there are many images that reveal their imagination.

Keywords: music, hearing, auditory perception, musical hearing, musical rhythmic classes, speech hearing, auditory-speech system.

Children with hearing impairments, as a rule, perceive the whole spectrum of piano sounds, therefore, to a certain extent, they have a holistic perception of music without the help of sound amplifiers. However, the use of individual hearing aids in the process of forming the perception of music helps in the development of auditory and especially vocal-speech reactions in children.

Speech breathing.

Put your hands on the diaphragm area. Inhale - with your nose, and exhale - say the syllable PA ___ Inhale with your nose, spread your hands up - on the sides when you say: pa ____ Jump when you open your hands to the sides, say short: pa ___. Jump with the spread of arms to the sides and legs to the side to briefly say: pa ___

Voice.

Light hit at waist level, say it slowly: no __, fold your arms up, say out loud PA ___. The teacher turns away from the students, delivers the speech: pa__PA__.

Pupils repeat what they hear accompanied by movements.

Pace. Rhythm.

Stomp loudly with your right or left foot (standing still): TOP__ TOP__

Loudly clap right - left: CLAP ___ CLAP __

Alternative loud listening and clapping: TOP__TOP__TOP__TOP

Children walk in circles, alternating loud tapping with cracking.

TOP __ TOP __ TOP __ TOP __ TOP __ TOP __, changing the pace: from slow to fast. Selection of words and phrases for a given rhythm.

Intonation. Logical stress.

C_A_C_A_C_A_ - THERE the wasp flies! (move to the sound C__ connect with the sound A __, then highlighting the word: THERE show something with a broad gesture, extend your hand up). S_U_S_O_S_A_ - HERE the wasp has sat! (to connect movement to C__ sound with sounds of U__O__A __, then highlighting the word: HERE to show something with a broad gesture, extend your hand forward and down. C_A_C_O_C_U_- we REPELLED the wasp (to connect movement to C__ sound with sounds A__O__U__, then highlighting the word: REPELLED to show with two hands, waving movement.

WHO repelled the wasp? – the teacher asks a question, highlighting the word: WHO with a move.

WE repelled the wasp – children respond, highlightting the word: WE with a move.

WHO we repelled? – the teacher asks a question, highlighting the word: WHO with a move.

We drove the **WASP** - the children respond, highlighting the word: WASP, exercise for the sound U_

What we **DID** – the teacher asks, highlighting the word: DID, by a move to the sound E__

We **REPELLED** the wasp - the children respond by highlighting the word: “REPELLED” by a natural move.

Musical development.

Recitation of songs. Children listen to music, distinguish rhythm, character, together with the teacher analyze the piece of music. By the end of classes, they perform exercises to the music.

Corrective and developing games.

A deaf and hard of hearing child - is a child nonetheless. The death of part of the auditory cells in the cochlea greatly complicates life, but does not deprive the status of the child. Therefore, he must live in the same cultural space as the hearing child. Hearing impairment is not the reason for the exclusion of the child’s musical life, high literature, visual arts, physical education. The influence of music on a person increases when he moves from the listener to active actions, that is, when he plays an instrument or sings.

Emotional, intellectual, physical, sound search for ways to more precise means of expression that help convey the mood, meaning of art or song.

The vocal apparatus is developing: not only sounds, but also the emotional state caused by the material of the song, is a source of intonational diversity in the performance of songs (which is very important for deaf children).

During singing, the baby's lungs work more actively, blood supply improves and the volume of speech breathing increases.

There are studies that show how this or that music, the works of one or another composer affect the state of various organs of a person and, consequently, his health in general.

So, music is necessary for a deaf and hard of hearing child not less, but rater more than for a hearing one.

The aesthetic development of children with hearing impairment is one of the main tasks of upbringing and musical development. It depends on the choice of musical material for listening, dancing and the repertoire of songs, the choice of rhythmic exercises. This task is carried out in teaching methods, in the organization of courses (teaching materials, school uniforms, how teachers interact with students and between them).

All activities related to music create a sense of beauty in children. Aesthetic education at various music lessons during extracurricular hours contributes to the moral development of students. The use of collective forms of work increases the ability of students to communicate in groups and express their interests.

The development of a student’s auditory perception is important for the full development of a hearing impaired child. During music lessons, children's ideas about the world of sound and the perception of various acoustic information — language, sounds other than language, music — deepen. In the classroom, students perceive music and speech through individual hearing aids. They learn to listen to music and speech, analyze and compare what they hear.

In addition, one of the goals of such classes is to improve the pronunciation of a student.

In the process of playing a musical instrument, children learn to overcome difficulties, control their activities, evaluate results. Thanks to this, it becomes effective to set goals, plan and control using a combination of different methods. Working with a musical instrument, the child seeks to achieve positive results, achieve their goals.

Thus, the use of musical teaching aids allows schoolchildren to develop such strong-willed qualities as independence, self-discipline, concentration, perseverance, and also brings them to empathy and help the hero of the program. The use of musical instruments and the child’s direct contact with the instrument positively affects the development of fine motor skills of the fingers, which also plays a peculiar role in the learning process.

In accordance with the curriculum, the required load of rhythm in the preparatory class, grades 1-4 is 1 hour per week. Classes are held in a group of 40 minutes. Much attention is paid to the development of children's hearing, as well as automation, differentiation of sounds previously delivered in individual lessons. In addition, the classes in the group are a system of motor exercises aimed at the development of macro movements (body movements), which creates a willingness to master micro movements (articulation organs). Much attention is paid to diaphragmatic respiration and orthoepy. In the lessons of phonetic rhythmics, the use of sound-amplifying equipment is mandatory. Instructions given by the teacher during the lessons, as well as all speech material, are provided to students with sound and only by ear. Based on hearing, a large number of exercises are performed, both motor and speech. Speech material, which is pronounced and accompanied by movements, occupies a part of the phonetic rhythm classes.

The speech material recommended for classes should meet the tasks of forming oral speech, serve as a means of developing speech hearing, and contain meaningful speech units: phrases, lines, words, texts.

Only with a full description of the tasks that are solved in music lessons can one achieve the full realization of the possibilities of the lesson for the maximum development of deaf children, get acquainted with the spiritual culture of society and socially adapt.

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THE INVESTIGATION OF NONSTEROID ANTI-INFLAMMATORY SUPPOSITORIES BY DISSOLUTION TEST

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Abstract. Nonsteroid anti-inflammatory suppositories have been prepared on Cocoa butter, Witepsol H-15, Hard Fat non-lauric type and Hard Fat non-lauric type including 0,5 % liquid phosphatide concentrate (Lecithin) or 5 % emulsifying cetostearyl alcohol type B. The biopharmaceutical investigation of nonsteroid anti-inflammatory suppositories has been carried out by Dissolution Test (Basket apparatus). Methods for quantitative determination of active substances in the dissolution medium have been developed and validated. Individual dissolution profiles of nonsteroid anti-inflammatory suppositories depending on the type of lipophilic base and surface-active agents has been shown. It was established efficacy (speed and completeness) of Paracetamol, Naproxen, Diclofenac sodium and Metamizole sodium release from suppositories prepared on Witepsol H- 15.

Keywords: suppositories, nonsteroid anti-inflammatory drugs, Dissolution Test, Witepsol H- 15.

Nonsteroidal anti-inflammatory drugs (NSAID) are a widely used group of drugs, including in the form of suppositories [3].

The standard, high bioavailability and safety of drugs are the key to effective pharmacotherapy. Recently, for the development of the optimal composition of suppositories, their improvement and standardization, the “Dissolution” test is increasingly being used [2]. For its successful use, differentiating conditions should be selected in relation to each active substance.

In this regard, the aim of this work was to develop the dissolution test methods for suppositories of metamizole sodium, diclofenac sodium, paracetamol and naproxen, and to obtain their dissolution profiles depending on the type of suppository base.

For the experiment, laboratory samples of the suppositories of the above medicines weighing 1.2 g were made on the following bases: cocoa butter (BC), Witepsol H-15 (Wp. H-15), non-lauric type Hard Fat (HF), and Hard Fat with the addition of 5% emulsifying cetostearyl alcohol type B (HF+ECA) and Hard Fat in combination with 0.5% liquid phosphatide concentrate (HF+PhC).

For the study of NSAID suppositories, the “Dissolution” test was used, which is recommended for the analysis of solid dosage forms in accordance with the guidelines of the General Pharmacopoeia Monograph. 1.4.2.0014. 15 [1].

