



SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

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这些会议文结合了会议的材料 – 研究论文和科学工作者的论文报告。它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。

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俄罗斯联邦发展共享经济的必要性

IMPERATIVES FOR THE DEVELOPMENT OF THE RUSSIAN FEDERATION'S SHARING ECONOMY

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摘要。本文对俄罗斯的共享经济进行了分析，重点关注最常见的部分——汽车共享。移动应用程序和车队管理系统等技术的发展为汽车共享开辟了新的机会，这需要分析它们对市场 and 用户的影响。公众对汽车所有权态度的改变和对资源共享日益增长的兴趣为研究汽车共享作为一种社会现象创造了新的条件。在经济不稳定的情况下，汽车共享可以成为许多人更容易获得的选择，这使得它的研究从经济效率的角度来看具有重要意义。汽车共享的研究对于了解交通运输部门的现代趋势及其对社会和经济的影响非常重要。这项研究基于俄罗斯联邦共享增长动态的数据、对其到 2025 年的发展预测以及对各种共享类型优缺点的分析。

关键词：共享经济；汽车共享；数字化；预测；可持续发展；交通系统；车队。

Abstract. *The article presents an analysis of the sharing economy in Russia with a focus on the most common segment - car sharing. The development of technologies such as mobile applications and fleet management systems opens up new opportunities for car sharing, which requires an analysis of their impact on the market and users. Changing public attitudes towards car ownership and growing interest in resource sharing create new conditions for studying car sharing as a social phenomenon. In conditions of economic instability, car sharing can become a more accessible option for many people, which makes its study relevant from the point of view of economic efficiency. The study of car sharing is important for understanding modern trends in the transport sector and their impact on society and the economy. The study is based on data on the dynamics of sharing growth in the Russian Federation, a forecast for its development until 2025, as well as an analysis of the advantages and disadvantages of various types of sharing.*

Keywords: *sharing economy; car sharing; digitalization; forecasting; sustainable development; transport systems; car fleet.*

The sharing economy, or co-consumption economy, is a model in which resources such as cars, housing, and tools are shared among users. The sharing economy promotes a more rational use of resources, which reduces waste and reduces the burden on the environment. Users can save money by accessing the resources they need without having to buy them. This is especially true for products that are used infrequently. In addition, the sharing economy promotes the creation of communities and strengthens social ties between people, which can lead to greater interaction and cooperation. The sharing economy model can help reduce emissions by reducing the need to produce new goods and promoting the reuse of existing resources.

The sharing economy provides users with flexibility in accessing resources, which can be especially useful in a rapidly changing market and demand environment. This model opens up opportunities for startups and small businesses by offering new ways to monetize assets and services.

Overall, the sharing economy is an important step towards a more sustainable and efficient society, contributing to both economic and social development.

One of the prerequisites for its emergence is urbanization. After the cities were populated by people and the population density increased, the pace of life changed, which led to the emergence and development of digital technologies. They became the impetus for the development of the sharing economy, since the basis of its functioning is the online promotion of any goods and services through the use of online applications, websites and other online platforms. Therefore, today there is a noticeable trend of increasing popularity of the idea of sharing goods and services instead of making their full purchase.

Methods.

The study was conducted using general scientific methods, including analysis of the authors' works, synthesis and comparison of information, the use of system-functional and integrated approaches.

The issues of the economy of joint consumption (sharing economy) are raised by modern scientists quite actively. Thus, Ayusheva I.Z. studies the features of civil regulation of settlement relations in the context of the development of the economy of joint consumption [4], the legal basis for car sharing is presented in the works of Bubnovskaya T.A. [6], Burdaev P.D. [7] and Sufiev, A.T. [11].

Results and discussion.

The dynamics of sharing development in the Russian Federation shows a gradual increase in the number of companies offering short-term rental services for cars, bicycles, scooters and other types of transport. In the largest cities of the country, there is already a developed system of sharing, and it is assumed that this trend will only intensify. The forecast for the development of sharing for 2025 assumes an increase in the number of users and an expansion of the range of ser-

vices offered. It is also expected that sharing will become more accessible in the regions and will be widespread both in large cities and in small towns. The rapid development of technologies in the field of autonomous and electric vehicles will also play an important role in the development of this industry.

Car sharing is a relatively new type of service for Russia, both from a legal and economic point of view. This market is developing and has great potential in the future. The number of car sharing operators and cars available for rent is constantly growing. However, car sharing is still not very widespread outside of large cities, and it cannot be called an integral part of public life, such as taxi services. Based on the data (Fig. 1), we can conclude that, starting in 2019, a stable trend has been formed in the formation of the carsharing market by four main companies, reducing the share of other companies from 31% to 7%.

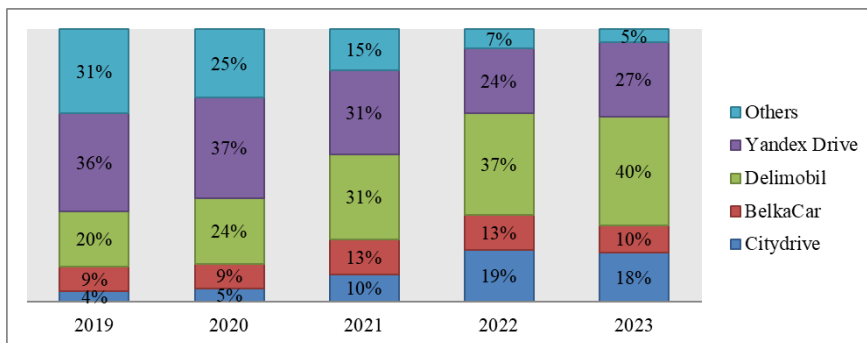


Figure 1. Revenue structure by carsharing operators in the Russian Federation in dynamics, %

Source: compiled by the authors based on the analysis of the B1 group of companies [5]

Yandex has been the leader for the past few years, but its share has been constantly declining, and in 2022 the company lost its leadership to Delimobil. You can also see an increase in the share of Citydrive and BelkaCar. According to experts, the trend towards market concentration will continue until 2028, including due to the high threshold for entering the market due to the need for wide coverage of service areas, which requires a significant amount of investment in a short period of time. To be competitive, a new player must quickly organize significant service coverage in the city, which requires large cash investments and special competencies [10]. In 2023, the volume of the carsharing market in the Russian Federation amounted to 44 billion rubles, which is primarily due to the stagnation

of demand for personal cars against the background of their sharp rise in price. In addition, the cost of owning a personal car has increased, and car loans have become less attractive [2].

Analyzing the data presented in Fig. 2, it is worth noting the growth in the volume of the car fleet: the capital, Moscow, consistently ranks first.

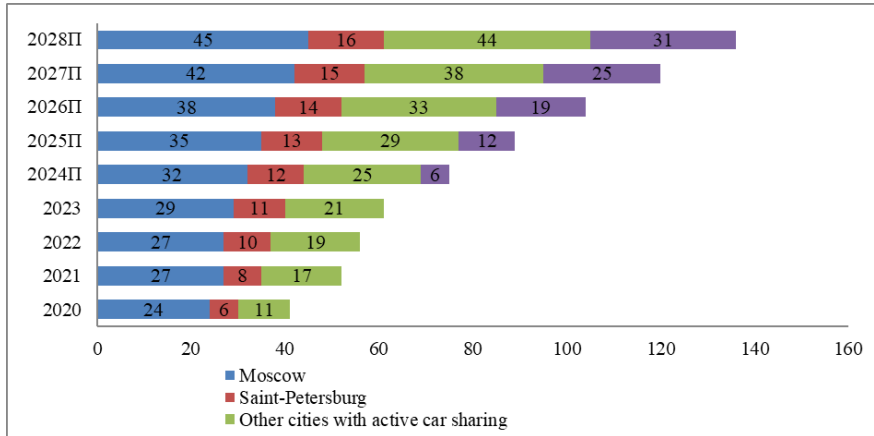


Figure 2. Car park by cities of the Russian Federation, thousand units)

Source: compiled by the authors based on the analysis of the B1 group of companies [5]

The forecast value for the volume of the car park will begin to grow in small cities, which may be due to the expansion of large companies and business expansion. It should be noted that the second large city - St. Petersburg - will have a small increase in value, which is due to the popularity of other types of transport among the population - buses, metro, etc. [3].

Due to the specifics of car sharing activities, cars are on the streets of the city around the clock, where their one hundred percent safety cannot be guaranteed. As a result, the car sharing operator takes on additional risks associated with unforeseen repair work and vehicle downtime. All these factors indicate that Russian car sharing as a young and developing area of public transport needs some support from the state, because most of the consequences of its development are favorable for the state [1].

The main positive results of car sharing development include [9]:

1. Tax revenues. Car sharing development can lead to an increase in tax revenues due to increased economic activity and consumer demand. For example, an increase in the number of car sharing service users can lead to an increase in sales

of cars and spare parts, as well as an increase in car rental income. In addition, car sharing development can stimulate the development of other industries, such as electricity generation, car maintenance, and much more.

2. Job creation. Car sharing service development requires the creation of new jobs in various fields. Such services require employees to service and repair cars, develop software, and support customers. In addition, opening new car rental points will also create new jobs.

3. Improving transport infrastructure. Car sharing service development actively stimulates the improvement of transport infrastructure and the development of public transport, bike paths, pedestrian zones, since it will often be more convenient and profitable for city residents to use these types of transport instead of personal cars.

4. Reducing greenhouse gas emissions. The use of car sharing vehicles can help reduce greenhouse gas emissions by reducing the number of cars used and using more environmentally friendly modes of transport.

Based on the data in Fig. 3, it can be concluded that Moscow occupies the leading position in terms of the percentage of use of car sharing services, with a 13% lead over its closest competitor, St. Petersburg.

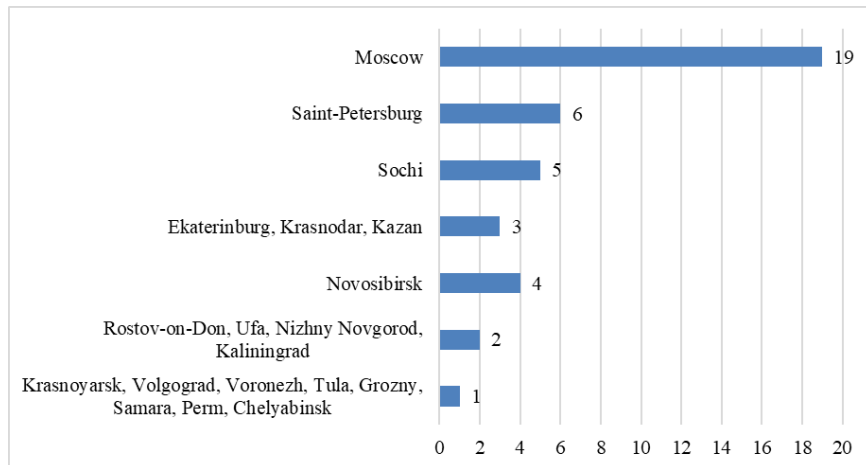


Figure 3. *Percentage of use of car sharing services by Russian cities*

Source: compiled by the authors based on the analysis of the B1 group of companies [5]

Analyzing the map of the Russian Federation (Fig. 4), a trend of expansion of car sharing services can be observed in the regions of the central zone (Republic of

Bashkortostan, Perm Krai), as well as in the regions of the Far East (Krasnoyarsk Krai, Novosibirsk Oblast).



Figure 4. Map of the Russian Federation by prevalence of carsharing (by region)

Source: compiled by the authors based on the analysis of the B1 group of companies [5]

The distribution of the level of carsharing development in the regions is directly related to the density of cities' population and the level of solvency of the population.

Despite all the positive aspects of carsharing development, the state may also face the negative side of the issue. Without the appropriate regulations that could regulate carsharing, as well as without improving the road infrastructure, people may face a number of problems. For example, an increase in the load on the roads, increased competition for public transport, which will lead to a decrease in the quality of service and coverage of road routes.

To resolve all possible problems associated with the development of carsharing, the state can apply a number of measures [8, 10]:

1. Road infrastructure. Direct investments into the development of road infrastructure, including the construction of new roads, the improvement of existing ones and the expansion of public transport to cope with the increased traffic.

2. Regulation of the number of cars. Restricting the number of carsharing vehicles in certain areas or imposing fines for improper parking and congestion can reduce congestion and road wear.

3. Environmental measures. Encouraging the use of environmentally friendly cars in carsharing and imposing fines for emissions can reduce the negative impact on the environment.

4. Regulating car sharing regulations. Introducing strict standards and rules for car sharing companies to ensure safe and fair car rental conditions.

5. Innovations in public transport. Integrating car sharing with public transport such as metro, buses and bicycles can increase the availability and convenience of alternative modes of transport.

These measures require cooperation from both the government and car sharing companies, as well as careful monitoring and regular updating of policies to achieve the desired results.

As a result of the analysis of the sharing economy of the Russian Federation, it can be concluded that this service is promising and rapidly developing in the world. Car sharing reduces carbon dioxide emissions and reduces traffic congestion, making the city more accessible and convenient for residents. In Russia, this rental option has great potential for development and is already popular among residents of large cities. However, there are problems that need to be addressed today, such as: legal regulation, insufficient number of cars and limited coverage area. Also on the agenda is the question of whether this agreement applies to existing types of rental agreements or is separate from them, remains open both in legislation and in scientific literature.

As part of the study, various aspects of car sharing were studied: economic, environmental and social, which prove its effectiveness and attractiveness. It is also important to continue working on improving the service and quality of cars and reducing the cost of services.

In addition, an objective need has been formed to attract more investors and develop cooperation with other types of transport in order to create a convenient and accessible public transport system. Only if all these conditions are met, car sharing can become a mass and accessible type of transport in Russia.

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俄罗斯开征环境税是环境保护的必然选择

INTRODUCTION OF AN ENVIRONMENTAL TAX IN RUSSIA AS A NECESSITY FOR ENVIRONMENTAL PROTECTION

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摘要。该主题的相关性取决于这样一个事实：当今的自然资源已经枯竭，为了未来适度使用，改善环境税的原则是必要的。全球环境状况的恶化为人类提出了向无废物或低废物生产技术过渡的问题。为了在经济增长的背景下改善环境状况，有必要采取措施来规范环境。环境监管是一套具体的立法、行政和经济性质的积极措施体系，包括一套不同方向（主要是金融）的国家手段，影响各种对象的活动，指导和迫使它们适度向环境中排放有害废物。

关键词：环境税、环境、自然资源、废水排放、经济活动、固定源、移动源。

Abstract. *The relevance of the topic is determined by the fact that today natural resources are so depleted that for their future moderate use it is simply necessary to improve the principles of environmental taxes. The global deterioration of the environmental situation poses the problem of transition to waste-free or low-waste production technology for humanity. To improve the environmental situation in the context of economic growth, it is necessary to apply measures to regulate the environment. Environmental regulation is a specific system of active measures of legislative, administrative and economic nature, including a set of state instruments of various directions (mostly financial), which affect the activities of various objects and direct and force them to moderate emissions of harmful waste into the environment.*

Keywords: *environmental tax, environment, natural resources, wastewater discharges, economic activity, stationary sources, mobile sources.*

The latest technologies and development of society influence environmental problems related to the preservation and restoration of the natural environment. They occupy an important place among the global problems of humanity to ensure compliance with the priorities of sustainable development. One of the traditional and effective tools used by governments of different countries of the world to reduce the harmful impact of economic activity on the environment are resource

payments, which include payments for environmental pollution. In Russia, the amount of these payments is so small that it is easier for enterprises to pay a fine than to invest their funds in innovative technologies for environmental protection. As a matter of environmental protection, the introduction of an environmental tax is extremely necessary in Russia at present [6, p.25].

Materials and methods

Based on statistical data from the Federal State Statistics Service, an analysis of emissions of air pollutants from stationary and mobile sources in the Russian Federation, as well as wastewater discharged into surface natural water bodies for 2010–2023 was conducted. To write this topic, the author used modern scientific research methods such as: analytical, statistical, and grouping methods.

Results and its discussion

The resources of the environment are not unlimited, which is confirmed by its use as a “garbage can”, despite its limited ability to absorb waste, harmful substances, etc. Sometimes, in pursuit of profit, enterprises cut down trees, which affects the animal world and flora [10]. This is a negative external impact, which is manifested in damage to the environment. It is easy to cause significant damage to nature, but it will take a long time to restore it. Pollution of air, water and soil has proven that the environment cannot be used indefinitely [5, p. 230]. Many experts believe that nature is used as a free or cheap resource. For example, iron ore, oil, coal, gas among the natural resources used are exhausted, forests and wildlife are being renewed. The growing deficit of many resources has a negative impact not only on consumption, but also on production. Many companies try to save on wastewater treatment facilities, but it is important to understand that if there is no sufficiently high-quality environment as a factor of production, then the costs of carrying out even expensive measures to clean it can quickly exceed the apparent profit from refusing to use environmental measures [1, p. 14]. In the worst case, environmental pollution in some industries can harm other areas of industry. The greatest loss of indicators occurs due to the impact of industry, which emits large amounts of harmful waste into the atmosphere [9]. Because of this, there is a special type of climate in cities, where acid rain falls, smog is felt, all of which has a negative effect on human health.

Nowadays, of all forms of environmental pollution in Russia, the most dangerous is the direct pollution of the atmosphere with harmful substances.

Let us consider the dynamics of emissions of air pollutants from stationary and mobile sources in the Russian Federation for 2010-2023. One of the main indicators characterizing the protection of atmospheric air is the volume of emissions of air pollutants from stationary and mobile sources.

Table 1.

Dynamics of emissions of air pollutants from stationary and mobile sources in Russia for 2010-2023

Year	Total volume of emissions of air pollutants, million tons	from the total volume of emissions of air pollutants, including:		Emissions growth rate (+/-), %
		from stationary sources, million tons	from mobile sources million tons	
2010	32,35	19,11	13,24	-1,22
2011	32,63	19,16	13,47	+0,87
2012	32,47	19,63	12,84	-0,49
2013	32,06	18,45	13,61	-1,26
2014	31,23	17,45	13,78	-2,59
2015	31,27	17,30	13,97	+0,13
2016	31,62	17,35	14,27	+1,12
2017	32,07	17,48	14,59	+1,42
2018	32,33	17,69	14,64	+0,81
2019	22,74	17,31	5,43	-29,66
2020	22,23	16,95	5,28	-2,24
2021	22,30	17,21	5,09	+0,31
2022	22,20	17,17	5,03	-0,45
2023	21,98	16,96	5,02	-0,99

According to the data in Table 1, it can be said that from 2010 to 2023, there has been an annual decrease in the volume of emissions of air pollutants from stationary and mobile sources in the Russian Federation. If we compare 2023 with 2010, the total volume of emissions of air pollutants decreased by 10.37 million tons (-32.06%) [3]. This can be explained by the implementation of environmental measures by industrial enterprises. Let us consider the dynamics of wastewater emissions into surface natural water bodies.

Table 2.

Dynamics of discharged wastewater into surface natural water bodies for 2010–2023, million cubic meters

Year	Discharge of contaminated wastewater	The rate of increase in the volume of discharges (+/-), %
2010	16,5	+3,77
2011	16,0	-3,03
2012	15,7	-1,88
2013	15,2	-3,18

2014	14,7	-3,29
2015	14,4	-2,04
2016	14,7	+2,08
2017	13,6	-7,48
2018	13,1	-3,68
2019	12,6	-3,82
2020	11,8	-6,35
2021	11,6	-1,69
2022	11,3	-2,59
2023	11,1	-1,77

Compared to 2010, for the period under review in 2023, this figure decreased by 5.4 million cubic meters (-32.73%) (Table 2) [3].

To improve the environmental situation, it is necessary to take measures to regulate the environment. Water resources protection includes a set of measures to improve the efficiency of use, protect water resources and water bodies from pollution and depletion. Currently, the volume of wastewater discharged into surface water bodies without treatment or insufficiently treated remains high.

The state policy in the field of environmental development of Russia for the period up to 2030 is aimed at solving socio-economic problems that ensure low-carbon sustainable development, preservation of a favorable environment, biological diversity and natural resources, the implementation of the right of every person to a favorable environment, including the following main areas:

- formation of an effective management system in the field of environmental protection and environmental safety;
- ensuring environmentally oriented economic growth and the introduction of environmentally efficient innovative technologies;
- preventing and reducing the current negative impact on the environment;
- reducing the carbon intensity of the economy and implementing measures to adapt to climate change;
- restoring damaged natural ecological systems;
- ensuring environmentally safe waste management and reducing the volume of its generation;
- increasing the number of people with access to clean water;
- forming an environmental culture, developing environmental education and upbringing;
- ensuring effective participation of citizens, public associations, non-profit organizations and the business community in resolving issues related to protection.

The introduction of an environmental tax in Russia is currently considered as one of the incentives for rational use of natural resources and is the subject of research by scientists in various fields [2, p.380].

The introduction of an environmental tax in Russia is justified by the need for financial support for the activities of the Government of the Russian Federation related to the implementation of state policy in the field of ecology, aimed at ensuring conditions for the implementation by citizens of their constitutional right to a favorable environment [4, p. 222]. The environmental tax has two functions:

1) regulatory - lays down the ideology of the environmental tax and consists in providing the state with the opportunity to stimulate or disincentivize individual spheres of life, including the level of man-made load;

2) distribution - is intended to accumulate funds for the restoration of the resources used.

According to the functions of the environmental tax, the proceeds from its payment should be a source of financing only environmental protection measures, and its size should be sufficient to implement measures to compensate for the damage caused to the environment by polluters [7, p. 18]. Therefore, the state is interested, on the one hand, in maximizing revenue from the environmental tax, since it is one of the sources of budget revenue, and on the other hand, in minimizing pollution that worsens the state of the environment [8, p. 76].

Revenues from the environmental tax, in turn, will lead to the need to finance environmental programs of the state at the expense of other budget revenues. Most opinions boil down to one of them: we must all use natural resources carefully. The environment, our health and the health of many future generations depend on it. Everyone must remember to treat the environment and natural resources carefully. No taxes and fines can compensate for the harm that people themselves cause [6, p. 15].