The test was conducted on an Erweka DT 6 instrument (apparatus I “Rotating basket”) on 6 samples placed one at a time. Purified deaerated water (pH 6.0±0.05) or a phosphate buffer solution with a pH value of 7.4±0.05 was used as a dissolution medium. Acceptor media are selected in order to approximate the conditions of determination to the conditions of absorption of active substances in the rectum. The smallest possible volume of dissolution medium was used. The optimal sampling points and the duration of the “Dissolution” test for each NSAID are selected experimentally, which is shown in table 1.

For the quantitative determination of active substances, methods for the quantitative spectrophotometric analysis of NSAID in a dissolution medium have been developed and validated. The value of the relative standard deviation (RSD) for each average value did not exceed ± 10%, except for the first sampling points, where it was no more than±20%.

Table 1

Test conditions	Metamizole sodium	Diclofenac Sodium	Paracetamol	Naproxen
Type of apparatus	"Rotating basket"			
Rotational speed	100 rpm			
Dissolution medium	Purified water		Phosphate buffer (pH=7,4)	
Volume	500 ml			
Sampling time, min	15, 30, 45, 60	5, 10,15, 20, 30	5, 10, 15, 20, 25	15,30, 45, 60, 75
Analysis method	UV spectrophotometry			

The obtained dissolution profiles are shown in figures 1-4.

Despite the good solubility of metamizole sodium in water, it was very slowly and incompletely released from Hard Fat (Fig. 1). The used surfactants had little influence on this process: emulsifier № 1 and phosphatide concentrate containing phospholipids. The release of metamizole sodium from Witepsol H-15 base was very active and fully, slightly slower from cocoa butter.

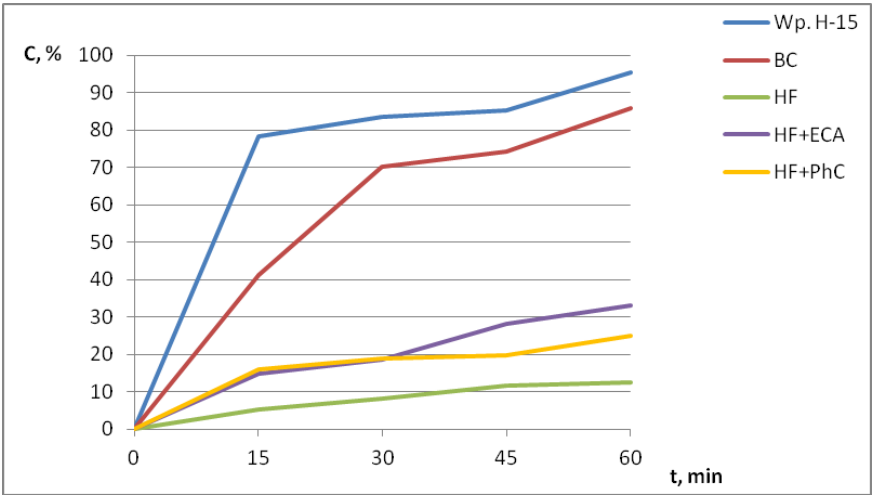

Fig. 1 Dissolution profiles of metamizole sodium from suppositories depending on the type of base

A study of the kinetics of dissolution of paracetamol suppositories (Fig. 2) also showed an active release of the substance from Witepsol H-15 base and a slower but complete release from cocoa butter in 25 minutes of the experiment. Solid non-lauric type fat and its surfactant compositions too slowly and little released paracetamol into the dissolution medium.

The release of slightly water-soluble diclofenac sodium from Hard Fat was significantly affected by surfactants, especially a phosphatide concentrate (Fig. 3). The most complete, fast and uniform yield of diclofenac sodium was provided by Witepsol N-15 base.

Naproxen is practically insoluble in water. Its release into the dissolution medium — phosphate buffer — was fully ensured only by the Witepsol N-15 base for 75 min of the experiment (Fig. 4). The tensides contributed to an increase in the yield of the drug from Hard Fat.

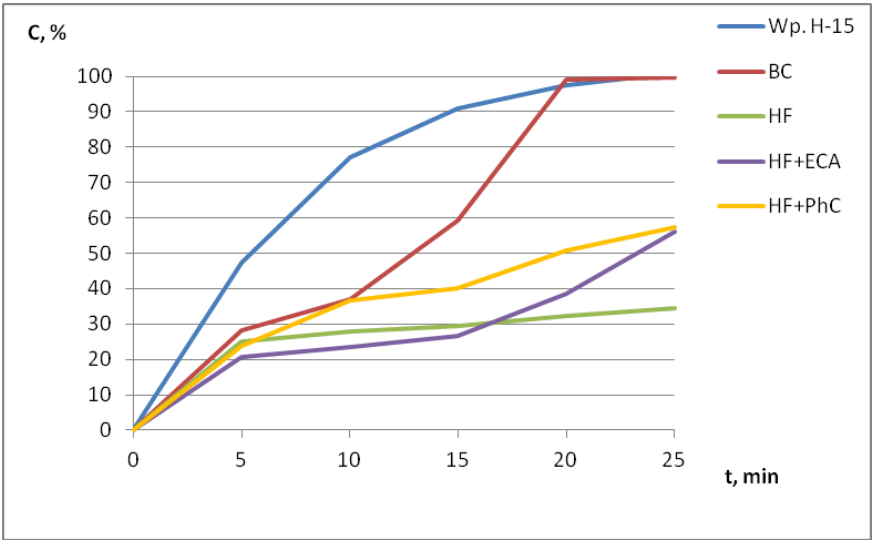

Fig. 2 Dissolution profiles of paracetamol from suppositories depending on the type of base

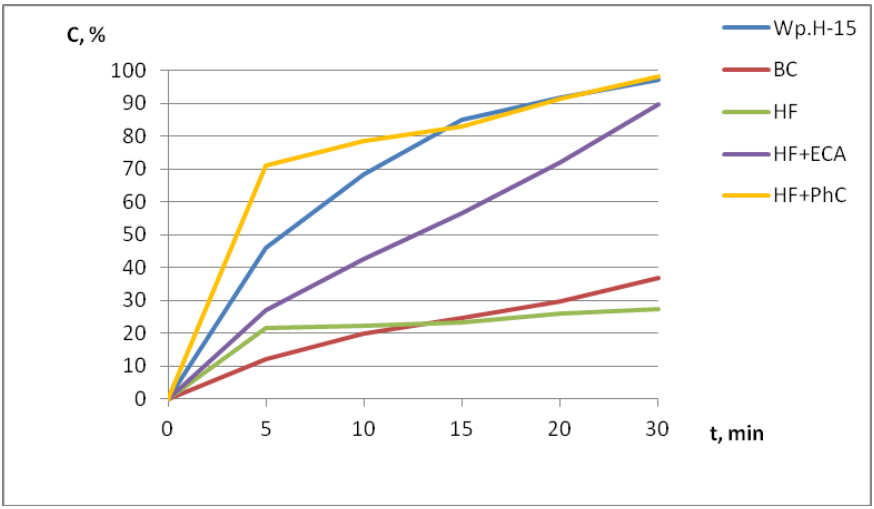

Fig. 3 Dissolution profiles of sodium diclofenac from suppositories depending on the type of base

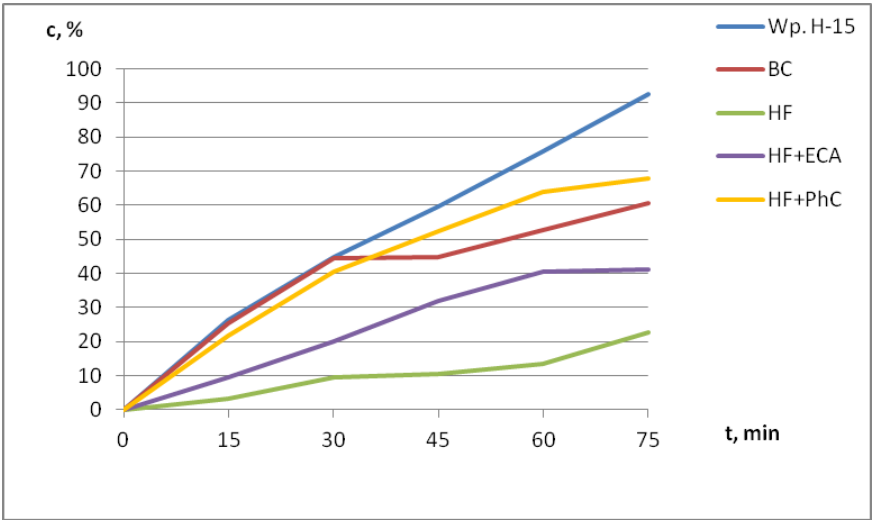

Fig. 4 Dissolution profiles of naproxen from suppositories depending on the type of base

Thus, the “Dissolution” test methods for suppositories of metamizole sodium, diclofenac sodium, paracetamol and naproxen have been developed. The conditions for the “Dissolution” test of the suppositories of these NSAIDs have sufficient discriminatory ability to detect differences in the composition of excipients. The resulting dissolution profiles of NSAIDs, depending on the type of suppository base, are characterized by an individual pattern.

The universality of the Witepsol H-15 base and the rationality of its use for creating NSAID suppositories are shown.

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SEPARATE COLLECTION SYSTEMS FOR PACKAGING WASTE IN BULGARIA

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Abstract. In the analysis of meteorological elements that influence the spread of radioactive particles and radioactive isotopes in Bulgaria will mainly analyze the winds and air currents that form in the airspace over Bulgaria. These are the main weather elements that most influence the climate of the radioactive background. Another element that influences is precipitation in its various manifestations - horizontal and vertical type and depending on the physical condition of the water. The other meteorological elements because of their vile influence of the radiation situation will exclude them from the factors shaping the natural indicators of the state of the atmosphere, water and soil.

Keywords: meteorological element, wind, precipitation, air flow, nuclear accident, radionuclide

Introduction

Recycling is the restoration of the primary properties of a material and its reuse to make a new product. Recycling is a way of turning old things into new ones, a way of turning waste into new products that we buy and use. Many things we think are waste can be recycled into new products and thus reused: plastic bottles, newspapers, boxes, cans, jars, bottles and more.

In order to recycle the waste, it is first necessary to separate the recyclable from the non-recyclable waste. The most effective way of this separation is to happen when they are turned into waste - in the case of pack-

aging, after using the products they contain. This is called separation at the source of formation [1]. Separation at the source of formation prevents contamination of recyclable waste and allows their further incorporation as a material into the production of a wider range of higher quality products. In addition to providing secondary raw materials for the production of new products, separate collection reduces the amount of waste that is landfilled, which saves on financial costs and extends the life of the landfills and generally reduces the adverse effects of human activity on the environment.

What is separate waste collection?

The main participants in the process of separate collection are the people, the mass consumers of packaged goods. Without people's participation, it is impossible for separate collection systems to work successfully [2]. Therefore, we need to change the way we dumped garbage for years. When we convince everyone to participate and act together, separate gathering will be more effective. It is up to us to make some effort.

So, if you haven't disposed of your waste separately before, start doing it. Do anything that contributes to protecting the environment and reducing the amount of junk [3]. So the small daily efforts you make will have a direct and immediate effect on the surrounding world [4].

Models for separate collection of waste

1. Three-container model for waste collection:

Packaging waste is divided into three containers:

- Blue - for paper and cardboard packaging.
- Yellow - for plastic and metal packaging.
- Green - for glass packaging.

Different colored containers are exported on separate courses.

The packaging that is disposed of in Bulecopack containers is transported to separation plants where they are further sorted in order to be recycled at the respective processing plants.

Advantages of the three-container system:

- Better sorting of materials before transportation to separation plant.

Disadvantages of the system:

- Each point (3 vessels together) takes up more space;
- Requires further separation of materials at the source of their formation;
- The cost of transporting waste is higher than the two-container system.

2. Two-container model for separate collection of municipal waste:

Packaging waste is divided into two different containers:

- Yellow - for plastic, paper and metal packaging.
- Green - for glass packaging.

Containers are served on separate courses.

The packaging that is disposed of in Bulecopack containers is transported to separation plants where they are further sorted in order to be recycled at the respective processing plants.

Advantages:

- It occupies less space than the surrounding area, which is essential in larger cities in the absence of sufficient parking space.

- Easier separation of household waste (paper, plastic and metal containers are thrown together in a yellow container).

In Bulgaria, as in most European countries, the three-container model is used [7].

Legislative requirements for separate waste collection in Bulgaria

According to the Law on Waste Management in Bulgaria, persons placing on the market products, after the use of which mass-produced waste is generated, are responsible for their separate collection and achievement of the respective goals for separate collection, reuse, recycling and recovery:

- not less than 60% by weight of packaging waste must be recovered or incinerated in energy-efficient waste incineration plants;
- not less than 55% and not more than 80% by weight of packaging waste must be recycled by recycling at least
- 60% by weight of glass packaging waste;
- 60% by weight of paper and cardboard packaging waste;
- 50% by weight of metal packaging waste;
- 22.5% by weight of plastic packaging waste, for which only plastic is recycled;
- 15% by weight of wood packaging waste [5].

Separate collection systems for packaging waste

Ecopack Bulgaria AD creates and manages together with the municipalities with which it has concluded contracts, systems for separate collection of packaging waste. In 2019 systems have been established in the territory of 88 municipalities, consisting of:

1. Three-color Igloo containers

with a volume of 1100 l and 1500 l (fig. 1):

- Blue - for paper and cardboard,
- Yellow - for metal and plastic,
- Green - for glass.

It is the most widely used and proven model in Europe.

Fig. 1 Three-color Igloo containers

2. Vehicles (fig. 2)

The used container park from Ecopack Bulgaria requires the use of specialized garbage collection equipment and on-board trucks [6].

A GPS system has been implemented to improve the quality of service and control over the service companies. For this purpose, the service trucks are equipped with devices that allow real-time monitoring by Ecopack Bulgaria and the respective municipalities of the traffic along the route, as well as the detection of all stops for servicing the respective colored containers. In order to inform the public about the timetable for service, each truck has an information sign indicating the color of the containers that are collected during the day. The frequency of removal of separately collected packaging waste depends on the annual rate of accumulation, agreed with the relevant municipality for the settlements, so as to ensure the normal removal of the collected packaging waste and not allow the accumulation and pollution of the spaces around the containers.

3. Sorting installations (fig. 3)

Ecopack Bulgaria has built 15 own sorting installations and uses a lease with contracts with others 3. Transfers for recycling and / or recovery of packaging waste to 27 recycling companies on the territory of the country and abroad. He works with 47 subcontractors to service his activities [6].

Mechanical sorting lines established shall meet all legal and technical requirements and shall be geographically distributed in order to cover all separate separation systems in place. The installations allow to process

from 1 to 8 t / h separately collected waste from packaging, separating all materials according to Art. It sorts the waste received from colored containers, from administrative buildings, from the sales network and from industrial customers on the territory of the respective municipalities. One of the sorting lines is specialized in glass packaging waste, ensuring a 99.7% purity of the obtained glass crushes.

Fig. 2 Vehicles

The systems for separate collection of packaging waste, built on the territory of the municipalities, operate with the following parameters:

Number of residents covered and minimum volume of containers placed:

- For settlements over 100,000 inhabitants, for every 800 inhabitants - containers with a minimum volume of 3 300 liters.
- For settlements with 50,000 to 100,000 inhabitants, for each 600 inhabitants - containers with a volume of at least 3,300 liters.
- For settlements below 50,000 inhabitants, for every 400 inhabitants - containers with a volume of at least 3,300 liters [5].

Collection of hotels, restaurants and cafes – HORECA: The essence of this method is to collect the generated packaging waste from hotels, restaurants and cafes with the assistance of municipal administrations.

Individual Household Collection - Door to Door: This method provides individual yellow containers of 120 liters and 240 liters for households in

compact areas of settlements made up of low-rise construction. In these containers, citizens discard paper, cardboard, metal and plastic packaging waste. Green containers are placed at selected addresses in which glass packaging waste is disposed of.

Collection from retail outlets: By signing contracts, the conditions for collecting waste from packaging from retail chains, individual retail outlets, gas stations on the territory of the municipalities with which the contracts have been concluded are negotiated. The sites included in this system are provided with individual containers, according to the quantities of packaging waste generated. They are included in a transportation schedule that is different from that of containers located in residential areas.