An environmental tax, as a source of revenue, can influence the behavior of economic entities and at the same time bring in significant income exceeding the revenues needed to collect the tax. Depending on the goals of collecting the environmental tax, a certain approach can be applied to determining the tax rate, as well as to choosing additional environmental policy measures. It should be noted that the issues of choosing an adequate environmental policy are highly debatable. Consequently, the environmental tax should be aimed at increasing environmental efficiency [6, p. 85].

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质量评估是确保产品竞争力的因素之一

QUALITY ASSESSMENT AS A FACTOR OF ENSURING PRODUCT COMPETITIVENESS

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Siberian State University of Science and Technology named after Academician M. F. Reshetneva

摘要。产品质量是决定其在市场上的竞争地位的关键因素之一。评估是确定产品是否符合消费者要求、发现和消除缺陷的重要工具。

关键词：质量、成本、产品、行业、创新、估值、投资、市场。

Abstract. *Product quality is one of the key factors that determines its competitive position in the market. Evaluation is an important tool for determining product compliance with consumer requirements, identifying and eliminating deficiencies.*

Keywords: *quality, costs, products, industry, innovation, valuation, investment, market.*

Product quality is a critical factor determining a company's competitiveness in the market. It has a direct impact on customer satisfaction, brand loyalty and company reputation. Therefore, product quality assessment has become especially important in today's business landscape, requiring a systematic approach to ensure differentiation. The market is a self-governing economic system that establishes specific relationships between consumers and producers. This system stimulates the development of production in terms of both quantity and quality, imposing strict requirements on product quality. By fulfilling these requirements, companies can gain a competitive advantage in the market [1].

The survival of products in the market environment is determined by the principles of competition. At present, competitiveness, as a form of existence of production and commercial activities of organizations in the sales market, stimulates

the development of production in the presence of consumer demand. Evaluation of product quality is becoming the main competitive factor [2].

One of the main methods of assessing product quality is the use of quality standards. Standards establish requirements for products, their production processes, quality control and safety. Compliance with standards allows not only to guarantee high product quality, but also to increase consumer confidence in the company's products.

Product quality assessment plays an important role in the competitive struggle in the market. Consumers choose products that meet their needs and expectations and that provide high quality. Companies that can offer high-quality products have a competitive advantage over their competitors. Product quality assessment includes the assessment of such parameters as functionality, reliability, safety, aesthetics, and others.

Quality standards are documented requirements for products, their production processes, quality control and safety. They establish uniform criteria for assessing product quality and ensure uniformity in quality assessment. Quality standards can be developed at the national, regional or international level. They help companies ensure high product quality [3] and increase consumer confidence in their products.

There are several advantages to using quality standards:

- ensuring high quality of products;
- increasing consumer confidence in products;
- increasing the company's competitiveness;
- reduction of risks associated with the production and sale of products;
- simplification of the certification and licensing process.

The survival of products in the market environment is determined by the principles of competition. In the modern market, competition is a key factor that forces companies to innovate and improve their products. The principles of competition include such factors as price, quality and service.

There are different types of competition that companies face in the market:

- price competition: Companies compete with each other by offering the lowest price for their products.
- competition by quality: Companies compete with each other by offering high-quality products that meet customer needs.
- competition in service: Companies compete with each other by offering excellent service to customers.

Competition has a significant impact on the survival of products in the marketplace. Companies that fail to compete effectively may see their products lose popularity and disappear from the marketplace. On the other hand, companies that can compete effectively may see their products thrive and gain market share.

To survive in a competitive environment, companies must develop strategies that will allow them to compete effectively. Some strategies include:

- Differentiation: Companies can differentiate their products from those of competitors by offering unique features or benefits.
- Cost leadership: Companies may focus on reducing costs to offer lower prices than competitors.
- Focus on customer needs: Companies can focus on understanding customer needs and developing products that meet those needs.

Product quality assessment is an important aspect of enterprise competitiveness. The quality management system plays a key role in ensuring high product quality. It includes processes of planning, control and improvement of product quality.

The implementation of a quality management system allows the enterprise to:

- identify and eliminate product defects;
- continuously improve production processes;
- increase competitiveness.

Quality audits also play an important role in assessing product quality. They help identify inconsistencies in production processes, quality control and quality management. The results of audits help the company take measures to improve product quality and increase competitiveness.

High quality products have the following advantages:

- increase in market share;
- attracting new clients;
- strengthening market positions.

Thus, to achieve success, companies must pay special attention to product quality assessment and continuously improve their production and quality management processes.

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知识与创新管理系统在统一企业管理体系中的地位和作用
**PLACE AND ROLE OF THE KNOWLEDGE AND INNOVATION
MANAGEMENT SYSTEM IN THE UNIFIED ENTERPRISE
MANAGEMENT SYSTEM**

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注释。在文章中，作者清楚地解释了“知识管理”这一术语的概念，其中包括管理积累和新知识（创新）的方法，这些方法对于有效解决公共管理问题和规范创新活动必不可少。它还展示了知识和创新管理系统的地位和作用，提出了各个要素和阶段相互作用的广义方案，描述了各个要素之间的空间和时间关系和相互作用，提出了基于世界最佳标准和能源生态参数方面的科学发展的国家监管和管理哈萨克斯坦共和国各地区、行业 and 企业的工业创新发展的监管框架。

关键词：知识管理、系统、技术、解决方案、SCALAR 卫星、基本模型、创新、创新发展。

***Annotation.** In the article, the authors clearly explain the concept of the term “knowledge management”, which includes the methods of management of accumulated and new knowledge (innovations), necessary for the effective solution of problems in public administration and regulation of innovation activity. It also shows the place and role of the knowledge and innovation management system, presents generalized schemes of interaction of individual elements and stages, characterizing the spatial and temporal relationship and interaction between individual elements, proposes a regulatory framework for state regulation and management of industrial- innovative development in regions, industries and enterprises of the Republic of Kazakhstan based on the best world standards and scientific developments in terms of energy-ecological parameters.*

***Keywords:** knowledge management, system, technologies, solutions, SCALAR satellite, basic model, innovation, innovative development.*

Knowledge management is a process of solving problems using a specific method. As a new direction in management, knowledge management emerged in the 20th century with the aim of creating guidelines and methods for the optimal use of employees' potential.

Globalization and increased competition, rapid development and implementation of new information technologies, and an increase in the overall technological level of management are the historical reasons for the emergence of a new direction.

At first, knowledge management was considered as a phenomenon related only to those industries and industries that are characterized by the production of new product samples based on specific scientific research and technical developments. However, practice has shown that there cannot be industries, industries, companies that do not use knowledge in the production of products, provision of services or management methods.

In 1962, F. Machlup published the work "Production and Dissemination of Knowledge in the United States", which was later published in eight volumes under the title "Knowledge. Its Production, Dissemination, and Impact on the Economy", where the term "knowledge-based economy" first appeared - this is a type of economy in which the production of knowledge is the main source of growth. Knowledge was recognized as an economic category. In modern literature, the term "innovation economy" is used as a synonym for the concept of "knowledge economy".

The emergence of a new direction in the 1970s caused a certain amount of caution in the global community. Knowledge management was identified with document management, business information systems, and collective work tools.

The term "knowledge management" itself was introduced by Karl Wiig, an American scientist and management consultant, and was first used in 1986 in his speech at a conference in Switzerland, held by the International Labor Organization under the auspices of the UN.

In the mid-90s of the 20th century, in the environment of large corporations, where the problems of information processing became especially acute, it became clear that the efficiency of processing and transferring knowledge accumulated by specialists provides the company with special advantages over competitors, and the goal of knowledge management is to strengthen the competitive advantage and increase the productivity (operability) of the system. It became especially important that knowledge not only be collected, aggregated and cataloged, but also delivered to those recipients who need it. Knowledge management in practice turns into good information management.

By the end of the 20th century, it turned out that information technologies were ready to offer the necessary tools. Information management is gradually trans-

forming into the direction of integrating different sources and carriers of information and knowledge, which requires qualitatively new tools and means of information work. First of all, this was about software and products capable of integrating and managing data from a wide variety of resources and sources.

Today, the importance of knowledge management is growing every year, reflecting the requirements of knowledge-intensive production, informatization of society and the increasing role of human potential. L. Terow asserts that knowledge management is the only source of competitive advantages that depend not on the size of material assets, but on the ability to obtain knowledge and properly manage it, quickly and effectively implement breakthrough innovative developments in various areas - from product manufacturing to business practices.

The evolution of knowledge management can be represented in three stages.

1st stage 1959-1985: formation of ideas about a new type of “knowledge workers” (works of D. Bell, P. Drucker, M. McLuhan, Y. Masuda, E. Toffler, K. Arrow, V. M. Glushkov, Y.A. Schreider, R.F. Gilyarevsky, L.S. Kozachkov and others);

Stage 2 1986-1995: the emergence of three different approaches to the concept of “knowledge management”, called “European” (Karl Sveiby, Sweden), American (Karl Wiig, USA) and Japanese (Ikujiro Nonaka, Japan). The authors of the European approach to knowledge management consider knowledge management as “knowledge measurement”, the American approach consists of direct “knowledge management”, the Japanese - in “knowledge creation”.

Stage 3 from 1996 to the present: penetration into all spheres of activity, including science, education, and library science; formation and development of knowledge management systems as a set of methods and software and technological tools aimed at ensuring the free circulation of knowledge and its generation. In the modern understanding, knowledge management is:

- a set of methods aimed at increasing the efficiency of solving problems covering:
- search and extraction of knowledge from living and non-living objects (knowledge carriers);
- structuring and systematization of knowledge;
- knowledge analysis (identification of dependencies and analogies);
- updating (updating) knowledge;
- dissemination of knowledge and generation of new knowledge.
- methods that organize the communication process and direct it toward extracting new and updating existing knowledge, helping to take necessary actions in a timely manner and effectively solve problems.

Thus, knowledge management includes methods for managing accumulated and new knowledge (innovations) that are necessary for effective problem solving.

IT solutions do not play a dominant role in knowledge management. To implement the technology and create a knowledge management system, it is not enough to install an effective software package, since 80% of knowledge management uses organizational schemes and only 20% uses technological (IT solutions).

Knowledge is the result of transformations in the “data-information-knowledge” system (Fig. 1).

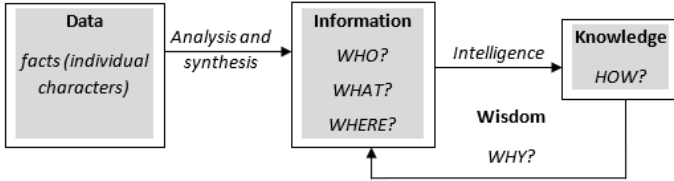


Figure 1. The system “data-information-knowledge” [1]

The internal environment of knowledge as a system is a set of related concepts: “new knowledge – innovation – innovation”.

New knowledge– is a new result in fundamental and applied research. A distinction is made between socially new knowledge, that is, knowledge that no one had, and subjectively new knowledge, “old knowledge that is passed on to new minds.” The growth of new knowledge includes: generating and identifying knowledge, developing new products, and using new knowledge (Fig. 2).

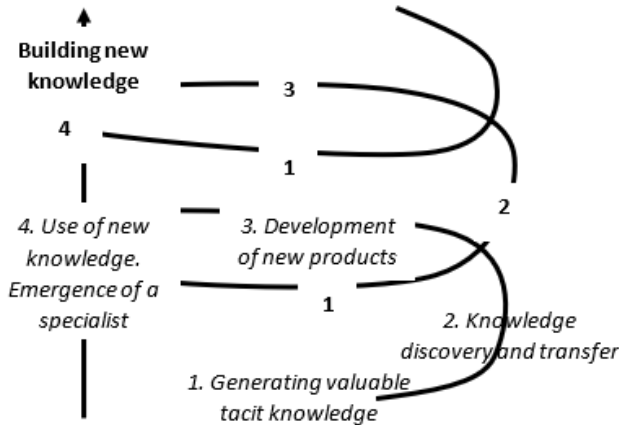


Figure 2. The spiral process of accumulating new knowledge [1]

As you can see, the process of knowledge accumulation occurs through their change, renewal – novation or innovations. The concept of “novation” as a way of terminating an obligation by replacing it with another first appeared in Ancient Rome. The famous Roman lawyer Ulpian characterized novation as a change and transfer of debt to another obligation, when a new obligation is created from the previous one, and the previous one is terminated.

Innovation records the very fact of something new: novus – new, that is, “appearing for the first time or recently”, “not having existed before”, “unknown”, “relating to a given time as to the initial moment” – that is, previously unknown or forgotten (lost).

In the dictionary of S.I. Ozhegov there is the term “innovation” - something new or novelty - a new method, a new system. In the dictionary of V.I. Dahl “innovation” is considered as the emergence of something new; it is noted that this is only a Russian word that appeared in the Russian language before the beginning of the 18th century (first noted in 1704).

In foreign and domestic literature, several concepts can be distinguished: “innovation” and “novelty”. The concepts of novelty and innovation are distinguished:

- **“Innovation-** a formalized result of fundamental, applied research, development or experimental work in any field of activity to improve its efficiency. Innovations can be formalized in the form of discoveries, inventions, patents, trademarks, rationalization proposals, scientific approaches or principles, a document (standard, recommendations, methodology) ...”;
- **“Innovation—** is the final result of the introduction of innovations with the aim of changing the object of management and obtaining economic, social, environmental, scientific, technical or other type of effect.”

Let’s define the place of knowledge management in the logic of designing innovative development, by putting into correspondence a question from the semantic structure of knowledge and the answer to it.

Why - the purpose of design

The purpose of design is to make certain changes to the constituent parts of the world around us so that the world as a whole is preserved and is sustainable.

It is impossible to make the transition to sustainable development without having a clearly formulated goal expressed in universal sustainable values.

Why is the reason

The reason for designing is a problem situation (negative change) or an unmet need that generates an idea (concept) that makes it possible to remove dissatisfaction, resolve a problem situation, eliminate or reduce a negative change in the system.

Who is the subject of design?

Sustainable development can be designed by specialists (researchers - designers - organizers) who have the necessary knowledge about sustainable development and the ability to use it to create a system.

Developers should have effective intellectual tools that reduce the time it takes to acquire the required knowledge. A scientific knowledge base on sustainable development can serve as such a tool (Fig. 3).

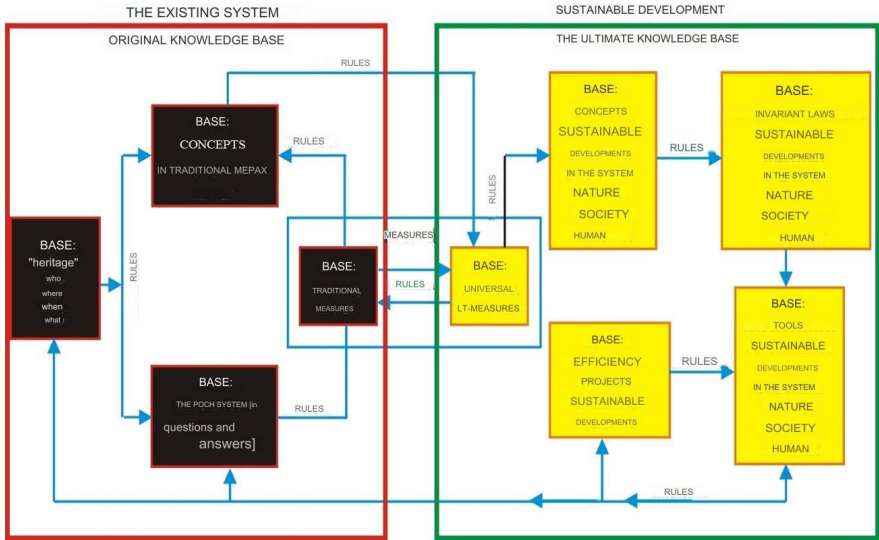


Figure 3. Structure of the scientific knowledge base on sustainable development [2]

What is the design object?

Design objects are any systems limited by time (when) and space (where) that can be developed and implemented: technical, informational, economic, political, socio-natural and others.

How to ensure that design goals are achieved?

To achieve the design goals, a plan of future actions is built. To form a plan of future actions means to develop a network of works (activities) necessary and sufficient to achieve the set goal.

How much - effect, cost

The plan has certain characteristics or parameters that are the subject of assessments during the design process:

- Length of the plan— “distance to the goal”, determined by the time from the beginning to the complete implementation of the plan.
- The width of the plan is the maximum number of jobs performed in parallel during the implementation of the plan.
- Depth of plan - total amount of all work performed during the implementation of the plan.
- Feasibility of the plan— is determined by the provision of work with resources envisaged by the plan (personnel, capacity, technology).
- The power of the plan is determined by the resources required to implement the plan (personnel, capacity, technology).
- The risk of ineffective development planning - a measure of risk can be the difference between the amount of investment and the amount of investment security, expressed in the same units.

To diagnose the current situation and determine the dynamics of the main development indicators, a management model is built, on the basis of which organizational management mechanisms are developed, an action plan and measures for achieving the goals of innovative development are built, problems are identified and their values are determined. All tasks to be solved are grouped into system blocks that determine the functional structure of the model. The following basic blocks are distinguished:

- The existing state of the object (capabilities).
- Target state of the object (need).
- Problems, planning for the goal.

The sequence and interrelationship of solving problems in blocks is clearly shown in Figure 4.

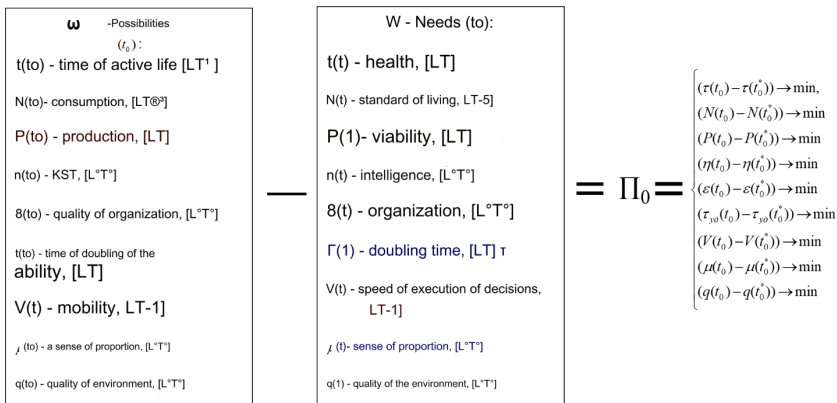


Figure 4. Basic blocks of the management model [2]

Block 1. Existing state of the object (possibilities)

The block is intended for an integral assessment of the state of a socio-economic object in the society-nature system. The assessment was carried out in accordance with the basic criteria of growth and development in the society-nature system.

Block 2. Target state of the object (needs)

The second block is intended for:

- construction of a classifier of logically possible types of goals;
- conducting an analysis of the target state of the object at the current time;
- analysis and evaluation of possible goal options;

Block 3. Problems (P0)

The third block is intended to determine the size and composition of problems, the projected time for solving them and the consequences of not solving them, and to plan measures to solve problems.

The amount of capacity at the disposal of society is a measure of the system’s ability to influence the environment. Need is the required capabilities (capacities) of the system that are currently absent, but which must be available to maintain development in the future. The problem is the difference between the required and available capacities of the system.

The following types of capabilities (power) are distinguished:

- Lost opportunity (losses);
- Real or technological possibility;
- Potential opportunity;
- Realized or economic opportunity;
- Integral capability.

In accordance with the identified types of possibilities, we will construct a system of energy-ecological parameters.

1. Potential capacity (N) – total consumption for a certain time t (year, quarter, month, etc.) of all types of food, fuel, electricity (Ni), expressed in units of power (W, kW, MW, GW, etc.):

$$N(t) = \sum_{i=1}^{n=3} N_i(t), \text{ Where} \tag{3}$$

N(t) – total resource consumption in units of power;

N1(t) – food consumption in power units;

N2(t) - fuel consumption in units of power;

N3(t) - electricity consumption in units of power.

2. Real opportunity (P) is the total product produced over time t, which is determined by the direct summation of the products of the resources (Ni) consumed over time t, expressed in units of power, by the coefficient of technological perfection (ηi):

$$P(t) = \sum_{i=1}^{n=3} N_i(t) \cdot \eta_i(t) \quad [3]$$

The coefficient of technological perfection (η_i) is the ratio of the theoretical minimum of power costs to its actual consumption for the production of a unit of the i -th product in time t . On average, the coefficient of technological perfection in the production of fuel and electricity (for machines and technological processes), as well as food products (for plants and animals) at the initial time t_0 is equal to:

- for food products: $\eta_1(t_0) = 0.05$;
- for fuel: $\eta_2(t_0) = 0.25$;
- for electricity: $\eta_3(t_0) = 0.8$.

The ratio of real opportunity to potential opportunity characterizes the generalized coefficient of perfection of the technologies used in the region:

$$\eta(t) = P(t) / N(t) \quad [4]$$

3. Realized or economic opportunity (\hat{P}) is the total final (produced and sold) product over time t , which is determined by the product of the real (technological) capability in units of capacity (P) and the quality of planning (ε):

$$\hat{P}(t) = P(t) \cdot \varepsilon(t), \text{ Where} \quad [5]$$

$$\varepsilon(t) = \begin{cases} 1 - \text{есть потребитель;} \\ 0 - \text{нет потребителей.} \end{cases}$$

Planning quality (ε) is the share of manufactured output (P) in time t provided to the consumer.