Ecopack Bulgaria organizes information and education campaigns aimed at raising the awareness and motivation of consumers for the activity of separate collection and recycling of packaging waste in Bulgaria with a focus on the three stages of Collection-Separation-Recycling [6];

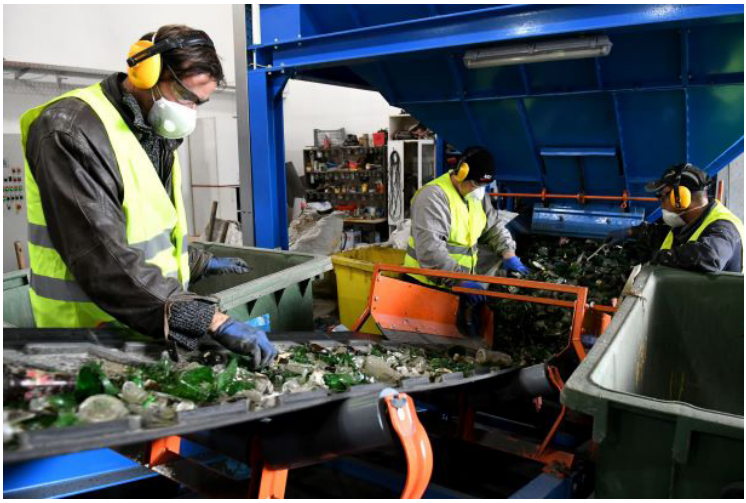

Fig. 3 Sorting installations

Informing consumers of the benefits of separate collection; Motivating and provoking active and responsible behavior towards environmental protection and saving of natural resources.

ECOPACK Bulgaria AD is the largest organization for the utilization of packaging waste on the Bulgarian market for 14 consecutive years.

ECOPACK Bulgaria strives to improve the existing and create new services for its members in the following areas:

• collection and transportation of packaging waste from production and logistic sites;

• conducts consultations and trainings in order to inform and comply with legal requirements;

• Provides assistance in the implementation of corporate and social responsibility programs.

• supports and participates in the organization of its members' green initiatives.

ECOPACK implements an electronic system for filing data from manufacturers and importers of packaged goods. ECOPACK ON-LINE is a web-based system part of the Management System, which was introduced to better organize and optimize business processes. The system allows you to enter reports on quantities of packaging, invoicing and generate reports on various indicators in real time. This saves ECOPACK members time, facilitates accountability and reduces paperwork. Working with the system is extremely simple. It is graphically identical to paper declarations, and it only takes a few minutes to complete the electronic application. It is based on a server owned by ECOPACK, with data security guaranteed by all security certificates.

The system currently has 532 member companies.

Members who wish to join may request by telephone or e-mail. An ECOPACK employee will visit them at a convenient time for them to train them to use the application.

Ecopack provides its members with a Certificate with information on recycled quantities for each customer and their expression in saved natural resources (electricity, water, trees, oil barrels, landfill site), as well as a CO2 footprint.

The real benefit is calculated by calculating the recycled quantities on behalf of the company concerned in terms of CO2 equivalent of saved GHG emissions.

Each ECOPACK member company receives annually information on its contribution to environmental protection from the Certificate of Recycled Quantities, Saved Resources and Greenhouse Gas Emissions [6].

Conclusions:

1. In the big cities of Bulgaria there is a system for separate collection of municipal waste, which fully complies with the Bulgarian legislation and good European practices.

2. The level of separately collected waste is still too low compared to Western European and Central and Eastern European countries. There are predominantly separate collection vessels and it is very difficult to find

a mixed waste container, whereas in Bulgaria predominantly mixed collection vessels are used and even the separate collection containers are not used purposefully.

3. The consciousness of the Bulgarian citizens has not reached the European level of the need for separate waste collection. Households in Bulgaria have no established habits for separate waste collection and the need to conserve natural resources.

4. Legislative measures need to be taken on the need for separate waste collection. There should also be an active media campaign on the need to economically use and reuse raw materials. It is necessary and regulated to restrict the use of non-degradable materials in nature.

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THEORETICAL DESIGN APPROACH OF CYCLES IN REVERSIBLE AND NON-REVERSIBLE ZONES

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Abstract. This paper presents model for calculating the performance of metal removal during cylindrical external grinding is presented taking into account the statically the process on CNC machines for a given automatic grinding cycle in reverse and non-reversible zones. The model performance allows calculating the current feed values, the actually taken stock over the steps of the cycle and the main time for stock removal. The model is based on the relationship of cutting forces with the operating parameters of the cycle, the elastic deformations of the technological system and the main technological factors.

Keywords: actual radial feed, grinding cycle. Traverse, cutting conditions, working stroke, cutting force.

Introduction

Continuous improvement of the quality of the manufactured machines while ensuring high productivity of the technological processes of their manufacture is one of the main tasks of modern engineering. Grinding is the main method of ensuring high precision manufacturing of machine parts. The proportion of grinding machines in the total volume of metal-cutting equipment is constantly growing and reaches, for example, 70% at automobile plants in Western countries. Of the grinding machines, approximately half are grinding machines. Recently, there has been a tendency in domestic and foreign engineering to increase the proportion of grinding machines equipped with active control devices. Processing productivity on such machines is 1.6...3 times higher compared to manually controlled

machines [1-5].

The performance management of operations on programmed cylindrical grinding machines is performed according to the control program, by stepwise changing the programmed feed rate according to the commands of the active control device depending on the remaining part of the stock [1-3]. A feature of the operation of these machines is the presence of vibrations caused by the action of the rotary parts, leading to a decrease in the accuracy and purity of processing, as well as to other violations of technological processes [6-8]. The grinding wheel is the weakest link in the technological system and has the greatest impact on the stability of the quality parameters of parts [4-8]. The purpose of operations efficiency increase defines the criteria of objective function to be the shortest possible time of treatment. In these papers, from the above point of view, the relations between actual radial feed, programmed radial feed, grinding force and elastic deformations of change the axis of the wheel at all stage are programmatically investigated [1,6,8].

Direction of scientific study of metal removal on the reverse zone

A literature review surveys books, scholarly articles and other sources of relevant information, is refers to many scientists have been engaged in studying, theory of designing optimal grinding cycles for CNC machines of operational performance management, some examples of scientists Malkin, S., Guo, C., Cahill, M.J., Bechtold, M.J., Fess, E., Wolfs, F.L., Bechtold, R., Lur'e, G.B.. However, in these papers was not information provided in the field of actual issues of improving the design quality of the optimum grinding cycles from the Point of view of their stability under variable processing conditions, existing in the real process in order to perform successful cylindrical grinding operations with CNC machines in reverse and non-reversible zones. Therefore, we can conclude that, despite the numerous studies and enormous effort in theoretical and practical basis in the design of optimal cycles of cylindrical grinding, until now the problem of developing a model for the formation of the optimum grinding cycles is not solved, which give the maximum performance operation stability under variable processing conditions in reverse and non-reversible zones.

Therefore, the above described method for optimal grinding cycle does not count unforeseen situations related to non-stable conditions of grinding, abrasive wheel grits blunting, fluctuations of allowance or initial radial runout of the workpiece, etc., that leads to substandard manufacturing processes during processing. For the design of an optimal controller for grinding cycle resistant to the aggregate impact of various technological factors

variables, one needs a synthesis of a resistance diagnostics system of a grinding cycle and optimal cycle design system. Approach to developing a diagnostic system for the stability analysis of the grinding cycle for the combined effect of the constantly changing variables that arise when processing a batch of parts, the concept of digital twin is applied. Within the framework of this concept, a system model, which, based on virtual testing and simulation of the grinding cycle intended for:

1. Prevention of faulty production by specifying the order data from programming and the causes of its occurrence during external cylindrical grinding with axial infeed at a numerical control.

2. Increase the reliability and resistance to the influence of technological fac-tors variables to treatment precision, accuracy, conformity and assurance of other quality parameters which a non-reversible zone greatly different from the modes in a reversible zone.

3. Providing full automation of the design for control program at the stage of calculation formalization and programming of cutting conditions in reversible (entry-section and exit-section) and non-reversible (mid-section) zones.

4. Forecasting the fluctuation in the accuracy, roughness, hardness of the machined surface after machining a batch of parts of grinding using the automatic step cycles of radial and axial feeds incorporated in to the control program of CNC machine.

5. The fixing of variable factors under which conditions under joint monitoring with radial and axial feed using CNC machine.

Conclusions

The relevance of modelling the process of metal removal in automatic cycles of cylindrical external grinding, taking into account the dynamics of the process implemented on CNC machines, is due to the lack of automated design systems, reference books and design techniques for cycles that satisfy the requirements of modern automated production. The solution to the problem of designing and calculating automatic cycles of cylindrical external grinding during the preparatory stages a proposal was made to consider the experience of grinding with axial feed in different sections of the treated surface, is presented in the methodology for calculating the actual feeds and cutting forces for a given cycle and grinding conditions.

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APPLICATION OF INDUSTRY 4.0 IN MILITARY PRODUCTION IN BULGARIA

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Abstract. Industry 4.0 or the Fourth Industrial Revolution has been very widely used in recent years. One of the areas where it finds a large and worldwide spread is the sphere of military or weapon production. For Industry 4.0, much has been spoken and written, but its place in specialized production speaks very little, and it's in close circles. That is where it is tacitly used first and there are tested and implemented all the scientific and technical achievements of mankind through the centuries. All the industry-leading countries and companies are implementing the latest discoveries and developments. The flow lines in these plants are mechanized, automated and robotized, the production process management uses industry excellence 4.0. The latest technologies are used in the development of modern weapon complexes, first in this area the theoretical achievements of scientists are tested. Here are the applications of laser technology, hardware and software development, electromagnetic waves, fusion and the division of radioactive isotopes and a number of other achievements of our time.

Keywords: Bulgaria; Digitalization; Economic; Electronics; Engineering; Export; Fourth Industrial Revolution; Industry 4.0; Innovation; Internet; Military Production; Military-industrial complex; Potencial; Production:

Introduction

Four major industrial revolutions have taken place since 1784. They have played a huge role in the process of building and accepting values in the world. During each of them political systems, technologies and social institutions develop in society and lead to fundamental changes in the development of humanity.

Each of the industrial revolutions has so far played a major role in the development of humanity. Industry 4.0 is also expected to play an important role in the development of business, society and technology, and this is very much changing every year since our development [12].

The main role in the development of the first industrial revolution is played by innovations mainly in the production of steel and textiles, and of course the first discovery - the steam engine. Invented and patented in 1775, the steam engine is used to drive various types of machinery, gradually replacing the animal and water thrust applied so far in the technique.

Significant innovations first started in England and she quickly realized her advantage over other continental European countries. In their position as leaders, the British categorically prohibit the export of skilled labor, technology and machinery outside the British Empire. This monopoly, however, proved to be perishable - in 1807 the two British William and John Cocharel opened machine shops in Belgium, making it the first continental country to change its industry and economy as a result of the use of machinery in manufacturing.

France is lagging behind in the period of major changes due to the unstable political situation in the country at the time, which is also the reason for the lack of major investments [11].

Despite huge deposits of coal and iron, innovation entered Germany only after national unification in 1870. But once it began to develop, Germany quickly accelerated the pace by the end of the century, becoming an absolute world leader in the steel and chemical industries. which also determines its future in the next century.

The next second industrial revolution is related to the application of electricity, conveyor production, internal combustion engine, car, radio and other technical innovations. It unfolds between the last decades of the nineteenth and sixties of the twentieth century.

During this period, large-scale factory production and the heavy machinery and chemical industries were required to determine the development of mankind. Different new industries are being identified with specific technological processing. Between 1870 and 1930, a new wave of technology continued economic growth and the success of the First Industrial Revolution. Radio, telephone, TV, home appliances and electric lighting demonstrate the transforming power of electricity and they are quickly becoming commonplace in everyday life, becoming increasingly important in the surrounding world.

The internal combustion engine allows cars and aircraft to be created and subsequently their ecosystems created with new jobs and high-speed road networks. There are also significant breakthroughs in chemistry: the world is receiving new materials, including thermosetting plastics, and new processes. Nowadays, our existence is unthinkable without the daily use of these achievements.

After the end of World War II, around 1950, breakthroughs in information theory and digital calculations began. It is these new technologies that make up the nucleus of the Third Industrial Revolution. Of course, the causes of the Industrial Revolution now are not just new technologies, but their impact on economic and social systems. The ability to store and process and transmit information digitally transforms most industries. The work and social relationships of billions of people around the world are radically changing. The combined impact of the three revolutions has led to a tremendous increase in the well-being of the inhabitants of developed countries. General changes in technology provide a practical basis for moving to a new phase of development [18].

In the prehistory of Bulgarian electronics, two names announce its future development between September 9, 1944 and November 10, 1989, and beyond. In 1937 Georgi Nadzhakov discovered the photoelectric state of the substance, which enabled the American inventor Chester Carson to create the first photo-electro copy machine and patent it in 1939. Professor of Mathematics and Physics John Atanasov, son of a Bulgarian immigrant to the United States Ivan Atanasov of Boyadzhik village, Yambol region, creates the first digital electronic computer in Iowa [14].

In 1965, exports of electrical, radio-electronic and instrumentation products to Bulgaria reached BGN 170 million, or 12% of the country's total exports, with a prospect of rapid growth. This perspective is outlined both because of the high productivity of 60 factories and the acquisition of semiconductor devices, where Bulgaria is one of the leading countries in this period.

One example is sufficient - for a number of years Bulgaria ranks first among the former socialist countries in terms of volume and exports of computer equipment. The UN and its Economic Commission in Geneva issued in 1989. Statistical bulletin on world trade in products of the mechanical engineering and electrical industry in 1987. The bulletin provides data for comparing Bulgarian exports with those of 15 countries comparable in population with Bulgaria - Austria, Belgium. with Luxembourg, Greece, Denmark, Israel, Ireland, New Zealand, Norway, Portugal, Singapore, Hungary, Finland, Hong Kong, Switzerland and Sweden. Of those countries,

only Sweden, Singapore, Ireland and Bulgaria have a positive foreign exchange balance in foreign trade in machine-building products, while electronic and electrical products only in Singapore, Bulgaria and Ireland. The electronics industry is one of the fastest growing industries in our country. This will continue to be the case. The Bulgarian traditions in this field will probably perish even more, because behind them are highly qualified and talented specialists who are able to absorb foreign discoveries and developments, but also to create their own. This inspires confidence in the future development of Bulgaria, despite the difficult period we are currently in.

On April 1, 2011, in the weekly newspaper of the Union of German Engineers, VDI Nachrichten published a short article entitled "Industry 4.0: With the Internet of Things on the Road to the Fourth Industrial Revolution". It is no surprise to announce that a working group of three professionals from entrepreneurship, politics and science will present to the public the previously unknown Industry 4.0 initiative at the forthcoming Hannover Fair [11].

Imagine quickly and at the cost of mass production that you can design your shoes online and have them delivered to you two days later. The Industry 4.0 platform makes it possible to produce single goods at the cost of mass-produced ones, with the highest quality. The basis for this type of production is the infrastructure of intelligent, digitally coupled systems and manufacturing processes. Thus, Industry 4.0 refers to the entire production cycle of a product: from the idea of development, through production, distribution and use, to recycling. So we can briefly introduce the fourth industrial revolution.

At the same time, only about 2% of European companies make full use of digital technology capabilities, according to Eurostat. The digital economy is an important driver of innovation, competitiveness and growth, with great potential for entrepreneurship and small and medium-sized businesses. Some of the small countries in the community such as Estonia, Luxembourg, Denmark, the Netherlands and others provide good examples in this regard.

Technology innovations such as the Internet of Things, 5G communications networks, cloud computing, data analytics and robotics are changing products, processes and business models across sectors, ultimately creating new industry structures as global value chains are changing.

Digitizing production can greatly lead to the automation of industry, allowing the free movement of industrial production in Europe and around the world. Digital production can reach 3.2 trillion euros in the G20 and already contributes 2.8% of GDP, leading to growth and job creation. It is important to note that over 75% of the value added generated by Internet technologies is in traditional industries and is due to productivity gains [9].

Europe has a leading position in many manufacturing sectors, but also in many industries in the service sector. Three quarters of the value of the digital economy will come from traditional businesses.

Speaking of Industry 4.0, it should be borne in mind that this is a platform and what content it will be filled with is yet to be conceptualized, because things have not been completely ironed out in the 8 years since its announcement.

The following key technologies were initially identified in Industrial Strategies that led to the development of Industry 4.0: Industrial Internet of Things (IioT), simulations, augmented / virtual reality (VR/AR), autonomous robots, cloud technologies (Cloud computing), cybersecurity, 3D printing, horizontal and vertical system integration, Big Data analysis.