The ratio of realized opportunity to potential opportunity determines the efficiency of resource use (φ):

$$\varphi(t) = \hat{P}(t) / N(t) \quad [6]$$

4. Lost opportunity (G) is a loss of power that is determined by the difference between potential and actual opportunities:

$$G(t) = N(t) - P(t) \quad [7]$$

Integral capability (QL) is the socio-economic-ecological capability of a regional object, which characterizes the quality of life (QL), expressed in units of power per person (kW/person), and is defined as a direct product of the main social, economic and environmental indicators:

$$QL(t) = TA(t) \cdot U(t) \cdot q(t), \text{ where} \quad [8]$$

$\frac{T_{sp}(t)}{100 \text{ лет}}$ - average standardized life expectancy in the region;

T_{sr} - average life expectancy (years);

$U(t) = \hat{P}(t) / M(t)$ - overall standard of living;

M - population size;

$$q(t) = \frac{G(t - \tau_0)}{G(t)} - \text{quality of the natural environment.}$$

The following criteria are identified for forecasting target parameters:

1. “Zero growth” or stagnation is the absence of growth in the total produced product over a certain period (year, quarter), which indicates a lack of positive changes:

$$\Delta P = 0 \tag{9}$$

2. Growth is an increase in the total output of a product primarily due to an increase in the consumption of resources rather than due to an increase in the efficiency of their use:

$$\begin{cases} \Delta P > 0, \\ \Delta N > 0, \\ \Delta \varphi = 0. \end{cases} \tag{10}$$

3. Development is an increase in the total output produced primarily through increased efficiency in the use of resources rather than through increased consumption:

$$\begin{cases} \Delta P > 0, \\ \Delta \varphi > 0, \\ \Delta N = \text{const.} \end{cases} \tag{11}$$

4. Innovative development is development through increased efficiency in the use of resources through the implementation of more advanced technologies that generate greater income:

$$\begin{cases} \Delta P > 0, \\ \hat{\Delta P} > 0, \\ \Delta \varphi > 0, \\ \Delta N = \text{const.} \end{cases} \tag{12}$$

5. Sustainable innovative development is the preservation of innovative development in the long term in the context of negative internal and external influences due to a non-decreasing rate of growth in the efficiency of resource use, a reduction in the power of losses without increasing the rate of growth of resource consumption:

$$\begin{cases} P = P_0 + \Delta P \cdot t + \Delta^2 P \cdot t^2 > 0, \\ \hat{P} = P_0 + \Delta \hat{P} \cdot t + \Delta^2 \hat{P} \cdot t^2 > 0 \\ \varphi = \varphi_0 + \Delta \varphi \cdot t + \Delta^2 \varphi \cdot t^2 > 0, \\ \Delta G < 0, \\ \Delta N = \text{const.} \end{cases} \tag{13}$$

6. A decline is a decrease in the total produced product over a certain period (year, quarter), which means a decrease in the ability to meet needs:

$$\begin{cases} \Delta P < 0, \\ \Delta G > 0. \end{cases} \quad [13]$$

7. Accelerated decline is an accelerated decrease in the total produced product (“negative growth”) over a certain period (year, quarter):

$$\begin{cases} \Delta P < 0, \\ \Delta^2 P < 0, \\ \Delta G > 0, \\ \Delta^2 G > 0. \end{cases} \quad [14]$$

Thus, a regulatory framework for state regulation and management of industrial and innovative development in the regions, industries and enterprises of the Republic of Kazakhstan is proposed based on the best world standards and scientific developments in terms of energy and environmental parameters.

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新丝绸之路上的文化外交：加强中国与中亚之间的联系
**CULTURAL DIPLOMACY ON THE NEW SILK ROAD:
STRENGTHENING BONDS BETWEEN CHINA AND CENTRAL
ASIA**

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摘要：“一带一路”倡议是一项长期的冒险，旨在扩大中国对世界的开放，同时推动沿线国家的经济发展。这一倡议的成功实施取决于参与国的共同努力和相互合作。民心相通是该倡议的关键组成部分之一，也是该框架成功的关键“五大环节”之一。这种纽带是促进其他支柱有效实施的社会基础。民心相通的目的是促进社会和社区之间更多的理解和互动，加强中国与“一带一路”国家的合作。这对于培养社会和公众支持至关重要，这是该倡议顺利运作的基础，有助于实现共同未来的愿景。哈萨克斯坦、土库曼斯坦、吉尔吉斯斯坦、乌兹别克斯坦和塔吉克斯坦等中亚国家在该倡议中发挥着至关重要的作用，因为它们连接欧亚大陆和中国的桥梁，具有战略地位。该地区的重要性凸显了建立牢固的民间关系的必要性，以确保“一带一路”倡议的长期成功。对于中亚地区来说，这种对人际关系的关注与该地区的游牧传统相呼应，在游牧传统中，流动和文化交流是生存的核心。从历史上看，哈萨克斯坦和邻国的游牧民族促进了广阔领土上的商品、思想和文化的流动，“一带一路”框架内的民间联系可以看作是这种传统的延伸。虽然中国和中亚参与者之间的政治透明度和经济联系因“一带一路”倡议的提出而得到加强，但进一步促进民间关系仍然是一项复杂而长期的挑战。需要继续关注如何提高沟通渠道和方法的有效性。本文通过对文化交流项目的历史分析和比较分析，探讨了中国与中亚民间关系的演变。通过研究古代丝绸之路沿线的历史互动并评估当前的进展，该研究确定了主要挑战并提出了进一步加强这些联系的建议。加强这些联系将确保它们继续在“一带一路”倡议的未来中发挥关键作用，反映出游牧社会在连接中亚不同文化方面的历史作用。

关键词：人类丝绸之路；一带一路；人民之间的联系；文化外交；新丝绸之路；中亚。

Abstract. *The “Belt and Road” initiative is a long-term adventure aimed at expanding China’s openness to the world, while simultaneously driving economic development in the countries situated along its path. Successful implementation of this initiative hinges on the collective efforts and mutual collaboration of the participating nations. Among the key components of the initiative is the people-*

to-people bond, which forms one of the “five links” critical to the framework’s success. This bond serves as the social foundation that facilitates the effective implementation of the other pillars. The purpose of the people-to-people bond is to promote greater understanding and interaction between societies and communities, strengthening cooperation between China and the Belt and Road nations. It is essential for fostering social and public support, which underpins the smooth functioning of the initiative and contributes to the vision of building a shared future. Central Asian nations, including Kazakhstan, Turkmenistan, Kyrgyzstan, Uzbekistan, and Tajikistan, play a crucial role in the initiative due to their strategic location as a bridge between Eurasia and China. The region’s significance underscores the need for strong people-to-people relations to ensure the long-term success of the initiative. For Central Asia, this focus on interpersonal connections resonates with the region’s nomadic heritage, where mobility and cultural exchange were central to survival. Historically, the nomadic peoples of Kazakhstan and neighboring countries facilitated the movement of goods, ideas, and cultures across vast territories, and the people-to-people bond within the Belt and Road framework can be seen as an extension of this inheritance. While political transparency and economic bonds between China and Central Asian actors have galvanized from the declaring of the Belt and Road initiative, further progress in fostering people-to-people relations remains a complex, long-term challenge. Continued attention is required to improve the effectiveness of communication channels and methods. This article, through a historical analysis and comparative analysis of cultural exchange programs, investigates the evolution of people-to-people relations between China and Central Asia. By examining historical interactions along the ancient Silk Road and assessing current advancements, the research identifies key challenges and offers recommendations to further enhance these ties. Strengthening these bonds will ensure they continue to play a pivotal role in the Belt and Road initiative’s future, reflecting the historical role of nomadic societies in connecting diverse cultures across Central Asia.

Keywords: *Human Silk Road; Belt and Road; People-to-People bond; Cultural diplomacy; New Silk Road; Central Asia.*

Antique Silk Road robust into New Silk Road

At the end of 2013, during President Xi Jinping’s visit to Central Asia and Indonesia, he successively put forward the initiatives of the “Silk Road Economic Belt” and “21st Century Maritime Silk Road”, collectively known as the “Belt and Road” initiative. “This initiative has attracted widespread attention from the international community. China has prolonged inherited bonds with Central Asia, from Zhang Qian’s mission to the Western Regions to President Xi Jinping’s “Belt and Road” strategy. The Central Asian region is a crossroads of civilizations, ethnic groups, and religions, and it is also the focus of the largest and broadest number

of Belt and Road construction projects, the implementation of which depends on the mutual trust between China and Central Asian countries. Cultural diplomacy, understood as the deployment of cultural assets to promote mutual understanding and cooperation between nations, has gained increasing relevance in contemporary international relations. Unlike traditional diplomacy, which often focuses on political negotiations or economic agreements, cultural diplomacy emphasizes engagement with a nation's values, beliefs, and cultural practices to foster trust and peaceful interaction [1]. Central Asia, historically positioned at the heart of the Eurasian continent, has played a pivotal role in such exchanges, most notably through the ancient Silk Road. This route, initiated during the Han Dynasty with Zhang Qian's missions to the Western Regions in the 2nd century BCE, laid the foundation for enduring interactions between China and Central Asian societies. The Silk Road not only facilitated trade but also encouraged the transfer of knowledge, technologies like papermaking and ceramics, and cultural practices, fostering mutual respect and openness between these diverse civilizations. This early model of cross-cultural diplomacy has left a lasting legacy, one that continues to inform China's modern approach to its neighbors in Central Asia.

Following the collapse of the Soviet Union and the subsequent independence of Central Asian states in the early 1990s, China moved quickly to establish diplomatic relations with the newly sovereign nations [2]. These relationships initially focused on political and economic cooperation, have evolved, increasingly incorporating cultural diplomacy as a key component of China's regional strategy. The Belt and Road Initiative (BRI), launched in 2013, draws heavily on the historical symbolism of the Silk Road and aims to deepen these ties through the revival of cultural, economic, and infrastructural exchanges. As a result, people-to-people connections between China and Central Asia have been strengthened, allowing for greater mutual understanding and collaboration in areas such as education, arts, and cultural heritage preservation.

This article seeks to examine the impact of China's cultural diplomacy on its relations with Central Asia, with a particular focus on how these initiatives have fostered closer people-to-people ties. By analyzing both the historical foundations of the Silk Road and the modern diplomatic strategies employed under the BRI, this study argues that cultural diplomacy has been an essential element in building trust and advancing cooperation between China and the nations of Central Asia. Through the lens of cultural diplomacy, China has not only maintained its influence in the region but has also contributed to the development of more integrated and mutually beneficial partnerships [3].

The Foundation of People-to-People Communication Between China and Central Asian Countries

China's historical ties with Central Asia date back to ancient times, and these connections have laid a solid foundation for modern diplomacy and cooperation.

The ancient Silk Road was a key channel through which not only goods but also ideas, culture, and mutual respect flowed between these two regions. The people-to-people ties established along this trade route fostered a sense of shared destiny, cementing the cultural bonds between China and Central Asia that have endured throughout centuries. Today, the Belt and Road Initiative (BRI) reflects a modern resurgence of these historical links, strengthening both economic cooperation and social integration between China and Central Asian nations. Over the past few decades, China and the Central Asian states have progressively built “good-neighborly relations” and strategic partnerships at various levels, based on mutual respect, shared interests, and cultural exchange [4].

Central Asia’s strategic location in the heart of the Eurasian continent has long made it a key player in the historic Silk Road, which connected the ancient civilizations of the East and the West. The importance of controlling the trade routes through this region was paramount, as it was here that merchants, diplomats, and scholars exchanged not only goods but also knowledge, technology, and cultural practices. Emperor Wu of the Han Dynasty’s decision to send Zhang Qian on diplomatic missions to the Western Regions in the 2nd century B.C. exemplified China’s early attempts to establish peaceful and cooperative ties with Central Asia [5]. Zhang Qian’s journey opened the gateway for friendly exchanges that would come to define China-Central Asia relations for centuries.

The Silk Road was much more than a trade route—it was a corridor for civilizational dialogue. Chinese goods, including silk, porcelain, and medicinal herbs, were traded for Central Asian products, while technologies such as papermaking and ceramics manufacturing were shared. These exchanges were conducted in an atmosphere of openness, mutual respect for cultural and religious differences, and a recognition of varying levels of economic development. As a result, a durable “bridge of communication” was established, which helped perpetuate long-lasting friendship and cooperation between China and the Central Asian countries. This historical connection continues to serve as a symbol of the region’s intercultural ties and is frequently invoked in modern initiatives like the BRI, which aims to promote people-to-people diplomacy in the 21st century.

China’s diplomatic strategy along the Silk Road has always emphasized cultural tolerance and mutual benefit, which has ensured the longevity of its relationships with Central Asian states. The shared history of cooperation along this trade route is still commemorated today, serving as a historical witness to the friendship between China and Central Asia. Through this historical lens, modern initiatives like the BRI have reinvigorated these ancient ties, reaffirming the importance of cultural diplomacy in shaping the future of China-Central Asia relations.

China’s Exchanges with Central Asian Countries Post-Independence

Following the collapse of the Soviet Union, the newly independent Central Asian states began charting their development courses. China promptly moved to

establish diplomatic ties with these nations, with official relations forming soon after a Chinese delegation visited the region in early 1992. By March of that year, the Uzbek President, Islam Karimov, became the first Central Asian leader to make an official visit to China, where the “China-Uzbekistan Joint Communiqué” was signed. This set the stage for ongoing exchanges between China and other Central Asian leaders.

In the early days of these relations, there was some hesitation from Central Asian countries towards China, partly due to historical border issues. While Chinese citizens were increasingly traveling to Central Asia, fewer Central Asians visited China, and trade remained modest. Over time, however, as high-level exchanges increased and Chinese goods became more widely available in Central Asia, a deeper mutual understanding began to take root. This growing interaction laid the groundwork for broader cooperation across various sectors, including trade and culture.

Cooperation within the Shanghai Cooperation Organization (SCO) Framework

The establishment of the Shanghai Cooperation Organization (SCO) in 2001 opened a new chapter for China-Central Asia relations, particularly in terms of security and multilateral cooperation. What began as an organization to foster trust and stability soon expanded into a platform for broader economic and political engagement across fields such as trade, energy, culture, and education.

Under the SCO framework, cultural exchanges have played a significant role in strengthening ties, especially in education. China has provided numerous scholarships to students from Central Asia, and cross-cultural initiatives have proliferated. At the first Belt and Road Forum for International Cooperation, President Xi Jinping announced that the Chinese government would offer 10,000 scholarships annually to BRI-participating countries to promote international educational and cultural exchanges.

Kazakhstan, a key player in the region, has been deeply involved in these initiatives, particularly in energy cooperation. The China-Kazakhstan oil pipeline, China’s first land-based transnational pipeline, is a prime example of the deepening relationship between the two nations. Additionally, Kazakhstan’s energy infrastructure is expanding, with petrochemical plants under construction and the ongoing modernization of the Shymkent oil refinery. President Kassym-Jomart Tokayev emphasized this cooperation, stating [6]: “Currently, petrochemical plants are being built in Kazakhstan. The modernization of the oil refinery in Shymkent is ongoing. Measures have been taken to increase the capacity of the Kazakhstan-China oil pipeline. I am confident that shortly, these projects will contribute to the development of the economy of Kazakhstan.”

Tourism cooperation between China and Kazakhstan has also grown rapidly, facilitated by the introduction of a visa-free regime that allows for easier travel.

With 2024 designated as a significant year for Kazakhstani tourism in China, experts anticipate increased tourist flows between the two countries. [7]

During a briefing on July 3, 2024, Chinese President Xi Jinping underlined the importance of expanding cooperation within the framework of the Belt and Road Initiative. He stated [8]: “We will effectively cooperate within the framework of the Belt and Road Initiative. A new goal has been set – to double trade turnover in the shortest possible time. We agreed to continuously deepen cooperation in such traditional sectors as trade and economy, investment, industrialization, transport connectivity, and energy. We will actively implement the roadmap for the implementation of the trade and economic cooperation program and accelerate the construction of the Trans-Caspian International Transport Route and the third cross-border railway between our countries. We intend to jointly cultivate new growth points in such areas as key mineral resources, alternative energy sources, scientific and technological innovation, aviation and space, and digitalization.”

This continued and expanding cooperation between China and Central Asia—whether through energy projects, educational exchanges, or tourism—highlights the lasting impact of the SCO and the Belt and Road Initiative on regional relations.

For over two decades, China and Central Asian countries have maintained strong diplomatic relations, which have been significantly bolstered by the introduction of the Belt and Road Initiative (BRI) in 2013. This initiative has led to further deepening of bilateral ties, elevating relationships to new heights. China has established comprehensive strategic partnerships with multiple Central Asian nations, starting with Kazakhstan in 2011, followed by Uzbekistan, Tajikistan, Kyrgyzstan, and Turkey in the following years. The frequent interactions between national leaders, such as the numerous visits of former Kazakh President Nazarbayev to China, have strengthened trust and laid a solid foundation for more practical cooperation.

The strategic partnerships formed between China and Central Asian countries have facilitated greater alignment of development goals. For example, the BRI has been synchronized with Kazakhstan’s “Bright Road” initiative, Kyrgyzstan’s “National Development Strategy for 2018-2040,” and Tajikistan’s “National Development Strategy before 2030.” This strategic alignment has deepened cooperation and paved the way for mutual development.

However, while Central Asia has shown enthusiasm for stronger ties with China, the region’s diverse historical, cultural, and religious contexts create unique challenges in fostering people-to-people connections. These factors highlight the importance of enhancing cultural and educational exchanges to strengthen mutual understanding and ensure sustainable political trust.

The establishment of Confucius Institutes in Central Asian countries plays a crucial role in advancing cultural ties. There are currently 13 Confucius Institutes

across the region, but their distribution is uneven, with Turkmenistan yet to host one. Expanding these institutes is key to meeting the growing demand for Chinese language education, providing platforms for mutual cultural understanding, and countering misconceptions such as the “China Threat Theory.” Strengthening educational and cultural links will not only enhance China’s influence in the region but also help cement long-term political trust.

Expanding Cooperation in Media and Cultural Industries

Strengthening media cooperation has also become a vital tool for enhancing people-to-people exchanges between China and Central Asian countries. Over the past years, both sides have achieved significant progress under frameworks such as the Shanghai Cooperation Organization and the Belt and Road Initiative. However, miscommunication and misunderstandings, often fueled by negative media portrayals, have led to skepticism between the regions.

To counter this, it is important for both Chinese and Central Asian media to deepen their cooperation by expanding positive narratives that reflect the benefits of their partnership. Joint media initiatives—such as producing films, news reports, and documentaries—can serve to highlight shared values and achievements, promoting mutual understanding. The use of new media platforms like social networks and digital apps to circulate information and visuals will also be crucial in shaping a positive public perception.

For instance, collaborative projects like the film “The Musicians” have demonstrated the potential of using storytelling to foster deeper emotional connections. By continuing to promote such creative partnerships, China and Central Asian countries can nurture an environment of trust, cultural exchange, and mutual appreciation.

In conclusion, stronger cooperation in media, education, and cultural exchange is essential for building a deeper, more lasting strategic trust between China and Central Asia, ensuring a foundation for sustainable partnerships across political, economic, and social spheres.

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俄罗斯非政府认证机构对职业教育项目质量的评估
**ASSESSMENT OF THE QUALITY OF VOCATIONAL EDUCATION
PROGRAMS BY NON-GOVERNMENTAL ACCREDITATION
ORGANIZATIONS IN RUSSIA**

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摘要。本文作者提出了外部独立的、替代性的国家教育质量评估——公共和专业认证的相关性、它们的区别、原则和功能；在文章中，考虑到俄罗斯教育的特殊性，认识到实现教育过程高质量的重要性，分析了基于国际教育质量标准的原则；得出结论：在俄罗斯发展公共和专业认证程序的可行性，西方国家和美国通过教育质量保障标准实施质量政策的活动中取得了高度成功，以及借鉴国际经验建设俄罗斯专业教育项目公共和专业专业知识体系的可能性和必要性。

关键词：国家认证、专业和专业认证、专业知识、教育组织、公共和专业专业知识模式。

Abstract. *the authors of the article present the rationale for the relevance of external independent, alternative state assessment of the quality of education - public and professional accreditation, their differences, principles and functions; in the article, taking into account the specifics of Russian education and recognizing the importance of achieving high quality of the educational process, an analysis of the principles based on international criteria for the quality of education is given; a conclusion is made about the feasibility of developing the procedure of public and professional accreditation in Russia and the high degree of success of the activities of Western countries and the United States in implementing quality policies through education quality assurance standards, as well as the possibility and necessity of using international experience in building systems of Russian public and professional expertise of professional educational programs.*

Keywords: *state accreditation, professional and public accreditation, expertise, educational organization, model of public and professional expertise.*

The main procedure for assessing the activities of educational organizations in Russia is currently state accreditation, which involves comparing their activities with a certain system of quantitative dynamic indicators. The actualization of the external independent, alternative state assessment of the quality of education is due to the fact that the state seeks to increase the level of competitiveness of universities and institutes in the educational services market, creating an attractive image through “trust in the diploma” of the educational organization among consumers of educational services and in the professional community, represented by potential employers.

Public and professional assessment of the quality of educational programs is an examination of the quality indicators of activity, helps to identify key problems in ensuring the quality guarantee of higher education, provides support in developing directions for the development of the organization as a whole and improving educational programs in particular.

Providing an opportunity to build vectors for the improvement and development of universities and institutes, highlighting competitive advantages, expanding educational and scientific ties, ensuring a high degree of trust in the educational organization on the part of consumers in the programs being implemented and graduates who graduated from this university, is also carried out by assessing the quality of higher education programs in the form of public and professional expertise. Since 2005, the development and widespread use of new technologies for assessing the quality of education systems have been rapidly growing in Russia, which has today led to an impressive segment of independent accreditation organizations that, to one degree or another, are engaged in assessing the quality of education in accordance with European and global standards. These standards, implementing institutional or specialized accreditation, are both universal and specialized.

In practice, we encounter a sufficient number of regional non-governmental structures with a partially “closed” character, for example:

- autonomous non-profit organization “Accreditation independent center for economic specialties”;
- regional centers for certification of professional qualifications (by profile);
- chambers of commerce and industry;
- associations of employers, with the functions of public and professional accreditation of programs and subsequent certification of qualifications of graduates of specific programs for training specialists in specific sectors of the national economy, etc.