This list is also complemented by new technological solutions that will play a leading role: artificial intelligence and cognitive systems, machine learning, smart mobile applications, blockchain technologies, digital platforms and more. The list of technologies that will have a significant impact on the development of society, economy and industrial production in the next 5 to 10 years cannot be exhaustive at the current level and dynamics of technological innovation, because new opportunities are constantly emerging and further applications are being opened which were not known 2 years ago, for example.

Where is Bulgaria on the Industry 4.0 map globally. In Germany, where the concession for Industry 4.0 is emerging, by the year 40 billion euros are planned for annual investments in the introduction of the respective systems, and 20% of the car companies already use automated and autonomous systems in their production, the picture in Bulgaria looks quite different [12]. The discussions here are at the level of digitalisation of business processes, but not of production processes. The share of enterprises whose business processes are automatically linked to those of their suppliers and / or customers for 2015 is the highest among large companies with more than 250 employees - 34% respectively. For small and medium-sized companies it is relatively low - less than 25% of these organizations use automation in connection with supply chain management.

It is observed that for small enterprises up to 49 employees the percentage is only 20.7%, while 60.8% of large companies have used ERP (Enterprise resource planning) system.

The percentage of enterprises using the online process of purchasing goods or services online (procurement) is low in all three categories of companies - small (12.3%), medium (14.8%) and large (23.9%). According to research, nearly one-third of employers in the medium term are training their employees in the field of digital competencies.

According to a poll conducted in the spring of 2016 by the German-Bulgarian Chamber of Commerce and Industry (GCBT) among 59 Bulgarian, German and foreign member firms, more than 80% of respondents rated the role of digitalization in their company as "decisive" or "Very significant." With regard to the current level of digitization, more than half of the respondents said that it was above average. Nearly 90% of companies by three years have already taken steps to digitize the processes, and 64% say they have a department or employee responsible for it. Over 70% of those surveyed will invest up to 3% of their turnover over the next five years [8].

The fourth industrial revolution, better known as Industry 4.0, got its name from the 2011 initiative, led by businessmen, politicians and scientists, who identified it as a means of increasing the competitiveness of the German manufacturing industry through enhanced integration of "cyber-physical systems", or CPS, into the factory processes.

CPS is essentially a comprehensive term used in conversations about the integration of small Internet-connected machines and human labor. Managers of enterprises not only rethink the principle of the assembly line, but also actively create a network of machines that will not only produce goods with a smaller number of errors, but will also be able to autonomously change production templates in accordance with need, while remaining highly effective [5].

In other words, Industry 4.0 is the production side, equivalent to the consumer-oriented “Internet of Things”, in which household items, from cars to toasters, will be connected to the Internet [2].

This should be a “completely new approach to production,” as a conglomerate of major industrialists, experts in artificial intelligence, economists and academics noted in the report of the Industry 4.0 Working Group. The German government supports this idea and adopts a “high-tech strategy” to prepare the nation, but as a whole Industry 4.0 should and is already capturing the whole world, whether we like it or not. The United States, for example, followed the lead of Germany and created the non-profit consortium Industrial Internet in 2014, led by industry leaders like General Electric, AT & T, IBM and Intel.

However, the term Industry 4.0 remains rather vague. One of the most tangible aspects of the fourth industrial revolution is the idea of "service-oriented design." It can range from users using factory settings for the production of their own products, to companies that supply individual products to individual consumers.

The potential of this type of production is huge. For example, the connection between the smart products of the “Internet of Things” and the smart machines that produce them, that is, this “industrial Internet”, will mean that

they can produce themselves and determine the target production depending on the needs defined by them. If your phone knows that it will “die” soon, it can notify the plant, where the task to produce a battery for your phone or a new phone in general, as well as for other smart devices, will be queued up. When your phone goes to the trash, the other will be waiting for you.

Moreover, when this process becomes more complex and integrated, your phone will arrive with your settings, almost no different from the one you used yesterday.

This process is not limited to telephones and other sophisticated electronics. From clothes to shampoos and soaps, everything can be put on stream without additional costs, which accompanied the services of individual designers. Objects will be produced individually for you directly, and you no longer have to choose from several predefined colors, calling it personalization [5].

In addition, the growing integration of smart plants into industrial infrastructures will mean significant reductions in energy costs. Many plants spend a lot of energy during production breaks such as weekends and holidays, a smart plant could have avoided this.

According to supporters of this type of integrated production, Industry 4.0 has the potential to change the very definition of human labor. Since machines can perform repetitive, routine tasks in production with much greater efficiency than humans, these tasks will be mostly automated. But instead of taking work from people, people will be engaged in more demanding skills, creative tasks, instead of engaging in hard work. Simply put, it will be possible to manage a smart factory via the Internet.

Those who will benefit most from the fourth industrial revolution, like Cisco, Siemes or ThyssenKrupp, argue that implementing CPS is more in demand than any other corporate agenda. Nevertheless, despite such rhetoric, further research shows that the main driver of industrialization is not so much the benefits of consumers, but the potential benefits for multinational industrialists who are the first to accept Industry 4.0 [1].

Conclusions

Today's realities of Bulgaria can be summarized in the following statements:

We rank 57th in the "Global Competitiveness Ranking", up from 54th in the previous issue. Thus, we remain at the bottom of the ranking of the 60 participating countries.

In terms of infrastructure development in a broad sense - communications, roads, communications, etc., Bulgaria is somewhere between 120 and 125 places out of a total of 135-136 countries in the world.

At the end of 2016, the sectors of the Bulgarian economy were dominated by sectors such as clothing and textile industry, wood processing, woodworking, furniture industry, construction, services. This means that the share of mechanical engineering, metalworking, information and other technologies is below 15-20%. This is the structure of an economy in a developing world. All that comes to show? We have a social, economic, demographic structure of a Third World country 20 years after the fall of the Iron Curtain. In other words, Bulgaria has taken a rapid step along the path of degradation in every respect.

And this cannot be overlooked with fairy tales or declarations that you see, we are an EU Member State.

And what's worse, I don't see a tendency to try to stop this degradation. These are powerful inertial processes that, even in the presence of a will that I do not think would be difficult, would be difficult to master.

All technologies are political in nature. They are the epitome of societal trends and trade-offs, expressed through the development and application of technology itself. Technology development is directly linked to, and dependent on, security policies and economic growth policies, as long as the creative process is not possible without security and security of life, creative behavior is not possible, enough to make a technological breakthrough , or else such a breakthrough is delayed enormously.

Technology and society (people) are mutually forming. Humans are as much a product of technology as they are a product of their own. Advantageously, technologies are developed that can be effectively used and produce a noticeable positive effect.

It has historically been a tradition to make political decisions to invest heavily in new technologies, especially for the needs of the military, from where they subsequently borrow and move into civilian traffic. But even with the emergence of new technologies, at the beginning of their emergence used and operated by a limited number of highly skilled professionals require a new type of people - with the appropriate knowledge, education, morals and training. The existing economic models with regard to the technologies used and their impact on environmental security need to be re-engineered so as to encourage producers and consumers to use resources scarce, and to promote environmentally sound products and services.

To be able to ensure prosperity, openness and equality for the public and citizens in the Industrial Revolution 4.0, a conscious choice of technological systems is required, which will inevitably affect the economy, the

environment, social systems and security [2]. This means that contemporary economic and political paradigms and their reformulation are necessary in order to achieve the involvement of all stakeholders, regardless of ethnic, gender or national origin.

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BIG DATA AS A MODERN TOOL FOR STORING, PROCESSING AND ANALYZING HUGE AMOUNTS OF INFORMATION IN THE FIELD OF METEOROLOGICAL RESEARCH FORECASTING

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Abstract In the article, the author considers based on the analysis of modern methods of information analysis, including the latest advances in computer technology and software, statistics, data mining technologies, Big Data technology or data of huge volumes, the processing and analysis of which involves the use of effective approaches to storage, processing and cashiering huge amounts of information, in particular in the field of meteorological research. The article presents the defining characteristics, methods and techniques of analysis, principles, trends and work technologies applicable to Big Data.

Keywords: programming, Big Data, environmental information, meteorological research, analysis, processing, work tenologies

The science of programming states that the development of software systems for the analysis of meteorological data contributes primarily to the development of an environmental monitoring system. In order to obtain an adequate description of the current environmental situation, first of all, an analysis of the information that enters the environmental monitoring system is carried out. The effectiveness of environmental monitoring systems depends largely on how accurately identified and predicted the environmental situation of a region, that is, on a systematic analysis of environmental information.