In this study, below we provide only a short list of organizations whose experience is broadcast at the federal, and earlier at the international level, having an institutional nature:

- National Center for Public and Professional Accreditation (Natsakkredtsentr) [1];
- Center for Public and Professional Accreditation of Educational Organizations - Association of Non-Commercial Educational Organizations of the Regions of the Russian Federation (AsNOOR) [2];
- Agency for Public Control of Education Quality and Career Development (APCEQCD) [3];
- Accreditation Center of the All-Russian Public Organization “Association of Engineering Education of Russia” (AC AEER) [4].

The above-mentioned organizations directly involved in professional and public accreditation of programs, before the introduction of sanctions, were distinguished by the fact that, using the world (European) experience of assessing the quality of education, they took part in international projects, involving foreign experts in the examination of programs, acting as participants in the procedures for assessing programs in foreign countries. These organizations carry out activities to attract employers and students, introducing other target settings and examination technologies that differ from state accreditation.

It should be noted that successful completion of the professional and public accreditation procedure is evidence of high assessment by the professional community, and, consequently, recognition of the quality of training in a given specialty in a particular educational institution [5], and educational organizations use the results of the examination not only for broader and more complete information of the public, protection of the interests of students and potential employers, but also for improvement of the process of quality management of education.

Completion of the professional and public accreditation procedure is also relevant in connection with the possibility provided for by the Federal Law “On Education in the Russian Federation” No. 273-FZ to submit the results of professional and public accreditation to the accreditation body for consideration during state accreditation or distribution of target figures for admission of applicants [6].

The main principles of this type of accreditation include:

- voluntariness and independence;
- professional and public nature of the examination;
- openness, reliability and relevance of information on the procedures of public and professional examination;
- frequency of quality assessment of training programs;
- competence and objectivity;
- collegiality of decision-making and wide publicity of positive results;
- confidential information in case of a negative expert evaluation of the program [7].

To pass the public-professional examination of the educational organization’s programs, it is necessary not only to have a license for educational activities, but

also to receive sufficient recognition from both the professional, academic and scientific community.

The purpose of conducting a public-professional examination, which assumes responsibility for informing the public and state education authorities about the quality of education in a particular educational organization, is an assessment procedure that includes thirteen criteria for assessing the quality of educational services, largely affecting the quality management system in the educational organization, analyzing and assessing the quality of educational services provided by the educational organization. At the same time, through public (professional-public) accreditation, assistance is provided in improving the efficiency and quality of educational activities.

Taking into account the specifics of Russian education and recognizing the importance of achieving high quality of the educational process, members of associations and centers undertake to be guided in their activities by principles that are based on international criteria for the quality of education:

- strict compliance with the regulatory framework for conducting educational activities, which is regulated by the legislation of the Russian Federation;
- systematic development and improvement of the system for improving the quality of education;
- the presence of an original system of effective quality control of the educational process with a clearly formulated mission, a developed development program, a concept for organizing the educational process in a specific educational organization;
- compliance of the personnel (teaching and administrative staff) and material and technical support of the organization with the concept of educational activities, including constant updating of the library collection, as well as the use of modern information and technological resources in the educational process;
- systematic advanced training of all participants in the educational process;
- creation and use of high-quality educational programs and materials that meet modern requirements;
- maintaining the motivation of students to actively develop professional competencies, involving them in the process of acquiring knowledge, skills and abilities, including through creative, research and project activities, with the involvement in active participation in Olympiads, competitions, festivals, competitions and contests;
- ensuring comprehensive safety of the organization's activities, including systematic monitoring studies of the health of students and teachers with the active use of health-saving technologies;
- ensuring a friendly atmosphere in the organization that would contribute to the successful mastering of the educational program, fruitful work and disclosure of the potential of both students and teachers;

- information openness of the educational organization and active participation in the life of the professional community.

The subject of public and professional accreditation in an educational organization are:

- education quality management system;
- the content, quality, level and focus of training students in the educational programs being implemented;
- the quality and composition of the comprehensive educational environment;
- openness and information positioning at the level of a constituent entity of the Russian Federation, in Russia and abroad.

The main principles of professional accreditation remain:

- voluntary and declarative nature of public accreditation;
- compliance with professional ethics standards, with the suppression of conflicts of interest;
- maintaining confidentiality and priority of the applicant's decision in disclosing the results of the procedure;
- motivation of the educational organization to provide complete and reliable information on the subject of public accreditation;
- presumption of good faith of the educational organization when disclosing information and presenting the results of its activities;
- reasoned agreement on the composition of participants in public accreditation, the level of professional competence and qualifications of experts;
- the possibility of appeal in accordance with the Regulations.

The decision and report on the result of public accreditation are formed on the basis of expert assessments obtained as a result of a comprehensive analysis of the materials of the educational organization's self-examination and external audit. The report prepared by the group of experts is a detailed conclusion on the compliance or non-compliance with the accreditation criteria of the accredited program, including individual opinions of the commission members.

If the result of public accreditation is positive, the educational organization receives a Certificate of Public Accreditation for a period of 5 years, information about which is open and provided to interested organizations, including bodies implementing the state procedure for accreditation of educational organizations.

It should be noted that the guarantors of the compliance of the level of educational programs with the minimum acceptable requirements of federal state educational standards in the domestic system of higher education are federal education management bodies (state accreditation), and the bodies of professional and public accreditation represent the recognition by the professional community of significant achievements of the organization in training specialists and conducting scientific research, guaranteeing an increased level of a particular educational program

implemented in a specific educational organization. Therefore, this assessment should be carried out by independent specialized accreditation organizations or agencies created by various public communities.

The basic model of public and professional expertise of vocational education programs is the procedure for analyzing the official website of an educational organization, in order to obtain complete information about the educational programs implemented in the educational organization, in order to identify the dynamics of graduate employment, their demand among the professional community, etc.

We have attempted to develop a sample expert sheet, which includes in its content indicators and criteria for evaluating the website of an educational organization in terms of the completeness of the available information about the programs implemented, which will allow, firstly, the expert to obtain objective information about the success of graduates in passing the state final certification procedure and to find out the percentage of those who received “good” and “excellent” grades when calculating the proportion of graduates whose diploma theses (projects) found practical application in specialized organizations; to identify the proportion of graduates and students of the educational program who became winners and prize winners of Olympiads, professional skills competitions, scientific conferences at the federal and international levels [8]. Secondly, it will allow us to determine the demand for a professional educational program and the demand for graduates of this program. We consider the following to be the main indicators:

- the share of graduates who found employment in the specialty they received in the educational organization during the first year;
- the share of those studying on the basis of target contracts and contracts for training at the expense of legal entities;
- the share of students who completed various types and kinds of internships and received a job offer as a result;
- the availability of information on career growth during work.

Thirdly, it will allow us to identify the compliance of the planned results of mastering the program formulated in the professional educational program with professional standards and modern labor market requirements.

Fourthly, it will allow us to monitor the compliance of the curriculum, work programs of academic subjects, courses, disciplines (modules), assessment materials and procedures with the planned results of mastering the educational program.

Fifthly, an assessment will be made of the availability of material and technical, information and telecommunications, educational and methodological, personnel and other resources in the educational organization. And finally, through the website of the educational organization it is possible to obtain information confirming the participation of employers in the design of the professional educational program.

It should be emphasized that the indicators included in the expert list are valuable not only when passing professional and public accreditation, but also for organizations that really want to demonstrate the demand for their programs and the high level of training of their graduates in the educational environment and in the area of professional demand [9].

It should be noted that all accreditation organizations that assess the quality of educational programs design their own unique standards, regulations, management, methodological and methodological support, which is conceptually built in the context of international standards and criteria for ensuring the quality of education, but in aggregate are identical to each other.

In most cases, the organization carrying out the assessment is a full member of international associations / agencies (organizations) on issues of education quality or is certified, accredited by the said association / agency.

We also emphasize that an obligatory component of the mechanism for implementing assessment procedures is the creation of an expert community. In conclusion, I would like to note that a comparative analysis of the public-professional assessment of the quality of professional educational programs in foreign and domestic theory and practice allowed us to conclude that it is advisable to develop this procedure in Russia and the high degree of success of Western countries and the United States in implementing quality policies through education quality assurance standards, as well as the possibility and necessity of using international experience in building systems of Russian public-professional assessment of professional educational programs.

The main features of public-professional expertise are:

- independence from the state, since it is carried out by non-governmental accreditation organizations;
- voluntary public-professional assessment of the quality of programs, the right of an educational organization to undergo or not undergo public-professional expertise;
- wide publicity about a program that has successfully passed accreditation and received a certificate of accreditation of the program and non-disclosure of information in case of a negative decision [10].

Public-professional expertise of higher education programs has the potential to be a tool for recognizing the high quality of the implementation of educational programs and training of specialists in various fields for compliance with the standards of professional-public accreditation, correlating with the European standards for ensuring the quality of education ESG-ENQA.

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继续教育实施中的反向指导

**REVERSE MENTORING IN THE ASPECT OF IMPLEMENTATION
OF CONTINUOUS PEDAGOGICAL EDUCATION**

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摘要。如今,人们对指导(一种用于经验转移、基于信任和伙伴关系的能力形成的技术)的研究和应用兴趣不断增加。本文介绍了反向指导在教师教育中的潜力。反向指导是建立代际教师关系的有效手段,有助于年轻教师和经验丰富的教师之间的互利合作,实施他们的专业发展计划,以及设计个人的教育和职业轨迹。反向指导解决了教学经验的连续性和代际沟通的问题。

关键词: 指导、反向指导、继续教师教育、教师。

Abstract. *Today, there is a steady research and applied interest in mentoring - technology for the transfer of experience, the formation of competencies based on trust and partnership. The article presents the potential of reverse (reverse) mentoring in teacher education. Reverse mentoring is an effective means of building relationships between generations of teachers, contributing to mutually beneficial cooperation between young and experienced teachers, the implementation of programs for their professional development, and the design of an individual educational and career trajectory. Reverse mentoring solves the problem of continuity of pedagogical experience and intergenerational communication.*

Keywords: *mentoring, reverse mentoring, continuing teacher education, teacher.*

In recent years, the system of continuous pedagogical education in Russia has been characterized by progressive development: future teachers - senior students - have received the right to work in educational organizations, specialized psychological and pedagogical classes are being created, programs for training, retraining and advanced training of the teaching staff of pedagogical universities are being modernized, etc. As we can see, a lot is being done in this direction, and mentoring of any kind plays an important role in this process.

In accordance with the Concept of training teaching staff for the education system for the period up to 2030, “mentoring is a universal technology for transferring experience, knowledge, developing skills, competencies, metacompetencies and values through informal mutually enriching communication based on trust and partnership” [1].

In this article, we will reveal the potential of reverse mentoring in relation to the field of education. The term “reverse mentoring” was proposed by J. Welch in 1999. It was mainly used in the business sphere as a strategy for building relationships between generations [2, p. 91] and a way of transferring knowledge.

T.S. Dorokhova and Yu.N. Galaguzova understand “reverse mentoring” as “pedagogical interaction in which the mentor has a lower status (age, experience, position) than the mentee; aimed at replenishing the deficit of the mentee in professionally significant competencies, based on trust, equality and active cooperation” [3, p. 160].

The increased interest in reverse mentoring today is explained by the fact that it erases possible boundaries between generations, barriers between managers and subordinates, allowing all participants to feel more comfortable and confident in various situations. In general, it is associated with such a phenomenon as generational change. Society is heterogeneous, several generations live, study, and work in it at the same time. Reverse interaction between generations allows us to use positive generational characteristics to the maximum, thereby achieving a high level of professional skills among representatives of different generations. However, despite the extreme popularity of reverse mentoring, there are still many unanswered questions that require the most careful attention, which many researchers and teaching practitioners are trying to solve. These questions are mainly related to the methodology of this type of mentoring, both at the theoretical and technological levels. As we can see, there is a lot of talk about this today, but there is still no sufficient theoretical basis. However, based on the available sources, we can highlight the essential characteristics of reverse mentoring. Reverse mentoring differs significantly from traditional mentoring, primarily in that the traditional roles of the mentor and the mentee change: a less experienced employee acts as a mentor to a more experienced specialist. Traditional mentoring involves vertical interaction between a mentor and a mentee, while in the case of reverse mentoring

we have horizontal connections based on trust and cooperation between young workers and experienced interns. Thus, a reverse interaction is built, the purpose of which is to resolve issues of introducing new trends and technologies into a particular sphere of life, increasing the competence of older employees in the field of information technology, increasing their motivation and removing fears associated with the future [4]. In our case, the participants in such interaction are an experienced and a novice teacher. The former are characterized by conservatism, orientation towards traditional forms and methods of teaching and education within various disciplines. For young teachers - ambition, a desire for creativity, a desire to prove themselves in the professional field, to increase the level of their competence in a particular area. As a rule, both parties win, since their mutually beneficial cooperation increases motivation and job satisfaction, therefore, the organizational climate and organizational culture in the teaching staff itself improve. As noted by E.V. Migunova, M.A. Zhigalik and V.N. Averkin, “reverse mentoring is useful in developing professional relationships between subjects of the educational process of different ages, in designing and implementing their individual educational and career trajectory” [5].

In the context of reverse mentoring, each generation reversely enriches educational relationships with each other. During regular meetings between mentors and mentees, there is an exchange of pedagogical innovations and traditions that have formed to date in psychological and pedagogical education, they reveal their potential to the maximum, exchange methods that have become firmly established in the practice of teaching various disciplines, as well as new ones that have appeared as a result of the modernization of the modern education system and the active implementation of digital technologies. Thus, the team accumulates organizational and corporate knowledge through corporate training, creates sustainable channels for training personnel, and builds a long-term career strategy. Reverse mentoring also effectively develops the leadership qualities of participants, reduces the gap between generations of teachers, solves the problem of continuity of pedagogical experience, allows formalizing the rich methodological experience of the older generation of teachers, creating modern digital educational content necessary in teaching various disciplines at the present stage, and quickly adapting to changes in the context of the digital transformation of education, etc. In other words, reverse mentoring allows experienced teachers to cope with the difficulties of implementing educational activities in the digital educational environment. Practice shows that this mentoring model needs to be implemented, since its potential is quite large.

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俄罗斯高校留学生教育: 挑战与前景

EDUCATION OF FOREIGN STUDENTS IN RUSSIAN UNIVERSITIES: CHALLENGES AND PROSPECTS

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摘要。本文分析了新西伯利亚大学培养留学生的传统, 突出了学生学术流动的个性化方面, 并指出了不同留学生群体的跨文化交流特点。

关键词: 俄语作为外语、留学生、教育输出、跨文化交流、民族心态。

Abstract. *The article analyzes the established tradition of training foreign students in universities of Novosibirsk, highlights individual aspects of academic mobility of students, and notes the features of intercultural communication in various groups of foreign students.*

Keywords: *Russian as a foreign language, foreign students, education export, intercultural communication, national mentality.*

Attracting foreign students to study at Russian universities (including military ones) is currently one of the most important challenges facing the modern system of training specialists. As we have already noted earlier, “the number of foreign students in a university is one of the main indicators taken into account in the accreditation procedure of a higher education institution, and one of the indicators of the internationalization of the university’s activities. It is used by such well-known world university rankings as QS World University Rankings and Times University Ranking” [3; 5]. In addition, this is a matter of the country’s prestige.

Russia strives to ensure that its universities are among the best educational institutions in international rankings.

In which countries is Russian higher education considered prestigious? According to experts, the largest number of students coming to Russia are from the CIS countries, this contingent makes up 79% of the total number of foreign students. Then come representatives of Africa, Asia and the Middle East. The smallest number of students come to us from North America and Australia.

Russia has adopted the program “Export of Education”, designed until 2025. The program includes 39 universities of the country. Within the framework of this educational project, the number of foreign students in Russian universities should be about 700 thousand people. Novosibirsk has always been an attractive place for studying for foreign students. The Novosibirsk Scientific Center in Akademgorodok, Novosibirsk State University are world famous.

Today, 7.9 thousand foreign students from 54 countries study at local universities. Currently, 12 higher educational institutions of the city carry out the training of foreign students. Three years ago, 4.7 thousand foreigners studied at Novosibirsk universities. The largest number of students comes from Kazakhstan (more than 6 thousand students per year). In second place is Tajikistan. In third place is China. According to the plans of the Ministry of Education of the Novosibirsk Region, by 2024 the number of foreign students in the city’s universities should be 15.6 thousand people [4]. Will this trend change? The British Council (“Megatrends: the Future of International Education and Post-graduate Student Mobility Trends to 2024”), based on an analysis of data obtained in 56 countries, predicts the following situation by 2024: “international student mobility will look like this: the main suppliers of young people of student age (from 18 to 24 years old) will be the following countries: Nigeria (8.3%), India (7.5%), Pakistan (6.4%), Indonesia (7.2%), Saudi Arabia (5.2%). Despite the fact that the number of young people in China is expected to decrease from 120 million people in 2012 to 80 million people in 2024, it will remain the main supplier of students for foreign universities. But countries such as Greece, Poland, South Korea, and Taiwan will significantly lose their positions compared to 2012” [3; p. 156] and will practically stop sending their youth to study abroad.

Today, Russia “provides higher education services to 270,000 foreign students, earning less than \$1 billion a year, while Australia, with the same number of students, earns \$18 billion.” [4].

Until recently, foreign students chose Moscow and St. Petersburg as places to study. Peoples’ Friendship University of Russia (RUDN) and St. Petersburg State University (SPbSU) have always been attractive universities for students from foreign countries. St. Petersburg Polytechnic University (SPbPU) also occupied a leading position.

But today the situation is changing. More and more foreign students choose Kazan Federal University, Novosibirsk State Technical University, Tomsk State Polytechnic University and other universities of the country as their place of study.

What areas and specialties are in demand among foreign students at Russian universities? Technical specialties (22% of students) and medical education (17%) are still popular. Business education and economics attract 16% of students, humanities programs - 12%, and studying the Russian language - 11%. This trend is characteristic not only of Russian universities, it reflects the situation in the world.

One of the important issues facing a foreign student is the issue of adaptation. The management of Russian universities does everything to create a favorable environment for students from abroad. In the Russian Federation, the educational system does not divide students into “ours” and “others”. Russian and foreign students study on the same terms, and tuition fees in most universities of the country are the same for everyone. In addition, many foreign students note the comfort, safety of living, and the friendly attitude of the local population towards foreigners. The advantages of today’s situation include a more attractive and affordable cost of education and accommodation in Russia compared to other countries.

The education of foreign students in Russia begins with their study of the Russian language, and teaching Russian as a foreign language “has recently come to be seen as teaching intercultural communication. The personality of the Russian language teacher largely influences the formation of the attitude of foreign students towards all native speakers of Russian - representatives of Russian culture” [1].

The success of communication depends largely on how prepared the teacher and the student are for communication. Different countries have different pedagogical models. Differences may concern the following points: “the social status of the teacher; the idea of distance in the educational process and acceptable closeness in communication outside of it; the dominant pedagogical style of teaching (authoritarian, democratic, liberal, partnership, etc.); the national form of teaching (intensive, extensive, playful, individualized, etc.); range of topics and problems that can be discussed; forms and methods of monitoring and evaluating educational activities; attitudes towards sanctions, etc.” [3; p. 54-55]. Using certain methodological achievements of Russian pedagogy in general during the educational process, it is necessary to develop linguodidactics of Russian as a foreign language in higher military educational institutions as well.

And here it is necessary to take into account the fact that in the Russian education system, “partnership relations between a teacher and a student are considered traditional, the educational process is not focused on any one textbook, and independent interpretation of the material by the student is encouraged. But, for example, in the Asian pedagogical system, the teacher and the student are in a relationship of strict subordination, as a rule, one source of information is used in the educational process, the listener passively assimilates the presented educational material, and the student’s independence in the educational process is not

stimulated. That is why creative types of assignments, violations of the sequence of assignments presented in the textbook, and supplementing the textbook with other educational materials are not recommended for cadets from Asian countries” [1]. If a teacher of Russian as a foreign language does not have such knowledge in the field of intercultural communication, then his aggressive manner of communication, fast speech rate, verbosity, and sharp increase in tone of voice can cause cultural shock in representatives of Asian cultures. This background knowledge must be taken into account when solving a wide variety of methodological problems: choosing a teaching aid, compiling methodological developments, as well as plans for practical classes.

For example, when working with an African audience, a Russian language teacher should not resort to a democratic style of communication, since “in the pedagogical tradition of most African countries, there is a significant distance between the teacher and students; reducing or eliminating this distance may be regarded by them as a manifestation of weakness and disrespect for their own personality (which African students are very afraid of in relation to themselves), inability to properly organize the educational process, and even not very high competence of the teacher” [1]. A characteristic feature of students from Middle Eastern countries is their constantly demonstrated religiosity and heightened emotionality. These students “are often restless, not attentive enough, they lack the skill of systematic (and especially independent) study work. They are distinguished by excessive sociability. Usually, they are characterized by an inflated self-assessment of the achieved educational results; they react very painfully to criticism, which requires the teacher to pay special attention to the choice of forms and methods of monitoring and evaluating their educational activities” [1], this should also be taken into account when solving certain methodological problems and methods of their implementation. The least difficult work is with students from countries whose culture is oriented towards Europe, since the pedagogical traditions of Russia and many European countries are similar. Researchers note that “the common thing is the recognition of the importance of using the entire experience of human civilization and enriching modern society with the spiritual heritage of previous generations” [1]. Therefore, studying the Russian language for this contingent of students is “not only the acquisition of vocabulary and grammar, but also knowledge of the culture of the country. In this regard, such educational material will be of interest to him, which contains cognitive, pragmatic, cultural and aesthetic components” [1]. But even when working with this audience, problems may arise. Some researchers of Russian speech etiquette note that the average Russian speaks and thinks faster than the average representative of the rest of Europe. Therefore, “the habit of some Russian language teachers to rush students with an answer often causes justified protest among Europeans. Students from Europe are usually

friendly and sociable, but the talkativeness and verbosity of native Russian speakers often turn out to be unexpected for reserved Europeans” [1] and undesirable.

Thus, we have touched upon only a part of the problems that arise when teaching foreign students in the Russian educational space. Many years of experience in developing the methodology of teaching Russian as a foreign language definitely reflects and takes into account the peculiarities of the national mentality, allows finding the shortest paths to successfully achieving educational goals.

As for the prospects for the education of foreign students in Russian universities, today this is a matter of close attention from the government. The President of the Russian Federation has set the task of increasing the country’s non-resource exports by \$100 billion in the coming years, and this is, first of all, Russian education. Today, the state considers the education of foreigners in Russia as one of the ways to solve long-term strategic problems in a difficult international situation: “in addition to economic benefits, the education of foreign students in Russia has strategic significance - through the training of the intellectual elite and the dissemination of the Russian language and culture, Russia’s international influence in the world community increases” [2; p. 172].

Unfortunately, the possibilities for exporting Russian higher education are currently limited by the lack of a single national operator in the country that would help Russian universities promote their educational services abroad. Rossotrudnichestvo partially performs these functions, but its work is still far from perfect.

A positive aspect is that today Russia has adopted the “Export of Education” program, designed until 2025. This project sets the task of at least doubling the number of foreign citizens studying in higher education institutions and scientific organizations, as well as implementing a set of measures to employ the best of them in the Russian Federation. The program includes 39 universities in the country. These universities include 3 Novosibirsk universities.

We must learn to bring expensive educational programs to the international market, learn to compete for foreign students, learn to promote Russian higher education institutions, both civilian and military, to advanced positions. This will not only attract additional financial resources to universities, but also enhance the academic reputation of our higher education institutions, promoting them in international university rankings.

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分布式导航与性别第二次人口转型时代的家庭制度
**DISTRIBUTED NAVIGATION AND GENDER THE FAMILY
SYSTEM IN THE ERA OF THE SECOND DEMOGRAPHIC
TRANSITION**

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摘要。本文分析了家庭作为一个分布式导航和性别系统，以及其传统家庭制度瓦解的问题，这是第二次人口转型和性别导航范式背景下极其重要的社会现象，是大都市生态和符号领域的一个风险因素。

关键词：家庭、性别、第二次人口转型、笛卡尔人类学、他心、自我中心导航、自闭症谱系障碍、性别认同。

Abstract. *The article analyzes the family as a distributed navigation and gender system, with its problems of the disintegration of the traditional institution of the family, as an extremely significant social phenomenon in the context of the second demographic transition and the navigational paradigm of gender, acting as a risk factor for the ecological and semiotic sphere of the metropolis.*

Keywords: *family, gender, the second demographic transition, Cartesian anthropology, allocentric, egocentric navigation, autism spectrum disorders, gender identity.*

In 2019-2024, we conducted a number of studies to identify risk factors for mental and psychosomatic health of the individual, adaptation to them in conditions of induced military stress, autism spectrum disorders (ASD), gender identity disorders (GID), and others [1-5]. Some of the conclusions were formulated in the dissertation study “Hygienic aspects of prevention and principles of personalized recovery of autism spectrum disorders in children” [1]. Thus, the risk factor for ASD, identified as a result of our own research, turned out to be of a semiotic nature [1], with signs of self-similarity of the epidemic dynamics of ASD [2,3], with the loss of reproduction by the modern family in children of the structures of the mechanism of recoding communications of two navigation systems: allocentric and egocentric, due to a decrease in the gender gap in the family, with a

simplification of the code diversity of intra-family communication circuits, with a general tendency towards automatization (atomization) in the ecological systems of rapidly increasing urbanization and globalization [1-3]. In the mentioned study, it was possible to quite accurately fit the epidemic curve of ASD into the model of the second demographic transition (SDT) of S.P. Kapitsa, as the second phase of the demographic growth of humanity, thereby forming a common family of hyperbolic curves, causing a decline to negative values of the second derivative (acceleration) of the curve on the graph of the second phase of demographic growth [1-3]. Significant aspects of the psychological theory of personality and gender as its navigational construct [5-9], family as a distributed navigation system [9-13] were discovered. Deep mechanisms of heterogeneous semiotics (in the paradigms of Yu. M. Lotman and W. Eco) [1] were revealed as a result of the “gender gap”, revealing a deep risk factor not only for ASD [1-3] (as was assumed at the beginning), but also for GID [5, 7, 8]. Connections with the transformation processes of family institutions and its procreation (fertility) in the context of increasing urbanization and globalization were identified [1-3]. In the context of such a gender-semiotic or, more precisely, navigational-gender paradigm [5-11, 14], a more general epistemology of ASD and GID [1-8] was formed. As a result, we identified risk factors for ASD and GID in the form of a decrease in semiotic heterogeneity (linguistic gender gap), represented either by monocode structures of syntagmatic, predominantly, grammar in the paradigm of N. Chomsky, or by the code of semantic-lexical, predominantly, grammar in the paradigm of C. Osgood [1-8]. Which, in turn, determines the dysontogenetic problems of new generations. At the same time, a high indicator of the semiotic (linguistic) gender gap turned out to be a factor in the prevention of ASD. Gender, demonstrating a certain relativism with respect to genetic sex, reveals the qualities of a certain, fairly stable operator orienting the individual in the surrounding world, which, in part, contradicts the paradigm of gender as a social construct or (and) frame accepted by the scientific community today. What we interpreted as a general navigation theory [14], which allows us to reduce the above aspects to a single paradigm, while rejecting the idea of gender as a social construct [5-11, 14], substantiating it with the type of ecological navigation operator: allocentric or (and) egocentric [5-11, 14].

Results and discussion. Animals and humans act by navigating in an allocentric space, surrounded by important things of the ecological world, such as food, threats, sexual partners, shelters, etc., which creates the need for memory of both these things themselves and their meanings [14, 15]. This allocentric space occupies the entire world of the animal’s ecological niche [14, 15]. The operator of this space is the old (paleo-) brain, with its distant reception system, limbic system, with the mapping circuit of the hippocampus and entorhinal cortex [14, 15]. In the space localized between the supporting surface and the body, animals and humans

use an egocentric type of navigation [14, 15]. The supporting surface can be represented by water, atmospheric gas, the plane of the earth, or a three-dimensional lattice of tree branches in primates. Egocentric space tends to zero volume in aquatic inhabitants, birds and bats, directly bordering their body, without a gap coinciding with its contour of the supporting surface [14, 15]. In terrestrial animals with limbs, a gap is formed between the support and the body, forming an egocentric space, which, in contrast to the allocentric space, has a high degree of psychophysical constancy [14, 15]. Such a structure of navigation in two spaces of the habitat forms two evolutionary lines [14, 15], one of which, in its development, ends with such specific cognitive structures of egocentric operators of human locomotion [14, 15]. We have proposed a model of topological transformation of the operator of egocentric navigation of monkeys, with the formation of a second sensorium (qualia), restoring the lost (due to movement in fording conditions) constancy of locomotion, which, in turn, determined the expansion of the human egocentric space not only to the size of the inhabited world, but also far beyond its limits [14, 15]. The emergence of common objects in the operators of two navigations, necessarily determined their interference and the need to form coherence of interaction with external speech communication (as another non-locomotor modality) [8, 9, 14]. The interference of two navigators turned out to be due not only to the commonality of the subject intention, when things of the surrounding world turned out to be, like binocular vision, at the crossroads of two modalities of navigational perception. The specified topological modification of the subject of egocentric navigation allowed communication with the operator of allocentric navigation to be carried out, the language of which must correspond to two contradictory requirements and codes: the successive (semantic) organization of allocentric navigation and the simultaneous (syntagmatic) temporal structure of egocentric [8, 9, 14]. To which only external commutation by means of short sound signals: phonemes [8, 9, 14] corresponds. Sound communication in an exteriorized way integrates (according to the type of egocentric speech) the personality, otherwise, which would disintegrate into disintegration intentions of isolated operators of two navigations according to the Trickster type [8, 9, 14]. Such a model of two-coordinate and two-code navigation space [8, 9, 14] allows us to assert that the basic condition of binary biological, cognitive and conscious structures of the human psyche and his activity is the binary structure of the image of the world [8, 9, 14]. As a result of the evolutionary genesis of two operators of ecological navigation, two types of gender were formed [8, 9, 14]. Allocentric - “feminine”, and egocentric - “masculine” [8, 9, 14]. At the same time, their actual interaction in the neurosystem of the individual’s brain is of a reciprocal-competitive nature, which in the analytical psychology of K. Jung is fixed by the transgender, switching archetype of the Trickster. Each of the genders, thus, is a specialized operator in one of

the interfering spaces of the surrounding world. Allocentric gender is most often personified by the population of women of fertile age [8, 9, 14]. The actual period of fertility in women is equal to the period of menopause (climax), which allows us to assume such a structure of the family navigation system, when in the early periods of human existence, the carriers of the gender of egocentric navigation were older women in menopause, heading the family matriarchal pride, similar to what happens with killer whales, who acquired such a rare ability to menopause in evolution [12]. As with killer whales, the primary matriarchal structures in homo sapiens, based on the menopause of older women, ensured food search navigation, creating the first type of navigational-gender structures, with the distribution of the roles of allocentric and egocentric navigation between women of fertile age and older women in menopause. Fertility presupposes succession and cyclicality of navigational functioning, which is characteristic of the allocentric (extended) navigation mode. At the same time, simultaneity (simultaneity) of assessment and orientation in the surrounding space is more characteristic of the egocentric navigation mode, which can be provided by female homo sapiens (or female killer whales) in the menopausal status [12]. In general, it should be emphasized that such an adaptation as menopause is rare and unusual in living nature, which is characteristic of only humans (homo sapiens) among land mammals, and of four species of large dolphins among aquatic mammals – killer whales. Subsequently, against the background of navigational-gender structures of the matriarchal family with the presence of incestuous relations, patriarchal marital structures arose in the paradigm of K. Levi-Strauss, with a radical ban on incest and control of sexual relations. Here it is necessary to pay attention to the presence of a certain symmetry in the natural prohibition of sexual-reproductive relations by means of menopause for the second half of the life cycle of homo sapiens women and the cultural prohibition of incestuous sexual relations by marital structures created by men in the process of their exchange of women. Oddly enough, but a biological species of animals with a body weight of 100 kg with two restrictions in sexual reproductive relations (natural and cultural) was able to reproduce and settle on the planet with a huge gap from other similar mammals with the same body weight. Which suggests an obvious correlation between the paradoxical restriction of sexual reproductive behavior and the hyperbolic demographic growth of the homo sapiens (humanity) population. In other words, the introduction of two significant restrictions on sexual reproduction in homo sapiens, at the beginning of the biological plan in the form of menopause in women of the second period of the life cycle, and then cultural marital restrictions of incest, somehow caused an unprecedented growth in the population. Our hypothesis boils down to the formation of a distributed navigation system among gender and age groups, which ultimately led to the formation of a multi-generational family of the patriarchal type, which caused an

unprecedented gender-semiotic gap between the genders - navigation operators and, at the same time, members of this distributed family-navigation structure. As strange as it may sound, filling this gender-semiotic gap is possible only by increasing the number of new generations, whose members play the role of semiotic compensators for this gender gap in the family. The family, therefore, is a distributed gender-navigation system [9-11] with its members being carriers of dominant operators of one of the navigation modes [9-11]. Since gender as one of the two types of navigation (allocentric and/or egocentric) in traditional communities is associated with biological sex in an attributive-symbolic manner: female with allocentric, male with egocentric, this correspondence should be understood as such that each man and woman, initially and neurophysiologically, is characterized by both types of navigation operator, but not two sexes ("sex") [9-11]. The concept of gender and family as a distributed gender-navigation system [9-11] allows us to subsume under these concepts the fundamental theory of human navigation in the space of the surrounding world [14]. And also, to consistently explain the emergence of menopause (a specific feature of humans and some species of killer whales) [12, 13] as a background for the formation of an egocentric operator, with Socrates' metaphor of himself as a woman in menopause [13]. The brain in the context of such a theory appears as a place of intersection and coherence of two different navigations in the system of the habitat, where this environment itself can be interpreted as a two-coordinate navigation space, in which the human brain itself with its consciousness and language (as the "house of being" according to M. Heidegger) is the result of this "meeting". Two cognitive navigation operators (genders) by means of loud speech form the external communication of the individual's brain, along with the internal reciprocal interhemispheric commutation [8, 9]. As a result, the individual's speech has, at a minimum, a two-code structure of an asymmetric type, with the dominant prevalence of one of the codes (due to the reciprocity of hemispheric commutations), causing the subsequent formation of an agglutinating system of sociality – a family, as an already complete, distributed, mutually complementary navigational-gender system [9-11].

Conclusions. In the course of cultural transformation, navigation operators form a topological space of the urban environment, the urbanization of which automatically transfers the surrounding world to the status of topology, being a direct competitor and a kind of inhibitor of the navigational functions of the family. In other words, households of families create their own "killer" with their activities - an autonomous analogue of the family as an operator of topological transformation - a city located as a layer between the individual and the natural world. Which thereby deprives the navigational structures of the family of the need for topographic navigation. Thus, the subway train system reduces mapping of the area to a topological scheme of station terminals. Water supply and a re-

frigerator on the tenth-floor level out the topography of significant locations of water and food sources. A grocery supermarket on the first floor allows you not to stock up on food, leveling out the seasonal cycles of their production. The city levels out the gender navigation gap, transforming the distributed system of family navigation, its institution into an individualized and atomized set of autistic and gender-undetermined individuals. Man as an atomized creature was initially characterized by the interference activity of two navigations, which, of course, should form the Trickster archetype with its uncontrolled transgenderism. In part, modern urbanization policy encourages this tendency of gender uncertainty and autonomous autization in the so-called countries of the golden billion. On the other hand, the interference navigation of the Trickster is too asocial, therefore, the natural strategy of city dwellers is to refuse two-code navigational communication with its translation into the single-code language of the metropolis. And the latter determines the progressive autization of the population, with the same progressive expansion of the childfree zone. The study of navigational constructs of gender within the framework of navigational-gender anthropology allows us to clarify the mechanism of VDP, founded, from our point of view, by a decrease in the gender gap and semiotic heterogeneity. Which in itself requires the modernization of the scientific paradigm of both family and gender, considering it as the main agent of ecological and social navigation in the space of urbanization of the modern emerging world order.

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青少年环境中反社会现象预防的特点
**PECULIARITIES OF PREVENTION OF ANTISOCIAL
PHENOMENA IN THE ADOLESCENT ENVIRONMENT**

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摘要。青少年反社会行为的发生率不断上升，对国家安全构成重大挑战，俄罗斯青少年犯罪的惊人统计数据就凸显了这一点。本文分析了导致此类行为的多方面因素，特别是在青少年这个心理和生理发生重大变化的关键发展阶段。社会互动的显著转变，加上边缘化青年群体的增加，加剧了鲁莽和反社会行为的风险。这项研究旨在确定诊断工具，以及制定和实施心理教育计划，以防止社交环境中的反社会行为。这项研究强调了反社会行为的本质，即背离社会规范，源于青少年扭曲的自我认知和社会价值观。研究指出了各种心理和社会因素，包括社交水平低、情绪障碍和教育方法无效。通过结合观察量表和自我报告问卷等诊断方法，该研究确定了青少年普遍存在的关键情绪和行为综合症。本文强调了预防措施的重要性，这些措施有助于早期诊断和干预，目的是培养积极的行为模式。实施的计划表明，这些计划在增强情绪调节、社交技能和减少青少年参与者的攻击性倾向方面是有效的。对教育工作者和心理学家的主要建议包括全面的心理教育策略，以培养支持性的教育环境并促进冲突的建设性解决。

关键词：反社会行为；青少年；心理适应；心理教育预防；预防措施；社会因素；情绪调节；适应不良；诊断；社会正义；方法工具；小组工作；秩序和规则；心理情绪状态；建设性行为模式。

Abstract. *The escalating incidence of antisocial behavior among adolescents poses significant challenges to national security, as highlighted by alarming statistics in juvenile delinquency within Russia. This article analyzes the multifaceted factors contributing to such behaviors, particularly during the crucial developmental stage of adolescence characterized by substantial psychological and physiological changes. A notable shift in social interactions, coupled with a rising cohort of marginalized youth, exacerbates the risk of engagement in reckless and antisocial conduct. The research aims to identify diagnostic tools, as well as develop and implement a psycho-pedagogical program for the prevention of antisocial behavior in social settings. The study underscores the essence of antisocial behavior as a deviation from societal norms, arising*

from a distorted self-perception and social values among adolescents. Various psychological and social factors are noted, including low levels of socialization, emotional disturbances, and ineffective educational methods. Through a combination of diagnostic methodologies, including observation scales and self-report questionnaires, the research identifies critical emotional and behavioral syndromes prevalent in adolescents. The article emphasizes the importance of preventive measures that facilitate early diagnosis and intervention, with the goal of fostering positive behavioral patterns. Implemented programs demonstrate effectiveness in enhancing emotional regulation, social skills, and reducing aggressive tendencies among the youth participants. Key recommendations for educators and psychologists involve comprehensive psycho-pedagogical strategies that cultivate a supportive educational environment and promote constructive resolution of conflicts.

Keywords: *Antisocial behavior; Adolescents; Psychological adaptation; Psycho-pedagogical prevention; Preventive measures; Social factors; Emotional regulation; Disadaptation; Diagnostics; Social justice; Methodological tools; Group work; Order and rules; Psycho-emotional state; Constructive behavior patterns.*

The problem of the growth of various forms of antisocial phenomena in adolescence in recent years has acquired exceptional importance, posing, according to a number of specialists, a threat to the national security of the country. This is confirmed by the statistics of juvenile delinquency in Russia, which is shocking in its cruelty and senselessness. Therefore, the factors that influence the formation of antisocial behavior of adolescents are subject to detailed consideration and study. Adolescence is a crisis period of development, during which physiological changes in the body are combined with the restructuring of the mental component of the personality. The above-mentioned features determine a pronounced provoking influence of age changes on the mental adaptation and personality formation of adolescents. The adolescent is increasingly distanced from the family, seeking to prove his adulthood, his interests are moving from the sphere of study to the sphere of communication with peers. At present there is a new social layer, the so-called “offended” members of society, a significant proportion of which are adolescents and young people aged 12-15 years. Their number is growing in proportion to population growth. Therefore, a teenager can be drawn into an unreliable company, in which, wanting to demonstrate his authority, often commits rash, often antisocial acts. [1]

Today we can also note the presence of a negative trend consisting in the rejuvenation of juvenile delinquency - the number of socially dangerous, antisocial phenomena is increasing, feeling impunity, these subjects continue to group

around themselves already new minors with antisocial orientation. In order to prevent the consolidation of antisocial behavior as a habitual model of behavior in adolescents it is necessary to make early diagnosis, psychological evaluation and correction of antisocial behavior of minors in a timely manner. [3]

The purpose of our study is to select methodological tools for diagnosis, development and testing of the program of psychological and pedagogical prevention of antisocial phenomena in adolescents.

Antisocial behavior is a deviation from the norm of behavior and development, deeds, actions that do not conform to the officially established or actually established in a given society norms; social phenomena expressed in relatively massive and stable forms of human activity that do not meet the criteria of behavior established in society. The essence of antisocial behavior of adolescents lies in their incorrect understanding of their place and purpose in society, in certain defects of moral and legal consciousness, social attitudes and formed habits. This essence is expressed in the inadequate attitude of the adolescent to school, teachers, parents, negative interests, unorganized leisure time, tendency to disorganize the general work, to show rudeness, insolence, to commit cynical acts. Asocial behavior is characterized by explicit or implicit hostility, aggression, which are manifested towards other members of society, disregard for moral norms. Sometimes antisocial behavior takes the form of a minor violation of the rules established in society, in other cases it can seriously harm others. Individuals prone to antisocial behavior may lead an isolated lifestyle or unite with other individuals who have a similar outlook. [2]

The reasons for the emergence of antisocial phenomena in adolescence lie in the peculiarities of the relationship and interaction of adolescents with the surrounding world, social environment and themselves. Quite common features characteristic of the contingent of young people under consideration are the state of psychological isolation, low level of socialization, underdevelopment, various kinds of disorders of the emotional sphere, defects of self-relationship and negative self-concept, undifferentiated "image of self", discordance of cognitive, emotional and behavioral components. The following specific socio-psychological features are distinguished: lack of experience of moral behavior; perversion or misunderstanding of such social values as friendship, love, courage, etc.; inadequately overestimated or underestimated self-esteem; wrong attitude to the system of moral norms (immoral behavior - own or surrounding persons - is assessed as normal, corresponding to social attitudes); situationality of psychological mood, associated with insufficient social experience of the individual and expressed in the social sphere. Pedagogical factors are primarily understood as incorrect upbringing, as a result of which the probability of deviations development increases significantly. [4]

Modern practice of prevention of antisocial behavior of adolescents in an educational institution includes a set of measures aimed at preventing a problem or phenomenon before it occurs, or it is the prevention of risk factors regarding the same problem. Prevention of antisocial behavior is a scientifically based, timely activity aimed at preventing possible deviations of adolescents, maximizing social justice, creating conditions for the inclusion of minors in the socio-economic and cultural life of society, contributing to the process of personal development, education, prevention of delinquency. Prevention makes it possible to save society and the individual from spending serious efforts to overcome persistent antisocial phenomena and processes, to prevent and prevent further development of the negative process. Methods of prevention of antisocial behavior of adolescents in the general educational organization are: conversations, information, role-playing games, discussions, training exercises, modeling of effective social behavior, psychotherapeutic techniques. Prevention of antisocial behavior of adolescents in a general education organization includes the following functions: 1) diagnostic and restorative; 2) corrective and compensatory; 3) corrective and predictive. [5]

The selection of specialized private psychodiagnostic techniques includes: L. Stott's observation card (OC), A. N. Orel's method of adolescents' propensity to deviant behavior (SOP), Bass-Darkey questionnaire to determine the aggressiveness and hostility of adolescents, and Kettell's 16-factor questionnaire to study the emotional properties of adolescents' personality. We selected the methods taking into account the initial target theoretical and experimental provisions. Appropriation and complexity of their application provided reliable results of diagnostics of antisocial manifestations in the adolescent environment. The representativeness of the sample of subjects and the correspondence of the set of techniques to age and individual-psychological features contributed to the most effective experimental study.