It should be noted that such an analysis is complicated, firstly, due to objective reasons (for example, equipment failures, information transmission channels), some of the environmental information may be incorrect or absent, and secondly, the presence of huge amounts of information in the field of forecasting meteorological data. This, of course, justifies the need to develop or select information analysis methods that are highly effective in the conditions of fuzzy and incomplete initial information. The methods

of information analysis that exist today, scientifically substantiated by the latest achievements of statistics, data mining technologies, contribute to the process of finding those patterns that can be successfully applied in the future for environmental monitoring. This circumstance helps to increase the effectiveness of monitoring and protecting the environment from pollution, which in turn will reduce the risk of harm to human health. In environmental monitoring systems, "the analysis of environmental information is limited to comparing measurements of environmental parameters with maximum permissible norms or using separate, unrelated methods of analyzing information" [1; 2; 3]. This study of the possibility of combining information analysis methods into a single system provides higher accuracy in assessing and predicting the environmental situation. Among modern approaches, tools and methods that differ significantly from the classical ones, there is Big Data or data of huge volumes.

Big Data is a certain system of approaches, tools and methods for processing structured, weakly structured and unstructured information of huge volumes and significant variety to obtain human-perceived results that will be effective in conditions of continuous growth, distribution across multiple nodes of a computer network, and alternative traditional database management systems. The “three V” are distinguished as the defining characteristics for big data: a) volume, velocity, variety; c) volume - in the value of the physical volume; c) speed - in understanding both the growth rate and the need for high-speed processing and obtaining results; d) diversity - in understanding the possibility of simultaneous processing of various types of structured, weakly structured and unstructured data. It should be noted that in the future, interpretations appeared with four V (added veracity), five V (viability and value), and seven V (variability and visualization). For example, IDC interprets precisely the fourth V as value, thereby indicating the importance and necessity of economic feasibility of processing large amounts of data in appropriate conditions.

Of course, Big Data is a combination of technologies that facilitate the implementation of three operations aimed at developing various skills, namely:

1) connected with the processing of large amounts of data compared to the "standard" scenarios;

2) assuming the ability to work with fast incoming big data;

3) requiring the ability to work with structured and loosely structured data in parallel and in different aspects.

The above skills help to identify hidden patterns that elude a limited human perception. This circumstance contributes to the realization of the

possibility of optimizing many areas of our lives, such as government, medicine, telecommunications, finance, transport, production, etc. Recently, we notice that the phrase Big Data is often used in scientific economic literature, in the press by journalists and marketers, although many experts suggest abandoning it.

It is known that in October 2015, a well-known research and consulting company specializing in information technology markets, Gartner excluded Big Data from the list of popular trends, believing that the concept of "big data" includes a large number of technologies that are already actively used and have become an everyday working tool. at the enterprises. Despite this, the term Big Data is still widely used in the science of programming.

In accordance with the above definitions, you can identify the main principles of working with big data, namely:

1. The basic principle of big data processing is the principle of horizontal scalability. The selection of this principle is due to the fact that there is more and more big data every day, and therefore it is necessary to increase the number of computational nodes over which this data is distributed, and information should be processed without compromising the performance.

2. The second principle of fault tolerance follows from the previous first; due to the fact that there are a lot of computing nodes in the cluster (sometimes tens of thousands) and their number, it is possible, will increase, and the likelihood of machines breaking down will also increase. Methods of working with big data should take into account the possibility of such situations and provide for preventive measures.

3. Locality. This principle of working with big data is related to the fact that the data is distributed over a large number of computing nodes, then if they are physically located on one server and processed on another, the data transfer costs can become unreasonably large. In this regard, it is desirable to carry out data processing on the same machine on which it is stored.

When working with Big Data, developers must take into account trends in working with Big Data and use modern technologies, methods and analysis techniques applicable to big data. So, the international consulting company McKinsey, which specializes in solving problems related to strategic management, identifies 11 methods and analysis techniques applicable to big data. They include such methods as methods of the Data Mining class, Crowdsourcing, data fusion and integration, Machine Learning, Artificial neural networks Pattern recognition, Predictive analytics, simulation, spatial analysis, Statistical analysis, Visualization of analytical data.

We are interested in Machine Learning technology, which includes the use of models built on the basis of statistical analysis or machine learning to obtain complex forecasts based on basic models. Note that this technology occupies an important place in meteomarketing.

Thus, it is known that The Weather Channel, the American pay-TV channel, based on established trends and geolocation of customers, is investigating the effect of weather on the emotional well-being of its viewers in order to prompt advertisers the most effective ways and means of delivering messages. The effectiveness of this approach was confirmed by the joint marketing campaign of Pantene, Walgreens and The Weather Channel brands. Based on Big Data from The Weather Channel and their own predictive models, Machine Learning, Pantene, and Walgreens touted curly hair at a time when air humidity reached its limit. Thanks to this strategy, in the Walgreens pharmacy chain over the summer, sales of Pantene products grew by 10%, and other hair care products - by 4%. Similarly, comparing weather and flight data, the Red Roof hotel chain has targeted its marketing campaign to areas where flights are often delayed or canceled due to inclement weather. Passengers with delayed or canceled flights were offered accommodation in hotels near airports, taking into account the potential occupancy of the room fund based on data on the number of seats on airplanes. As a result, the company accelerated its growth in these regions by 10% [4]. Technically, the architecture of the Big Data system, which is based on the collection of weather data from various sources (including mobile devices) and on the analytical processing of the obtained information using predictive Machine Learning models, is implemented as follows [5]:

a) Apache Kafka provides continuous collection and aggregation of data from weather stations, mobile devices and aircraft;

b) Spark Streaming obtains information from Kafka topics and builds predictive Machine Learning models based on this data using the Spark MLlib component;

c) The results of the analytics are transferred to BI systems and data windows (dashboards) for making management decisions, and are also sent to end users (passengers) in the form of marketing offers and recommendations on profitable hotel reservations in case of flight cancellation.

Information about the many measurements of weather parameters in different places is just a typical example of Big Data. Apache Hadoop is used by meteorologists to analyze a huge amount of information, since its flexibility helps to create scalable analysis tools that are needed to be combed and used to the maximum extent possible. Apache Hadoop

technology, which is “a freely distributed set of utilities, libraries, and a framework for developing and executing distributed programs running on clusters of hundreds and thousands of nodes,” is today considered one of the fundamental technologies of big data [6]. Analysts in the processing of meteorological data joke that the weather creates a “rain of data”, especially when information is being collected around the world. Using the results of observations, the most powerful supercomputers perform billions of calculations in order to simulate real processes in the atmosphere in order to obtain long-term forecasts for a given point on the Earth. The most interesting was the fact that not all models are equally good. While many companies and organizations are involved in weather modeling, the European Meteorological Community is showing the best results. It is thanks to the superiority in hardware and software that European platforms manage to achieve such successes. American experts in the field of weather analysis almost always try to include data from Old World colleagues in their calculations, and in the event of a conflict between their model and the European one, they often prefer the latter. This, firstly, emphasizes the key role of information technologies and solutions in the field of data mining in weather forecasts, and secondly, shows us that weather forecasts can often be without exaggeration a matter of life and death, therefore cooperation is very important here. An example of such a situation was Hurricane Sandy, a powerful tropical cyclone that formed in late October 2012 and affected Jamaica, Cuba, the Bahamas, Haiti, the coast of Florida and, subsequently, the northeastern United States and eastern Canada. The hurricane caused the most severe damage to the northeastern US states, in particular New Jersey, New York and Connecticut, but without full weather forecasts and predictions regarding this hurricane - the damage would have been much greater. US meteorologists admitted that if even one, even small, data source were omitted in the analysis of Sandy’s movement, the accuracy of predictions (for example, such an important question: exactly where the hurricane will “land” on the coast) could significantly decrease, and this could would have catastrophic, and maybe even fatal consequences for many people. It is known that after 72 hours, the model of European meteorologists pulled ahead in the accuracy of predicting the actions of a hurricane.

Summarizing the above, we note that Apache Hadoop technology is significant and important for the analysis of such large amounts of data, however, for all its advantages, it is significant as much as it allows the hardware of data analysis and processing systems, and one of the key characteristics that affect efficiency Hadoop, is the speed of the disk sub-

system. No matter what kind of big data you process, whether it is a weather forecast, or, for example, the development of a flu vaccine, one of the worldwide recognized ways to speed up the work of Apache Hadoop is the Nytro LSI series [7].