According to the results of primary diagnostics using selected methods, the following conclusions can be drawn: L. Stott's observation card (OC) revealed a picture of the emotional state of the subjects. The most expressed for teenagers are such syndromes as: unfavorable environmental conditions - 44%; lack of social normativity - 40%; emotional tension - 32%; anxiety towards adults - 28%. The overall "maladaptation coefficient" (32% have some maladaptation). In the category with a significant degree of severity of violation of personal adaptation mechanisms (more than 25 points) fell 24% of subjects. This category of adolescents is a risk group, but nevertheless, their development is considered to be in line with the norm. For timely prevention of antisocial behavior it is necessary to pay special attention to such dominant factors as: depression; withdrawal into oneself; hostility towards adults; hostility towards peers; emotional tension; neurotic symptoms. The manifestation of the average degree of maladaptation (from 8 to 25

points) is characteristic of 40% of the subjects. The rest of the subjects - 36% - are categorized as adaptation potential, with manifestations of some or other dominant factors (anxiety towards adults, emotional tension, distrust of new people, things, situations; illnesses and organic disorders; lack of social normativity). The results of diagnostics according to the questionnaire "SOP" (propensity to deviant behavior), author A.N. Orel. Orel showed that the average scores on the studied scales were increased: Attitude to socially desirable responses; Tendency to overcoming norms and rules; Tendency to additive behavior; Tendency to self-damaging and self-destructive behavior; Tendency to aggression and violence; Volitional control of emotional reactions; Scale of tendency to delinquent behavior - they are on the lower border of addiction (range of values 50-60 T-points), which indicates the presence of tendencies in subjects to manifestations of asocial behavior, as well as an underdeveloped level of social control. The results of the conducted research with the help of the Bass-Darkey questionnaire draw attention to the increased level of aggressiveness in the group of test subjects, which is at the upper limit of the norm - 24.1 (the norm is from 17 to 25), which is typical for 46%. A high level of hostility was also noted in 40% of adolescents, with a coefficient of 11.6 points with a norm of 11 points. The group of adolescents under study is characterized by manifestations of aggressive behavior in one form or another: physical, verbal, indirect, or irritability, negativism and resentment of the surrounding world. The results of diagnostics of the emotional block according to the methodology of the 16-factor Kettell's questionnaire allowed us to make sure that the majority of subjects are characterized by an insufficient level of emotional-volitional regulation (emotional stability, increased degree of anxiety, insufficient self-control), which can be a risk factor in the manifestation of antisocial behavior. (High - 16%, average - 44%, low - 40% of the subjects - levels of development of emotional properties).

The development and implementation of the program for the prevention of antisocial phenomena in adolescence was aimed at the formation of skills of adaptation to changing conditions of society, development of social activity, stimulation and development of interest in themselves and others, training in self-regulation skills, cooperation, adequate display of activity, initiative and independence; optimization of positive experience, leveling the experience of deviant and aggressive behavior, creation and consolidation of constructive patterns of behavior. Preventive work was carried out through the organization of group training work with the use of the following techniques: role-playing of life situations, corrective psychological exercises, psychotechnical exercises, projective drawing, as well as individual consultations, discussions, involvement in socially useful volunteer activities.

The results of the control stage of the experiment allowed us to draw the following conclusions: according to the L. Stott's observation card (OC), the in-

creased values of the indicators of emotional states of such syndromes as: emotional tension; anxiety towards adults, depression decreased. The total “coefficient of maladapted” adolescents decreased by 12% and amounted to 20% of subjects, at the stage of monitoring the value was fixed at 32%. The results of diagnostics on the questionnaire “SOP” (propensity to deviant behavior), author A.N. Orel showed that the overall average score of the questionnaire “SOP” (propensity to deviant behavior), author A.N. Orel showed that the total average score on the studied scales (propensity to overcome norms and rules; propensity to additive behavior; propensity to self-damaging and self-destructive behavior; propensity to aggression and violence; volitional control of emotional reactions; propensity to delinquent behavior) was determined within the limits of the norm and amounted to 49.8 T-points with the norm up to 50 T-points (at the monitoring stage the average score was 53.1 T-points), which indicates an increase in the level of social control and emotional intelligence. The results of the control study with the help of the Bass-Darkey questionnaire indicate a decrease in the aggression indicators in the group of subjects from 24.1 to 18, 6 points. (the norm is from 17 to 25). There is also a decrease in the level of hostility in adolescents, the coefficient is 8.6 (at the monitoring stage it was 11.6) with a norm of up to 11 points. The results of diagnostics of the emotional block according to the Kettell’s 16-factor questionnaire allowed us to make sure that the majority of the subjects increased the level of emotional-volitional regulation. (High - 28% (it was 16%), average - 48%, low - 24% (it was 40%) of subjects - levels of development of emotional properties. Accordingly, the program of prevention of antisocial manifestations in adolescence developed and tested by us is effective.

The main methodological recommendations for the prevention of antisocial behavior of adolescents include: individual and group work with a teacher-psychologist; psychological and pedagogical support, participation in trainings aimed at anger management, constructive resolution of aggression, non-violent conflict resolution; creation of a psychologically safe educational environment in the organization; interaction with services (in school and out of school) that can assist in solving the problems of students who need psychological and pedagogical support. It should be noted that of crucial importance for the preventive practice of preventing antisocial phenomena in adolescence are complex psychological and pedagogical programs aimed at improving the conditions of family, school and public education, and humanizing the system of relationships of adolescents.

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学龄前高龄儿童情绪智力形成的心理特点
**PSYCHOLOGICAL PECULIARITIES OF FORMATION OF
EMOTIONAL INTELLIGENCE IN CHILDREN OF SENIOR
PRESCHOOL AGE**

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摘要。本研究探讨了大龄学龄前儿童的情商发展，强调情商在预防成年后情绪挑战方面发挥的关键作用。研究将情商定义为自我意识、自我控制、同理心和人际关系技能，强调其与一般智力同等重要。采用投射技术与童话疗法相结合等诊断方法来评估儿童的情商水平。结果表明，儿童的情商以中低水平为主，普遍表现出同理心。该研究设计了一个干预计划，结合游戏、音乐和艺术疗法，旨在提高学龄前儿童的情绪意识和社交互动技能。干预后评估显示，同理心和情感投入有显著改善，强调了该计划的有效性。我们的研究结果主张在早期儿童教育中整合全面的情绪发展策略，以提高社会适应能力和情绪调节能力，从而培养儿童全面的发展轨迹。对教育从业者的建议包括改进策略，以培养对有效社交互动至关重要的直觉和同理心能力。

关键词：情商；大龄学龄前儿童；自我意识；自我控制；同理心；人际关系技巧；一般智力；诊断方法；投射技术；童话疗法；干预计划；游戏疗法；音乐疗法；艺术疗法；情绪意识；社交互动技巧。

Abstract. This study explores the development of emotional intelligence in older preschool children, emphasizing its critical role in preventing future emotional challenges in adulthood. The research delineates emotional intelligence as comprising self-awareness, self-control, empathy, and relationship skills, highlighting its significance alongside general intelligence. Diagnostic methodologies such as projective techniques intertwined with fairy tale therapy were employed to assess the emotional intelligence levels in children. Results indicated a predominance of medium to low levels of emotional intelligence, with empathy being commonly exhibited. The study designed an intervention program incorporating play, music, and art therapy, aimed at enhancing emotional awareness and social interaction skills among preschoolers. Post-intervention assessments showed significant improvements in empathy and emotional engagement, underscoring the efficacy of the program. Our findings advocate

for the integration of comprehensive emotional development strategies in early childhood education to enhance social adaptability and emotional regulation, thereby fostering a well-rounded developmental trajectory for children. Recommendations for educational practitioners include refining strategies to develop intuitive and empathetic abilities crucial for effective social interaction.

Keywords: *Emotional intelligence; Older preschool children; Self-awareness; Self-control; Empathy; Relationship skills; General intelligence; Diagnostic methodologies; Projective techniques; Fairy tale therapy; Intervention program; Play therapy; Music therapy; Art therapy; Emotional awareness; Social interaction skills.*

Modern psychological research emphasizes the importance and significance of not only the formation of general intelligence, but also social and emotional intelligence. Preschool educational institutions emphasize the child's experience of social interaction and psycho-emotional development as the main directions. The problems of all adults associated with the inability to effectively communicate, cooperate, contact, build meaningful relationships, empathically join are mainly associated with the preschool age. [3]

Learning involves building general intelligence and cognitive thinking abilities, while emotional and social domains are overshadowed. Upbringing and education are increasingly reduced to just learning, although the psycho-emotional involvement of the preschooler in the system of human relationships is no less significant. The problem of emotional intelligence and child's understanding of the emotional state of other people is becoming increasingly important in connection with modern realities. We believe that not only understanding, but also the child's experience of various life events related to his family environment, to relations with peers and complete strangers is a necessary component of orientation in the world of information and emotions. Only through this prism the child can receive reliable information about what is happening. [1]

The study of psychological features of formation of emotional intelligence in children of senior preschool age, in our opinion, will allow to avoid serious problems of emotional character in adults in the future.

The most important difference between the coefficient of mental development and the coefficient of emotional development is that the latter is least connected with genetic factors, which gives greater importance to the process of preschool education and socialization at this age. On the other hand, programs of emotional intelligence development for preschoolers should be adequate to the age and leading activity. However, in our opinion, the existing programs of formation of emotional intelligence do not have a holistic approach and freedom of emotional expression, and are aimed only at individual characteristics of emotional intelligence.

The purpose of our research is to study the psychological characteristics and develop a strategy for the formation of emotional intelligence in older preschool children. [4]

We define emotional intelligence as a group of mental abilities that stimulate awareness and understanding of one's own emotions and the emotions of others. Emotional intelligence is the ability to interpret one's own emotions and the emotions of others in order to use the information obtained to realize one's own goals. There are four main components of emotional intelligence (EQ): self-awareness, self-control, empathy, and relationship skills. The structure of emotional intelligence is as follows: conscious regulation of emotions; understanding (comprehension) of emotions; distinguishing and expressing emotions; using emotions in thinking activity. [5]

The senior preschool age is characterized by high intensity of mental development. There are progressive changes in a wide range of mental characteristics - from psychophysiological functions to personality traits. Throughout the preschool age there are noticeable changes both in the content of feelings (in what exactly calls for emotional state and experience of children), and in the form of their manifestation. Earlier emerged feelings deepen, become more stable, diverse, easily expressed. Education of feelings and emotions in preschoolers should be reduced, above all, to a harmoniously developed personality, one of the indicators of which is a systematic ratio of emotional and intellectual development. Leadership researchers are convinced that it is the level of emotional intelligence that determines the success or failure of later life. The ability to understand oneself and other people, to motivate and unite people to achieve a goal, to control one's own and others' emotions - all these skills are determined by emotional intelligence and intellect. The analysis of conceptual approaches to the problem of emotional intelligence development gives us the basis to conclude that it is in preschool age that emotions undergo a path of progressive development, acquiring more and more rich content and more complex forms of manifestation under the influence of social conditions of life and upbringing. [5]

Numerous methods have been developed to study the level of emotional intelligence in adolescents and adults. For children of preschool age, and Russia adapted a diagnostic package of tools aimed at the study of emotional intelligence, the basis of which are projective techniques conducted in conjunction with fairy tale therapy. Projective techniques have the advantage that they can be used in group work with children. The methods are included in the fairy-tale plot of the lesson and are a natural conclusion of it with the output of one or another qualitative result of the child. The development of emotional intelligence repeatedly increases the effectiveness of learning at school, provides safe penetration into social spheres and is often superior to intellectual development.

For the practical part of the study we selected diagnostic tools adequate to the goals and objectives of the study, taking into account the age characteristics of the study group: Questionnaire “The nature of manifestations of empathic reactions and behavior in children” by A.M. Shchetinina; Projective technique “Drawing: the world of things - the world of people - the world of emotions”; Projective technique “Three Wishes”; Method “What - why - how”; Method “Evaluate behavior” by E.V. Nikiforova.

Based on the data obtained at the monitoring stage to study the level of development of emotional intelligence in older preschool children, it was revealed that most of the test subjects are children with medium and low level of development of emotional intelligence, but the manifestation of empathic reactions is characteristic of the vast majority of test subjects. Understanding of the social position of themselves and others, how to behave in society is adequate for almost all subjects, but some preschoolers require additional attention of teachers and psychologists in this matter.

When developing a program for the formation of emotional intelligence in older preschoolers, the obtained empirical data were taken into account. The program included 8 practical sessions with preschoolers with the predominance of methods of game, music and art therapy. In the work we used the program of development of emotional intelligence of senior preschoolers, the tasks of which are: awakening of children’s interest to the world of human emotions, to their influence on human behavior and mood; formation of the ability to see not only problems, but also another person in all life situations; formation of awareness of the possibility of their participation in the lives of others and the importance of the other in their activities to optimize cooperation; development of the ability to sympathize, empathize and the desire to help others.

At the stage of control diagnostics the same methods were used as at the establishing stage of the experiment, in the same sequence and conducted in similar conditions. According to the method “The nature of manifestations of empathic reactions and behavior in children”. There is a slight increase in the percentage of children of senior preschool age by levels of manifestation of empathy towards other people. The high level increased by 8%, the average by 4%, the low level of empathy manifestation decreased by 8%, and the mixed type decreased by 4% in favor of increasing the high level. According to the results of the projective technique “Drawing: the world of things - the world of people - the world of emotions” it was revealed an increase in the manifestation of emotional intelligence in the majority of subjects. When analyzing the obtained data at the control stage of the experiment, the tendency of changing the orientation of children’s interests from objects (the world of things) to the emotional interest of communication (the world of people and the world of emotions), established during the forming

program, is visible. In drawings children paid more attention to the emotional state of the drawn people. The number of subjects with a low index decreased by 8%, children showed interest in drawing people rather than any objects. The number of subjects with a high level of emotional orientation increased by 12%, and the number of subjects with an average level increased by 4%. According to the method of researching the level of emotional intelligence “Three Wishes”, changes in the indicators of children’s emotional orientation were revealed. The number of subjects with a low level of emotional intelligence decreased by 12%, the number of subjects with a high level increased by 12%, the number of subjects with an average level increased by 4%.

The results of the “What - Why - How” technique showed a change in the number of subjects with a high level from 36% to 44% (8% dynamics), a medium level from 48% to 44% (4% dynamics), and a low level from 16% to 12% (4% dynamics). The following changes were revealed in the study of children’s social experiences with the help of E.V. Nikiforova’s “Evaluate Behavior” technique: the quantitative indicators of subjects with an average level of social normativity decreased from 48% to 44% (group 2). The number of subjects of the third group (high level of social normativity) increased by 8%, which amounted to 36% of children. The number of subjects with a low level decreased by 4%, 20% of children were in the first group.

In general, the results of repeated diagnostics at the control stage of the experiment testified to the effectiveness of the training program and the increase in the level of emotional intelligence of older preschoolers. The recommendations developed by us allow to develop emotional intelligence of educators and children of senior preschool age, namely the ability to see, decipher and adequately reflect emotional signals of another person, intuitive and empathic abilities, to quickly orient in the situation and understand their own emotional manifestations.

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K. Clark 以 Mironenko V.M. 的画作为例对风景进行分类
**CLASSIFICATION OF LANDSCAPES BY K. CLARK ON THE
EXAMPLE OF PAINTING BY MIRONENKO V.M.**

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摘要。本文以英国艺术史学家、作家肯尼斯·克拉克的著作《艺术中的风景》中所描述的风景画类型分类为基础，对伊尔库茨克著名画家、艺术家联盟成员米罗年科·V.M.的风景画作品进行了研究。该分类包括四种类型的风景画：象征风景画、现实风景画、幻想风景画、理想风景画，并以对文艺复兴时期大师的画作的分析为基础。这种分类在应用于现代作家的绘画作品时很有意思。作为例子，给出了以“贝加尔湖风景画”而闻名的画家米罗年科·V.M.的画作，其中可以区分出以下作品：“贝加尔湖的保护”、“贝加尔湖在可怕的环境中”、“贝加尔湖的寒冷”、“生命的开始。贝加尔湖”、“贝加尔湖的黄色天空”。艺术家的画作现藏于伊尔库茨克地区艺术博物馆，也为私人收藏。

关键词：象征风景、现实风景、幻想风景、理想风景、贝加尔湖、绘画、比较分析。

Abstract. *This article is a study of the landscape works of the famous Irkutsk artist, member of the Union of Artists, Mironenko V. M., conducted on the basis of the classification of the landscape genre described in the work of the English art historian, writer Kenneth Clark "Landscape in Art". This classification includes four types of landscape: landscape of symbols, landscape of reality, landscape of fantasy, ideal landscape, and is based on the analysis of paintings by Renaissance masters. This classification is of interest in the context of its application to the works of painting by modern authors. As an example, the paintings of the artist Mironenko V. M. are given, who is known for his "Baikal landscapes", among which the following can be distinguished: "Protection of Baikal", "Baikal in a formidable environment", "Baikal cold", "Beginning of life. Baikal", "Yellow sky of Baikal". The artist's paintings are in the Irkutsk Regional Art Museum, as well as in private collections.*

Keywords: *landscape of symbols, landscape of reality, landscape of fantasy, ideal landscape, Baikal, painting, comparative analysis.*

The landscape genre is distinguished by the individual-mental communication of the viewer with a natural phenomenon and the artist through viewing his work of art. Man came from nature, and it is this inseparable connection that artists of all times and peoples demonstrate in their works.

Man is a part of nature, the crown of creation. Therefore, no matter what happens to humanity in the age of globalization, transformation and digitalization, it is impossible to break the connection between man and nature. Therefore, landscape painting as a part of fine art will always be in demand. The relationship between personality and nature relates to the issue of forming cultural and moral values. That is, we can say that landscape painting is a conversation between a person and himself, with his inner world, an opportunity to understand himself through a work of art.

The purpose of this article: to consider the landscape works of the famous Irkutsk artist, member of the Union of Artists, Mironenko V. M. in the context of the classification of the landscape genre, described in the work of the English art historian, writer Kenneth Clark "Landscape in Art". In accordance with the stated goal, the article must solve the following tasks:

- to present an overview of scientific and specialized literature on the issues raised in this article;
- to give a definition of the landscape genre in fine art, indicate its types;
- to consider the classification of landscapes by Kenneth Clark, described by him in his work "Landscape in Art";
- in the context of Kenneth Clark's classification, to consider the paintings of the Irkutsk artist Mironenko V. M.

This study is relevant due to the fact that the works of a specific artist of the late twentieth century of the Baikal region are considered in the context of the well-known concept of landscape painting, which determines the trends in the development of fine art in this area.

Despite the fact that throughout time, landscape painting has pursued different goals and objectives (it was a background, performed decorative and applied purposes, etc.), one thing remains unchanged: landscape painting has always glorified the beauty and grandeur of Nature. Currently, there are different classifications of landscapes: mood landscape, portrait landscape, sea landscape, etc. The classification presented in the article is another individual personal view of the landscape genre, the types of which are described in the work of Kenneth Clark.

The scientific novelty of the work lies in the ability to consider and study landscape works of any artists in the context of Kenneth Clark's classification.

The practical value of this study lies in the possibility of using the obtained data and conclusions in further special scientific studies of landscape painting using the example of artists from specific regions and localities.

In preparing and writing the article, scientific and specialized literature was used, reflecting the questions posed in the study.

Thus, in the scientific work of the editor-in-chief of the ASG mass media Borodina S. D. "Things Not Created by Us. The Evolution of Landscape Painting in the 17th-19th Centuries as a Reflection of Understanding Nature" the features of landscape works of the specified period of time by different artists are briefly and succinctly revealed, which correlates with the classification of landscapes by Kenneth Clark presented in the article, made on the analysis of Renaissance painting [1]. In Kenneth Clark's classification, the first type of landscape is indicated - the landscape of symbols, which echoes the publication of Veselova A. A. "The Endless Silence of Landscapes by Fernand Khnopff. On the Issue of the Origin and Development of the Belgian Symbolist Landscape", where a definition is given and the features of this type of landscape in the fine arts are indicated using the example of a specific Belgian artist Fernand Khnopff, which echoes the topic of this study [2]. The work of B. R. Vipper "History of European Art History: From Antiquity to the End of the 18th Century" is of interest from the point of view of describing the processes of the emergence and development of fine art, including landscape painting [3].

The book of the English art historian, writer Kenneth Clark "Landscape in Art" is key in the preparation and writing of this article, since it describes the types of landscapes on the basis of which this study of the landscape works of V. M. Mironenko is conducted [5].

The work of art critic T. G. Lareva "History of Fine Art of the Baikal Region of the 20th - Early 21st Century", among other things, presents a description of the landscape genre in the Baikal region, which is of significant importance in the context of the study, since the paintings of the Irkutsk artist are considered [6]. Scientific publications of the candidate of art history, member of the Union of Artists of Russia Likhatskaya L. N. "Features of the interpretation of images of nature in the paintings of the artist S. A. Prokhorov" [7] and the master of art history Myasnikova E. V. "Landscape in the works of Belarusian plein air artists" [8] are of interest from the point of view of describing the approaches of art history analysis and artistic methods in the depiction of elements of nature and their interpretation in accordance with the painting of individual artists and the methods of their execution (plein air).

The "Illustrated Art Dictionary" of V. G. Vlasov [4] provides definitions and concepts used in this work.

The specified publications of scientific and specialized literature more fully and succinctly reveal the concept of landscape painting, which is important for the conducted research and disclosure of the topic of the work "Classification of landscapes by K. Clark on the example of painting by V. M. Mironenko".