Thus, in conclusion, it can be emphasized that the importance and significance of Big Data as one of the modern tools for storing, processing and analyzing huge amounts of information in the field of forecasting meteorological studies is obvious. Big Data technology is used to obtain human-perceived results that are effective in conditions of continuous growth, distribution of information across multiple nodes of a computer network, and are alternative to traditional database management systems and Business Intelligence solutions. According to the results of the analysis of big data, one can identify prospects and strategic decisions regarding the further development of any enterprise, including a weather station.

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AUTOMATED CALCULATION OF DETERMINING THE SIZE OF THE CASTING

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Abstract. The solution of the problem of determining the main dimensions of the casting using an automated design system for the sand casting process is considered.

Keywords: computer-aided design, mathematical model, sand casting, casting dimensions, tolerances, allowances, database.

Introduction

Currently, the widespread use of computer technology and mathematical modeling in the foundry industry has led to the emergence of a large number of programs that provide more or less successfully solved problems that foundry workers face in everyday practice.

Today in the world there are more than ten systems of automated modeling of foundry processes (CAM FP). The German program Magma and the American Procast are well-known to specialists, the American SolidCast, the Finnish CastCAE and the German WinCast should also be mentioned. Two developments - Polygon and LVMFlow - are of Russian origin.

The quality of a modern product is characterized by a wide variety of properties, one of which is manufacturability. The standard definition of the concept of manufacturability of structures contains the initial principle of the approach to reduce material and labor costs in all areas of manifestation of the properties of structures. Manufacturability in accordance with the State Standard GOST 14.205-83 is considered as a set of properties of product designs, manifested in the possibility of optimal labor costs, means, materials and time during technical preparation of production, manufacture, operation and repair, compared with the corresponding indicators of similar structures and products of the same purpose. Testing the product design for manufacturability is carried out with a creative community of designers and technologists at all stages: design development, procurement processes, processing, assembly and control [1].

Research objective

One of the problems of developing a technological process in sand forms is mechanical processing. The purpose of excessively large allowances leads to unproductive losses of material, turning into chips, increasing the complexity of machining, increasing the consumption of cutting tools and electricity to meet the needs for equipment and labor [2].

The main goal of creating the software is to automatically determine the main dimensions of the casting by assigning allowances for machining, tolerances of the linear dimensions of the casting, as well as linear shrinkage, in accordance with the State Standard GOST R 53464-2009.

Research methods

Allowances are assigned to the surface to be machined, indicated by an icon above which there is a number indicating the size of the surface roughness.

Shrinkage is the property of metals and alloys to reduce linear dimensions and volume during cooling.

Tolerance - the difference between the largest and smallest limit values, is set on the geometric dimensions of the parts, mechanical, physical and chemical properties. It is assigned based on the technological accuracy of the part [2].

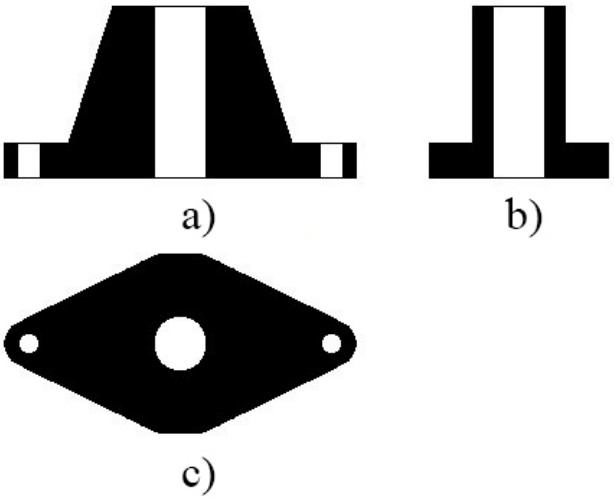

Figure 1. An example of a part. This figure shows a graphical representation of the part:
a) main view of the part; b) detail view on the left; c) top view of part

To solve this goal, it is necessary to solve a number of problems that arise in the way of computer design, namely creating a mathematical model for determining the main dimensions of the casting and creating a database for storing tables of machining allowances, linear shrinkage and linear dimensions' tolerances.

To build a mathematical model, we choose a rectangular coordinate system in space. To implement the solution of this problem, the Borland Delphi 7 programming environment is used [3]. The structure of the discrete space is carried out using a three-dimensional array, which contains the numerical data of the part. Visualization of the model is shown in Figure 1.

The mathematical model for calculating the main dimensions of the casting is performed according to the following formula:

$$R_{casting} = R_{part} + Q + U, \quad (1)$$

where R_{part} – part size, millimeters; Q – machining allowance, millimeters; U – average linear shrinkage, millimeters (2).

$$U = (R_{part} \cdot U_t)/100, \quad (2)$$

where U_t – table value of linear shrinkage, percent.

Expression (1) allows you to automatically determine the main dimensions of the casting.

To perform the solution of expression (1) a data bank has been generated, including: a computing system; a database; database management system; calculation program.

The database provides information storage and is a collection of data organized according to certain rules. To calculate the main dimensions of the casting, a local database (DB) is used.

The local DB is located on the same computer as the applications working with it. Work with the DB occurs in single-user mode (Fig. 2).

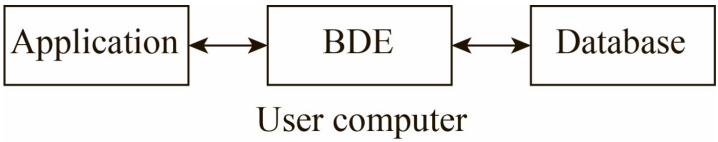

Figure 2. Local DB example. This figure shows a local DB.

This database is compiled on the basis of the State Standard GOST R 53464-2009. It consists of five tables describing the minimum wall thickness of the casting, machining allowances, tolerances of the linear dimensions of the castings, dimensional accuracy of the castings depending on the quality accuracy of the dimensions of the machined parts, the recommended average linear shrinkage.

To verification the solution, in this program, the “Bracket” part was selected (Fig. 1). The purpose of the solution is to determine the main dimensions of the casting, taking into account the casting instructions.

The optimization results for determining the main dimensions are presented in Figure 3.

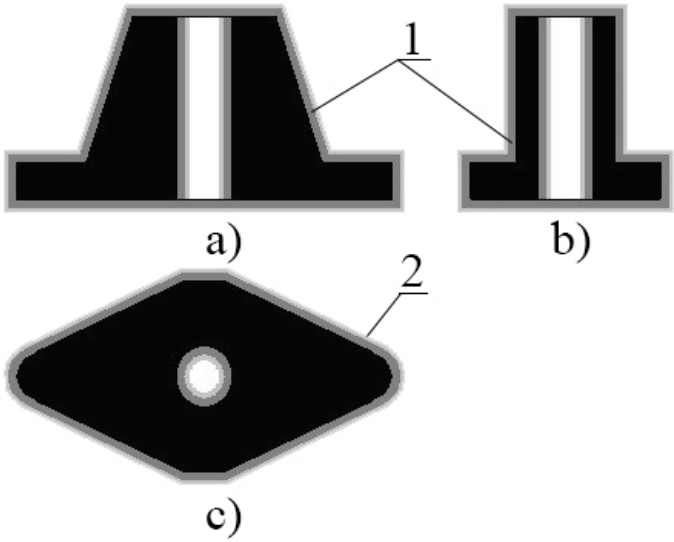

Figure 3. Example solution results. This figure shows a graphical representation solution results:
a) main view of the part; b) detail view on the left; c) top view of part; 1 – machining allowance; 2 – linear shrinkage of metal.

All data obtained in the process of automated solution, namely, the main dimensions of the casting, selected machining allowances, tolerances of linear dimensions and linear shrinkage, are saved in a table (table).

Table
The results obtained in tabular form, millimeters

Part size	Size tolerance	Machining allowance	Casting size	Shrinkage
208	±1,4	1,8	211,6	3,3
104	±1,2	1,6	107,2	1,7
96	±1,1	1,4	98,8	1,5
72	±1,1	1,4	74,8	1,2
Ø56	±1,0	1,2	Ø53,6	0,9

Results

When using this computer simulation system, the main goal was achieved - to determine the main dimensions of the casting, but further optimization of the software is required, namely the creation of a convenient interface and optimization of the output of the received information in the form of technological documentation regulated by the standards of a unified system of design documentation (ESKD).

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