This study was carried out using:

– empirical research methods, which include: description, observation and comparison. Having established the initial data, which is the classification of landscapes by Kenneth Clark, an observation and comparison of landscape works given in the specified classification with the works of a specific Irkutsk artist Mironenko V. M. is carried out;

– methods of induction, deduction, comparative analysis, as well as the method of analogy. The methods of induction (from the particular to the general) and deduction (from the general to the particular) are presented as follows: initially, the characteristic features and features of the “type of landscape” described in the classification are established, which are then compared with a specific painting, and vice versa - from the entire general set, for example, “fantasy landscape” the features and features of a specific work of the artist are determined.

At the same time, when studying and describing the artistic features of a particular work, comparative analysis and analogy will be used, which will highlight and emphasize the characteristic features of the presented classification;

– methods of generalization and systematization, designed to collect all the data obtained and formulate the main conclusions obtained as a result of the study of the artistic features of the landscapes of the artist Mironenko V. M. in the context of the classification of landscapes by Kenneth Clark.

In classical fine art, the theme of depicting nature or its objects has been known since ancient times. Landscape as an independent genre did not exist then, but its elements can be found in images of ancient man, presented in the form of rock paintings, stone, wood, and leather products. Landscape - (from the French *paysage* from *pays*, area, country) is a genre of fine art (or independent individual works of this genre), where the key original subject (object) of the image is wild or, to one degree or another, transformed by man nature; the object of such an image itself is also called landscape [4]. “Landscape painting reflects the stages of our understanding of nature. Its emergence and development since the Middle Ages is one of the attempts of the human spirit to achieve harmony with the surrounding world” [Clark, 2020, p. 11].

In addition, the relationship between man and nature was the subject of discussion of ancient philosophers who found a cause-and-effect relationship between the moral and ethical problems of society and a person’s personal position in relation to nature. As a result, with the passage of time and the development of science, an understanding came that the emergence and very existence of humanity as a species is inextricably linked with the world around it and represents a single whole.

The attitude to nature of different nations and nationalities differs from each other. This difference is clearly visible in the decorative, applied and fine arts.

Understanding the laws of nature is reflected in the worldview and religious views of ancient man, trying to conduct a dialogue with the Creator himself through art.

The daily life of the first humanity was far from idleness and initial aesthetics, since they had to survive in the difficult conditions of the ancient world. Therefore, the first images of natural elements were rather of a purely practical nature - a person depicted the layout of the hunted animal, human camps, for example.

Among the ancient Egyptians, the image of elements of the natural world was symbolic, for example, the lotus flower is a symbol of the beauty and immortality of the pharaoh, the scarab beetle is a symbol of the immortal god of the sun, the snake is a symbol of suppression and power. In ancient China, contemplation of nature is an obligatory part of the spiritual life of the Chinese. That is why the landscape painting of the Celestial Empire has a philosophical and religious character, putting forward the questions of the creation of the world and the Universe. The basis of the spiritual life of the Chinese is meditation and, as a result, enlightenment. All this is reflected in the landscape painting of China.

In the Renaissance, the landscape acts as a kind of background for portrait and battle scenes, the general composition and plots of paintings.

Already in the 16th century, in the works of European artists, the image of the landscape itself comes to the forefront, the main character of the painting is nature itself. This can be seen in the works of such great artists as Titian, El Greco, Velazquez, Rembrandt.

In many present and past works of fine art, nature is not just a specific location of the characters and heroes of the picture, but also determines and shapes the inner world of a person, influences his emotional attitude.

Landscape has not always been an independent genre. Initially, it occupied a secondary position, performing the subordinate role of the background and environment for the main characters of the picture. Only over time, the landscape acquired an independent character and became a separate genre of fine art. The depiction of nature by artists changed from century to century. In view of the gradual development of technical knowledge and humanitarian disciplines, the attitude of human society to nature itself changed. On the agenda were questions about the role and place of man in natural cycles, about his negative and positive impact on natural phenomena. These processes coincided with the development of fine art, where the issues of aesthetic perception of beauty in nature, the preservation of pristine beauty, not subject to human influence, came to the forefront.

In summary, all human life takes place in the reality surrounding it: rural or urban areas, water elements, mountains, forests - all these are landscapes. When an artist depicts the landscape surrounding him, his task, in addition to a reliable image, is to convey his experiences, mood, and only then, the landscape acquires features of originality, is a unique and unrepeatable work of art. To do this, the

artist uses various expressive artistic means and techniques, such as a certain order in the composition, the chosen color and others. The value of the landscape lies precisely in how the artist depicted and conveyed his experiences, feelings and thoughts, what emotional background is present in the picture, what it conveys to the viewer. Hence the concept of an artistic or pictorial “image” in the landscape. Therefore, a pictorial work, created as a kind of copy of reality, already completed, is a kind of separate independent unit existing outside the reality conveyed in it, this is an independent work and a new reality created by the artist and preserving the energy and message of its creator. For example, artists in the open air can paint the same corner of nature together, but in the end, each one will have his own, unlike the others. All works will be different, as different as the people themselves [6].

Taking into account the element of nature that is depicted, the following are distinguished: urban, rural, village, architectural, industrial, forest, park, sea, river, mood landscape.

In his work “Landscape in Art”, the famous English art historian, writer Kenneth Clark¹ gives the following classification, based on his study of landscape works by Renaissance masters:

1. The landscape of symbols is characterized by the fact that, by symbolically depicting any objects or natural objects, endowing them with a unique meaning, the artist of the Middle Ages learned about the surrounding world, tried to fit it into his own specific picture of the world. One example of the landscape of symbols is the Medieval decorative landscape, where the artistic technique of “stylization” emphasizes any significant characteristics of natural objects. 2. The landscape of reality acts as a landscape of perspective. This type of landscape is directly related to scientific discoveries in the field of three-dimensional space and perspective, which significantly expanded the possibilities of artists. This type of landscape ceases to play a secondary role as a background and becomes an independent genre. A significant role belongs to the image of the sky. Bright representatives of the landscape of reality are: Bellini, Bruegel, Rembrandt, Rubens. “... one of the conditions necessary for the emergence of the landscape of reality was a new sense of space. “The realistic landscape, which ignorant people consider one of the simplest types of painting, is in fact one of the most incomprehensible, where success is extremely rare and accidental” [Clark, 2020, p. 50].

3. The most mysterious and mystical can be called a fantasy landscape, which is essentially not an image of nature itself, but an image of mystical invisible forces and spirits of nature. When creating this type of landscape, the artist uses techniques that allow him to give the surrounding nature a mystical and mysteri-

¹ Kenneth Clarke (1903–1983) - British writer, historian, major specialist in the field of history and art.

ous aura, an element of understatement. Then the image of nature acquires the signs of a phantasmagoria, in which natural elements are used. Here it is appropriate to recall such artists as Albrecht Durer, Leonardo da Vinci.

4. The ideal can be called a landscape where the ratio of horizontal and vertical lines in the presented composition is balanced. Artists such as Poussin and Titian introduced architectural elements into the composition to balance their works, since perfectly vertical lines are quite rare in nature. "It is also quite natural that Poussin is not satisfied with a simple reproduction of reality, that he demands from the artist complex work of the mind to select phenomena worthy of art, sublime and extraordinary actions in nature. These provisions form the basis of the theory of classicism" [Wipper, 2012, p. 155]. The complexity and peculiarity of this type of landscape is that they have an invisible vanishing point, where all geometrically correctly located lines converge. "Groups of buildings in Poussin's paintings perform the function of modules in the system of proportions on which the composition is built. An essential feature of Poussin's composition is that verticals and horizontals must necessarily converge at right angles, therefore Poussin's landscape is always frontal, which is far from our natural vision" [Borodina, 2016, p. 38]. The classification of Kenneth Clark's landscapes is considered using examples of paintings by the Irkutsk artist V. M. Mironenko. The first is the "landscape of symbols" in the works "Guarding Baikal" and "Baikal in a Menacing Surroundings". In this case, the symbols in both paintings are trees. The trees are the guards protecting Baikal. The composition of both canvases is horizontal. Baikal is in the background, in the distance, behind the trees. The vertical tree trunks emphasize the severity and unambiguity of the composition - "Baikal in a menacing surrounding, under protection". These works can be called a landscape of symbols, since the elements of nature are considered here from a side that is not characteristic of them. "The motif of silence and silence, hidden melancholy, is very important for symbolism" [Veselova, 2016, p. 183]. This is not just a landscape of a natural landscape, where there is a smooth surface of water, sky and vegetation in the form of trees, the crowns of which are not included in the boundaries of the paintings. "A similar composition, when the artist "cuts off" the upper part of trees or architecture, is used by the artist quite often: it allows to place emphasis on the foreground, to concentrate the viewer's attention not on the endless sky, blue distances, but on the dark mirror of the water surface, silently keeping the secrets of the area" [Veselova, 2016, p. 182]. In this case, the artist put the meaning of "defenders of Baikal" into the trees he painted, which in fact they are not.

The landscape of reality in the presented classification is presented second. Here it is appropriate to cite as an example the work of Mironenko V. M "Baikal Cold". The landscape of reality is characterized by a clearly expressed perspective of the depiction of the surrounding world. In the presented work, the first and

second plans are quite clearly read. The foreground of the work is represented by the smooth surface of winter Baikal. Its tone is brighter and denser in comparison with the distant perspective, which is executed in smoky-blue colors. Therefore, the Baikal mountains and hills located in the depths of the picture look transparent and airy. “Not a single element in the landscape can be controlled, the sky, for example, in reality constantly changing, in the picture always appears as it was captured in the artist’s memory at a particular moment” [Borodina, 2016, p. 30]. This image corresponds to the real Baikal winter nature. The picture has depth and is deployed in space. “Indeed, by depicting objects and the state of nature at a certain time of day, the artist seeks to convey his own sense of the image of light” [Likhatskaya, 2021, p. 136]. The work “Yellow Sky of Baikal” can be considered a landscape of fantasy in the work of V. M. Mironenko. The fantasy and unreality of the plot is evidenced by the bright color scheme of the image: yellow-red with shades of orange, as if the artist depicted the landscape of another planet. Red Baikal and yellow sky as a metamorphosis, with which the artist expressed his inner attitude to the Sacred Lake, painted his inner personal Baikal, in everyday life, hidden from the eyes of strangers. The horizontal composition and elements of the picture: the surface of Lake Baikal, trees, rocks and the sky echo elements of other paintings by V. M. Mironenko, but the tone set by the color scheme transfers the image to an unreal imaginary world. “The desire to convey the idea of the existence of another reality - a reality that exists in our subconscious or our memories” [Veselova, 2016, p. 183].

According to Kenneth Clark’s classification, the ideal landscape from the works by the artist V. M. Mironenko can be called the work “The Beginning of Life. Baikal”. In the composition of this work, one can see a certain visual balance between horizontal and vertical lines. The composition of the work itself is horizontal. The water surface of Lake Baikal and the sky are also horizontal. The verticals here are the tree trunks, which stand almost vertically.

If we consider the works of V. M. Mironenko separately, in many of his works we can see elements of landscapes from Kenneth Clark’s classification: landscape of symbols, landscape of reality, landscape of fantasy, ideal landscape. That is, we can say that the artist uses all the available possibilities of landscape painting in his work, unlike the artists of antiquity, who painted their works in a strictly defined style, without going beyond the framework of the pictorial concept. “The landscape genre presupposes analytical work and is often associated with the author’s value orientations” [Likhatskaya, 2021, p. 137], which significantly expands the possibilities of modern artists in comparison with the masters of the Renaissance.

The analysis of the presented landscape works by the artist V. M. Mironenko showed that:

– the artist’s works can be classified according to Kenneth Clark’s classification separately into: landscape of symbols, landscape of reality, landscape of

fantasy, ideal landscape. “In these landscape works there is not only a “portrait of nature”, but a “portrait” of aesthetic experience [Likhatskaya, 2021, p. 136];

– the artist’s works can simultaneously contain elements of a landscape of symbols, a landscape of reality, a landscape of fantasy, an ideal landscape (examples include the same horizontal composition of landscapes and the arrangement of objects on them (for example, trees, the surface of Lake Baikal, the sky and other elements);

– the landscape works of the artist Mironenko V. M. have their own specific artistic “language” (methods, techniques), which significantly distinguishes the works of this artist from other masters of the landscape genre;

– the image of nature in the paintings of Mironenko V. M. reflects to a greater extent the inner world of the artist, his state and mood, inspired by Baikal views, legends and tales;

– the traditions of Russian realistic landscape can also be traced in the works of the artist Mironenko V. M., which is expressed in the classical composition of the works and the choice of colors.

“The landscape genre is one of the most diverse – development goes from realistic narration to stylization and extreme expression, through lyrical and impressionistic motifs” [Myasnikova, 2020, p. 404].

Thus, in the course of the conducted research:

– a review of scientific and specialized literature on the issues raised in this article was presented;

– a definition of the landscape genre in fine art was given, its types were indicated;

– the classification of landscapes by Kenneth Clark, given by him in the work “Landscape in Art” was considered;

– in the context of Kenneth Clark’s classification, the paintings of the Irkutsk artist V. M. Mironenko were considered.

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欧洲山杨内、外皮的脂质不皂化物
**LIPID UNSAPONIFIABLE COMPOUNDS OF *POPULUS*
TREMULA L. INNER AND OUTER BARK**

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摘要。本文介绍了用气相色谱-质谱法、核磁共振光谱法和X射线衍射法分析欧洲山杨树皮各部位提取的醚类化合物的结果。

脂肪族醛和醇在白杨外皮提取物的碱性水解产物中含量最高。甾醇在内皮提取物的反应产物中占主导地位。

关键词：欧洲山杨外皮和内皮、醚溶性物质、不皂化化合物、甾醇、气相色谱-质谱法、核磁共振分析。

Abstract. *The results of the analysis of the composition of ether compounds isolated from individual parts of the P. tremula bark using GLC-MS, NMR spectroscopy and X-ray structural analysis are presented in this article.*

The high content of aliphatic aldehydes and alcohols is found in the products of alkaline hydrolysis of the aspen outer bark extract. The high content of sterols is found in the products of alkaline hydrolysis of the aspen inner bark extract..

Keywords: *outer and inner bark of P. tremula, ether-soluble substances, unsaponifiable compounds, sterols, gas-liquid chromatography-mass spectrometry, NMR analysis.*

Aspen bark has come to our attention due to reports of its beneficial medicinal properties [1] and the enormous amount of waste generated by pulp and paper mills processing aspen wood.

Composition of phenolic components, amino acids and monosaccharides [2], composition of fatty acids [3,4]. Linoleic acid is found in free and bound acids in the largest quantities. The homologous series of acids begins with C12 and ends with C24. Unlike the inner bark, the outer bark contains more saturated acids than

unsaturated ones [3]. The composition of esters [5] of aspen wood was previously studied. Wood of *P. tremula* contained primarily the palmitate, stearate, and eicosanoate esters of α - and β -amyrin; palmitate, stearate, and eicosanoate esters of tirucalla-7,24-dien-3 β -ol and lupeol.

This report presents the results of a study of unsaponifiable compounds in aspen bark lipids.

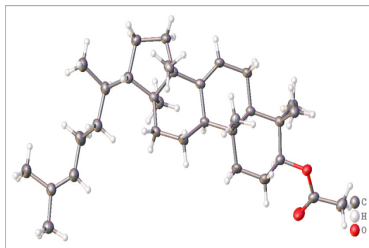
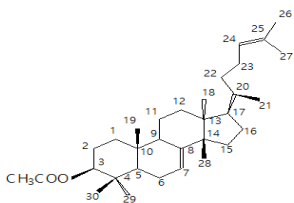
Bark components were separately collected from the lower part of the trunk of a female tree in May 2020 in the Leningrad region for a comparative analysis of outer and inner bark. The tree was 50 years old. The bark and its components were crushed, dried, and extracted with isopropyl ether. The ratio of outer bark to inner bark is 1 to 1.5. Non-polar substances were isolated from the extract using methyl *tert*-butyl ether. The ethereal extract was saponified with an alcoholic alkali solution. Unsaponifiable compounds were isolated from the reaction products. The yield of unsaponifiable compounds from the outer bark is 4.4%, from the inner bark - 2.9%.

The main components of the MTBE unsaponifiable compounds of aspen outer bark extract were identified: 7-methoxy-4',5-dihydroxyflavanone (15.0), stigmata-3,5-diene (2.2), tetracosanal (3.4%), tetracosanol (1.1) hexacosanal (19.1), hexacosanol (3.7), octacosanal (19.2), octacosanol (5.0), α -tocopherol (1.7), β -sitosterol (18.6) by gas-liquid chromatography-mass spectrometry.

In the composition of the unsaponifiable compounds MTBE from the aspen inner bark extract, the main compounds were identified by GLC-MS: lanosta-8,24-dien-3-ol (1.0%) β -sitosterol (39.4), 23-ethylcholestan-3-ol (3.1), β -amyrin (5.8), tirucalla-7,24-dien-3 β -ol (18.0), α -amyrin (3.0), lupeol (2.8) citrastadienol (2.4), stigmata-3,5-dien-7-one (3.5), citrosta-7-en-3-ol (4.4), citrastadienol (12.1), 24-methylenecycloartanol (3.0). Quantitative assessment was given after chromatography of the fraction on silica gel.

The identification of most compounds was carried out by comparison of mass spectra with the spectra of the NIST 11 database. In addition, β -sitosterol and citrastadienol were identified by NMR spectra (Table 2), and tirucalla-7,24-dien-3 β -ol after X-ray diffraction analysis of the corresponding acetate. Lanosta-7-en-3-ol was isolated from aspen for the first time. Below are the data of the NMR spectra of lanosta-7-en-3-ol (Table 1).

Tirucalla-7,24-dien-3 β -ol is a component of sulfate soap in enterprises where it is produced using the kraft cooking process [6].



The assignment of signals in the NMR spectrum of tirucalla-7,24-dien-3 β -ol is given below.

Table 1
Data of NMR spectra of tirucalla-7,24-dien-3 β -ol

C atom	δ C	δ H; J, Hz	H-H, NOE	C atom	δ C	δ H; J, HZ	H-H, NOE
1	36.9 d	1.66 β m; 1.22 α m		16	23.9 t	1.67 m	
2	24.3 q	1.660 m		17	53.3 d	1.479 m	H-C21
3	81.2 d	4.509 dd; J=4.0, 11.3	H-C29, H-C30	18	16.0 q	0.923 s	
4	37.9 s	-	H-C29	19	13.2q	0.757 s	H-C5,C1, C11
5	50.8 d	1.397 m	H-C29,30	20	35.9 d	0.965 m	H-C17
6	25.4 t	2,13 m; 2.09 m		21	22.1 q	0.790 d	H-C17; H-C22; H-C16
7	117.7 d	5.237 dd; J=2.4, 8.0		22	35.2 t	0.971 m	H-C20
8	146.1 s	-	H-C28	23	34.0 t	1.438; 1. 644	
9	48.9 d	2.214	H-C11, C19	24	125.2 d	5.090 t; J=7.2	C27 C26
10	34.9 s	-	H-C5, C1	25	131.0 s	-	H-C26,C27
11	18.2 t	1.485 m		26	25.8 q	1.676 s	C25
12	28.6 t	1.922 m, 1.947 m		27	17.7 q	1.597 s	C25
13	43.6 s	-	H-C28,C17	28	27.4 q	0.965 s	C8
14	51.4 s	-	H-C28	29	18.7 q	0.83 m	
15	33.8 t	1.812 m	H-C28, C16	30	27.7 q	0.921 s	
<u>CH3-</u> <u>C=O</u>	21.4 q	2.043 s		<u>CH3-</u> <u>C=O</u>	171.1 s		

Signal assignment was made after analysis of two-dimensional NMR spectra: H-H (COSY), H-H (NOESY), C13-H (HMBC), C13-H (HMQC).

Table 2
Data of NMR spectra of citrastadienol

C atom	δC	δH ; J, Hz	H-H, NOE	C atom	δC	δH ; J, HZ	H-H, NOE
1	36.71 t	1.849, 1.798	H-C19	16	28.1 t	1.910	H-C17
2	27.2 t	1.804, 2.006		17	56.1 d	1.238 m	H-C14
3	78.6 d	4.394 dt; J=10.8; 4.2	H-C2, C6	18	11.9 q	0.528 s	H-C12, C11, C15
4	37.1 d	1.521 m	H-C2	19	14.1 q	0.830 s	H-C1, C6
5	46.7 d	1.076 m	H-C6, C30	20	36.67 d	1.370	H-C15, H-C18
6	26.7 t	1.656	H-C19	21	19.0 q	0.969d; J=6.8	H-C22
7	117.3 d	5.166 dd; J=1.3; 5.5	H-C15	22	36.0 t	1.853	H-C21
8	139.2 s	-		23	28.06 t	1.989, 1.939	H-C28
9	49.5 d	1.652 m		24	145.9 s	-	
10	34.9 s	-		25	28.7 d	2.821 spt; J=6.9	H-C27, C29
11	21.4 t	1.595; 1.447	H-C12	26	21.1 q	0.941 d; J=6.5	H-C26
12	39.6 t	2.013; 1.215		27	21.2 q	0.969 d; J=6.9	H-C18, C25
13	43.4 s	-		28	116.6 d	5.099 q, J=6.7	H-C23
14	55.0 d	1.804 m	H-C9	29	12.8 q	1.580 d; J=6.8	H-C25
15	23.0 t	1.531	H-C7, C18, C20	30	15.2 q	0.843d; J=6.4	H-C56 H-C3, C2
CH3- C=O		2.043 s	21.36 q	CH3- C=O	171.0 s		

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关于牙科干预前口腔消毒治疗重要性的问题现状
(基于对专科医生的调查结果)

**STATE OF THE QUESTION ABOUT THE IMPORTANCE OF
ANTISEPTIC TREATMENT OF THE ORAL CAVITY BEFORE
DENTAL INTERVENTION
(BASED ON THE RESULTS OF A SURVEY OF SPECIALIZED
DOCTORS)**

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注释。本研究的目的是根据对不同专业牙医问卷材料的统计分析结果，确定局部防腐剂在牙科实践中的使用相关性，并确定其在手术预约中使用的特点。

对象和方法。通过对牙医的匿名问卷调查收集了牙科口腔防腐治疗的数据。问卷包括 19 个问题，涉及使用的防腐剂、使用频率、牙科预约期间对临床方案的遵守情况以及影响选择合适防腐剂的因素。对获得的数据进行了统计处理。

结果。问卷调查显示，91.89% 的受访者指出需要在干预前对手术区域进行初步防腐处理。葡萄糖酸氯己定 (100%)、过氧化氢 (45.45%)、呋喃西林 (33.33%) 和聚维酮碘 (21.21%) 是外科牙医最常用的防腐剂。选择的因素包括微生物负荷的减少程度、抗菌作用的持续时间、无不良反应以及关于防腐剂在临床实践中有效性的研究数据。

94.59% 和 85.14% 的问卷参与者分别知道所用防腐剂的不良反应和禁忌症清单，54.05% 的人在实践中注意到对防腐剂的不良/负面反应。

结论。所得结果表明微生物净化问题与现代牙科实践的相关性，这表明需要有针对性地制定个性化的防腐术前准备方案，同时考虑到患者的个人特征和口腔微生物群。

关键词：防腐；预防；安全；功效；方案；问卷。

Annotation. *The aim of the study is to determine the relevance of the use of local antiseptic agents in dental practice, as well as to identify the peculiarities of their use at surgical appointments based on the results of statistical analysis of questionnaire materials of dentists of various specialties.*

Objects and methods. *Data on oral antiseptic treatment in dentistry were collected by anonymous questionnaire survey of dentists. The questionnaire included 19 questions about the antiseptic agents used, frequency of their use, adherence to clinical protocols during dental appointments, and factors influencing the choice of appropriate antiseptic agents. The obtained data were subjected to statistical processing.*

Results. *The questionnaire survey showed that 91.89% of the respondents noted the need for preliminary antiseptic treatment of the surgical area before intervention. Chlorhexidine bigluconate (100%), hydrogen peroxide (45.45%), furacilin (33.33%) and povidoyodine (21.21%) are the most frequently used antiseptic agents by surgical dentists. The factor of choice is the degree of reduction of microbial load, the duration of antimicrobial effect, the absence of adverse reactions, and the data of studies on the effectiveness of antiseptics in clinical practice.*

The list of adverse reactions and contraindications of antiseptic agents used was known to 94.59% and 85.14% of the questionnaire participants, respectively, with 54.05% noting adverse/negative reactions to antiseptic agents in their practice.

Conclusion. *The obtained results indicate the relevance of microbial decontamination issues for modern dental practice, which indicates the need for targeted development of personalized protocols for antiseptic preoperative preparation of patients taking into account their individual characteristics and oral microbiome.*

Keywords: *antiseptics; prophylaxis; safety; efficacy; protocol; questionnaire.*

Introduction. Invasive interventions in the oral cavity have a cardinal difference from operations in other localizations due to the impossibility of creating sterile conditions in the operative field. The oral cavity is a unique ecological niche inhabited by various species of bacteria, fungi and viruses freely circulating in the oral fluid [1]. As a consequence, surgical manipulations are accompanied by disruption of the integrity of sterile tissues, which creates a high risk of microbial contamination of the latter and the development of not only local infectious and inflammatory complications, but also systemic lesions with transient bacteremia in immunocompromised individuals [2, 3]. Preoperative and postoperative instillation of the area of intervention using antiseptic agents can minimize the risk of postoperative inflammatory complications, as well as the risk of iatrogenic infection of medical personnel.

The aim of the study is to determine the relevance of the use of local antiseptic agents in dental practice, as well as to identify the peculiarities of their use at surgical appointments based on the results of statistical analysis of questionnaire materials of dentists of various specialties.

Objects and methods. The work was carried out on the basis of the Universal Declaration on Bioethics and Human Rights (1997), the Council of Europe Convention on Human Rights and Biomedicine (1997) and the World Medical Association Helsinki Declaration on the Ethics of Scientific and Medical Research as amended in 2000-2008. Informed consent for the use of the results of the survey was obtained from each participant of the study, certified by personal signature. The authors took all possible measures not to disclose the personal data of the study participants.

Data on antiseptic treatment of the oral cavity in dentistry was collected by questionnaire survey of dentists. A total of 74 dentists participated in the questionnaire. The questionnaire included 19 questions about the antiseptic agents used, the frequency of their use, compliance with clinical protocols during dental appointments, and factors influencing the choice of appropriate antiseptic agents.

The list of antiseptic agents for local use in dentistry, presented for selection during the questionnaire survey, was determined taking into account the indefinite period of registration according to the “Center for Expertise and Testing in Public Health”, availability for sale in pharmacies of the Republic of Belarus, as well as recommendations in accordance with the clinical protocols approved by the Resolution of the Ministry of Health of the Republic of Belarus N 66 of May 2, 2023.

Thus, the following list of antiseptic agents was determined: Chlorhexidine bigluconate; Povidone iodine; Miramistin; Furacilin; Potassium permanganate; Hydrogen peroxide; Mucosanin; Furagin (Furasol®); Cetylpyridinium chloride; Dequaline chloride (Efisol®); Septolete Total®; Oroseptin®; Cameton M®, in addition, the possibility to choose “Other” was given, pre-specifying the drug used, not represented in the proposed list. Statistical method was used to analyze the obtained data: Microsoft Excel 2013, Past4.16 software.

Results of the study. Out of the total number of specialist doctors interviewed, 41.89% belonged to the therapeutic profile, 36.49% to the surgical profile, 6.76% to the orthopedic profile, 14.87% were pediatric dentists (6.76% therapeutic and 8.11% surgical).

Distribution by gender – 59.46% of respondents were women, 40.54% – men. The average age of the sample was 34.51 ± 1.51 years, working experience was 11.5 ± 1.44 years, professional development courses were completed within a period of not more than 4 years, while for 60.81% of respondents the period of completion was not more than 12 months at the time of the survey.

The study participants represent public and private health care organizations (71.62% and 6.76%, respectively), and 21.62% of respondents combined their work activities.

According to the results of the questionnaire 91.89% of respondents noted the need for preliminary antiseptic treatment of the surgical area before the interven-

tion. Surgical dentists most frequently used chlorhexidine bigluconate (100%), hydrogen peroxide (45.45%), furacilin (33.33%), and povidoyiodine (21.21%) (Figure 1).

For the dental surgeon, the factor of choice is the degree of reduction of the microbial load and the duration of the antimicrobial effect, as well as the absence of adverse reactions. For the therapeutic dentists, when selecting an antiseptic agent, the importance of the results of studies on the effectiveness of the latter in clinical practice (in the form of courses, lectures, webinars, scientific articles and other publicly available sources) is noted.

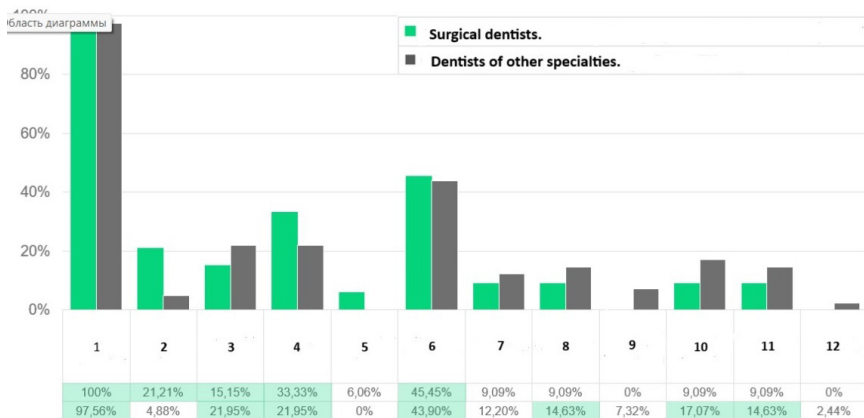


Figure 1. Results of answering the questionnaire: “What antiseptic agents do you use in your practice?”, where 1 – Chlorhexidine bigluconate; 2 – Povidone iodine; 3 – Miramistin; 4 – Furacilin; 5 – Potassium permanganate; 6 – Hydrogen peroxide; 7 – Mucosanin; 8 – Furagin (Furasol®); 9 – Dequaline chloride (Efsisol®); 10 – Septotele Total®; 11 – Oroseptin®; 12 – Another option.

The list of adverse reactions and contraindications of antiseptic agents used is known by 94.59% and 85.14% of the survey participants, respectively, with 54.05% noting adverse/negative reactions to antiseptic agents in their practice. According to the results of the questionnaire, the following changes were noted: chlorhexidine bigluconate – allergic reactions, tooth discoloration, dysbacteriosis; povidone iodine – allergic reactions, tooth discoloration; hydrogen peroxide - burning in the area of application, burn of the oral mucosa; oroseptin – burning in the area of application.

Given the sample size and the difficulty of taking into account the questionnaire, it is not possible to statistically identify a reliable frequency of adverse reactions when using certain antiseptics in this study. The use of a narrow range

of antiseptics is associated with a higher frequency of allergic reactions ($r=0.54$, $p<0.001$).

Chlorhexidine bigluconate (100%), Miramistin (36.36%), SeptoteleTotal (45.45%) are the most commonly recommended antiseptic agents for home use by both surgical and general practitioners (Figure 2).

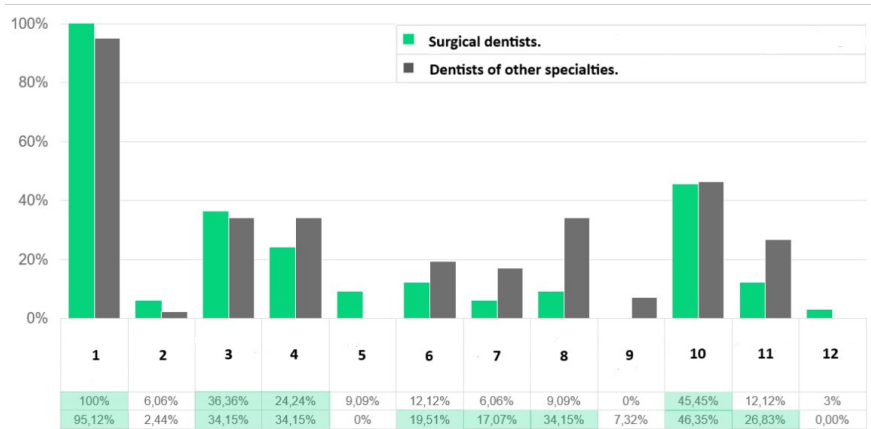


Figure 2. Results of the survey question: “Which antiseptics do you recommend to patients for home use?”, where 1 – Chlorhexidine bigluconate; 2 – Povidone iodine; 3 – Miramistin; 4 – Furacilin; 5 – Potassium permanganate; 6 – Hydrogen peroxide; 7 – Mucosanin; 8 – Furagin (Furasol®); 9 – Dequaline chloride (Efisol®); 10 – Septotele Total®; 11 – Oroseptin®; 12 – Another option.

In individual use, the choice of drug is influenced by the convenience of its use (dosage form), as well as the cost and availability for purchase. It was observed that dentists with more experience recommend a wider range of products ($r=0.34$, $p<0.005$). Dentists who have recently completed advanced training courses are more likely to recommend home use of antiseptic agents to their patients ($r=0.30$, $p<0.05$).

Conclusion. The obtained results testify to the relevance of microbial decontamination issues for modern dental practice, which indicates the need for targeted development of personalized protocols of antiseptic preoperative preparation of patients taking into account their individual characteristics and oral microbiome.

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子宫体癌
CANCER OF THE CORPUS UTERI

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注释。子宫内膜癌是一种由子宫内层细胞形成的恶性肿瘤。研究表明，在过去的10年中，29岁以下女性中这种癌症的发病率增加了48%。目前，子宫癌在俄罗斯女性肿瘤疾病中排名第二。而腺癌是不同年龄段中最常见的肿瘤组织学类型。与其他形式的子宫癌相比，子宫内膜样癌占80-90%。

关键词：子宫癌，肿瘤疾病，恶性肿瘤，风险因素，诊断，预防。

Annotation. *Endometrial cancer is a malignant tumor that forms from the cells of the inner layer of the uterus. Research shows that over the past 10 years, the incidence of this form of cancer in women under 29 has increased by 48%. Currently, uterine cancer ranks second among oncological diseases in women in Russia. Adenocarcinoma, in turn, is the most common histological type of tumor among different age categories. Endometrioid cancer occurs in 80-90% of cases compared to other forms of uterine cancer.*

Keywords: *Uterine cancer, oncological disease, malignant tumor, risk factors, diagnostics, prevention.*

Endometrial cancer is a malignant tumor that develops from the cells of the inner layer of the uterus. The main symptom that appears already at the initial stage of the disease is bloody discharge from the genital tract.

Endometrial cancer is also called uterine body cancer and endometrial adenocarcinoma. Previously, it was believed that endometrial cancer mainly occurs in women who are pre- and postmenopausal. However, at the moment, data indicate that the incidence of endometrial cancer in women under 29 has increased by 48%.

This trend is negative, since it concerns the most socially active age group. In this regard, the study of morphological features of endometrial cancer in different age groups of patients reveals particular relevance of this work. If we talk about the incidence of uterine body cancer in the Russian Federation, over the past 30 years, there has been an increase in the incidence, which has increased 3 times and at the moment, uterine body cancer ranks second in the rating of oncological diseases in women.

According to available data, women suffering from endometrial cancer are distributed into age groups in the following ratio:

- At the age of menopause – 75%;
- In premenopausal age – 20%;
- Under 40 years of age – 5%

Etiology and pathogenesis of the disease.

Uterine cancer is classified as a hormone-dependent tumor, since the endometrium, being the “target tissue” for sex hormones, is extremely sensitive to the action of estrogens.

In most patients, RTM is sporadic. In about 5% of cases, RTM is associated with hereditary syndromes, in particular, Lynch syndrome. Hyperestrogenism, early menarche, no history of childbirth, late menopause, age over 55, and use of tamoxifen are considered risk factors for this pathology. There are 2 pathogenetic types of RTM.

Type I (more common). The tumor develops at a younger age, in contrast to patients with pathogenetic variant II, against the background of long-term hyperestrogenism and endometrial hyperplasia. Patients with RTM of pathogenetic type I often have obesity, diabetes mellitus and hypertension, estrogen-secreting ovarian tumors or sclerocystic ovary syndrome are possible. Tumors of pathogenetic variant I are usually highly differentiated and have a more favorable prognosis.

Type II. Endometrial tumors are usually poorly differentiated and have a less favorable prognosis. Pathogenetic type II tumors occur at an older age, in the absence of hyperestrogenism, against the background of endometrial atrophy.

Risk factors for endometrial cancer

Currently, the following factors are identified that determine the development of uterine cancer:

- Long-term ovulation disorder, causing hyperestrogenemia, which in turn leads to hyperplasia and proliferation of the endometrium without transition to the secretory phase;
- Decreased reproductive function and infertility due to menstrual cycle disorders (hypomenstrual syndrome, amenorrhea associated with anovulation processes);
- Hypertension, especially in combination with obesity, is a consequence of a disorder of carbohydrate metabolism (decreased tolerance to carbohydrates);

- Impaired liver function, causing disruption of hormone metabolism, especially steroids, which leads to increased activity even with normal secretion levels;
- Feminizing ovarian tumors (theca cell and granulosa cell, Brenner tumor), leading to hyperestrogenemia;
- Stein-Leventhal syndrome;
- Hyperactivity of the cells of the inner lining of the follicle during menopause, when they become the main source of estrogens;
- Follicular ovarian cyst, in which the feedback mechanism between the pituitary gland and the ovaries is disrupted; glandular and, especially, glandular-cystic hyperplasia of the endometrium with a tendency to form polyps; uterine fibroids, combined with increased estrogen production; endometriosis of the uterine body with growth into the myometrium.
- Hormonal imbalance— substances that are created by our glands, pass through the bloodstream to the organs and tissues and tell them how to act – to work or to rest, to excrete something or to absorb. The main female hormones are progesterone, which prepares the body for pregnancy, and estrogens, which regulate the menstrual cycle and the functioning of the reproductive system. Their content in the body constantly changes during the month, due to which the correct state of the endometrium is maintained, and menstruation begins on time. A shift in the balance of these compounds towards a greater number of estrogens increases the likelihood of cancer.
- Hormone replacement therapy. This treatment helps reduce hot flashes – a feeling of intense heat throughout the body, reduce vaginal dryness and prevent osteoporosis – a decrease in bone density that often occurs after menstruation. Using estrogens alone increases the risk of developing life-threatening endometrial tumors. To reduce it, progesterone is additionally prescribed, but this combination is not harmless either – its use can lead to breast cancer or the formation of blood clots that clog blood vessels.
- Obesity excess adipose tissue is also considered a disease-provoking factor, since it is capable of producing estrogens.
- Increase in the number of menstrual cycles. The earlier your period starts and the later it ends, the longer your body is exposed to estrogen, and the higher your chances of developing endometrial cancer.
- Tamoxifen– a drug used to prevent and treat breast cancer. It acts like estrogen in the uterus, which can cause the uterine lining to grow after menopause and increase the likelihood of dangerous tumors developing.
- Polycystic ovary syndrome.

- Diabetes mellitus– the body’s inability to transfer glucose from the blood to tissue cells to obtain the energy they need. Endometrial cancer occurs approximately 2 times more often in women with this disease than in other representatives of the fair sex.
- Age: the older the woman, the higher her risks.
- Lack of physical activity. Lots of research showed that physical exercise reduces the risks, while a tendency to a sedentary lifestyle increases them.
- Hyperplasia– increased growth of the endometrium can also cause the development of life-threatening neoplasms.
- Family history.
- Breast and ovarian cancer can also increase the chances of developing life-threatening endometrial neoplasms.

The impact of IVF on the development of uterine cancer:

To assess the relationship between oncology and in vitro fertilization (IVF), two large meta-analyses were conducted. When studying its results, no increased risk of developing oncology was found during infertility therapy. The second included 12 studies. Almost 2 million women took part in it. In most cases, no data on the relationship between IVF and cancer were found. It is important that oncological diseases of the uterine body after IVF occur in approximately the same percentage as without the use of assisted reproductive technologies. This is due to the fact that patients are carefully examined at the stage of preparation for the procedure. Therefore, background and precancerous processes in the cervix are promptly detected and treated.

Infertility and the risk of developing endometrial cancer:

Women who have never given birth to a child are more likely to develop endometrial cancer. This is because during pregnancy, progesterone levels increase and estrogen levels decrease. This hormonal balance has a protective effect on the endometrium.

Forms and stages of uterine cancer

The International Histological Classification of Uterine Cancer (IHC) identifies the following forms of uterine cancer:

Malignant epithelial tumors:

1. Adenocarcinoma of the uterus – a malignant tumor of the endometrium. Originates from glandular tissue, most often affects the bottom of the uterus.

Macroscopic specimen. The uterus is enlarged, a section reveals a tumor-like formation growing from the mucous membrane of a papillary type, without clear boundaries, brownish in color, with ulcerations and hemorrhages, growing into the cervical canal.

Symptoms:

It may be asymptomatic for a long time. Postmenopausal women may experience bleeding, while young patients may experience unusually heavy menstru-

ation. When adenocarcinoma of the uterus spreads, lower back pain, abdominal enlargement, vaginal discharge, and nonspecific cancer symptoms (weakness, weight loss, and loss of appetite) may occur.

According to some data, up to 80% of all malignant tumors in women are uterine adenocarcinoma.

Mature women are more prone to this type of tumor.(40–65 years). However, in recent years, there has been a tendency for the pathology to become younger. Up to 40% of patients with uterine adenocarcinoma are women of childbearing age.

2. Serous uterine cancer.

Serous carcinoma of the uterus- This malignant form serous tumor, which occurs in uterus. This is an unusual form endometrial cancer, which usually occurs in postmenopausal women.

Unlike the more common low-grade endometrioid adenocarcinoma of the endometrium, serous carcinoma of the uterus does not develop from endometrial hyperplasia and is not sensitive to hormones.

According to various data, serous uterine cancer occurs in 10–20% of cases among all endometrial diseases.

3. Clear cell carcinoma of the uterine body.

Clear cell carcinoma of the uterus (CC) – rare form endometrial cancer with distinct morphological features of pathology; it is aggressive and has a high frequency relapses. As well as serous cancer of the uterine papillae, CC does not evolve from endometrial hyperplasia and is not sensitive to hormones, rather it occurs due to endometrial atrophy.

It accounts for less than 5% of all cases of uterine cancer. It is more often observed in elderly patients and is characterized by an extremely aggressive course and poor prognosis.

Malignant mixed epithelial and mesenchymal tumors:

1. Adenosarcoma of the uterus.

Adenosarcoma (AS), or Müllerian adenosarcoma, is a mixed tumor consisting of a benign epithelial component and a malignant mesenchymal component. The most common location of AS is the body of the uterus, the second most common is the cervix.

AS is a rare tumor, it accounts for about 1% of all malignant neoplasms of the genital tract and 3-9% of uterine sarcomas. Most often, the tumor develops in peri- and postmenopause, the age of more than half of patients is 40-65 years, however, cases of AS development have been described in a wide age range from 10 to 93 years.

2. Carcinosarcoma of the uterus and cervix, also known as malignant mixed tumor of the Müllerian type, which consists of both mucosal and connective tissue cells.

Sarcoma is much less common than endometrial cancer, spreads faster and is more difficult to treat. The main symptoms are pain in the lower abdomen, sometimes bloody discharge from the genital tract. According to literature, the frequency of carcinosarcoma among all uterine sarcomas is about 5%.

3. Leiomyosarcoma of the uterus

Leiomyosarcoma of the uterus (LMSU) is a malignant neoplasm that develops from the smooth muscle cells of the uterus. It grows intramurally or exophytically into the uterine cavity. The node is single, soft in consistency, with unclear borders, foci of necrosis and hemorrhages.

Leiomyosarcoma is characterized by an aggressive course and early hematogenous metastasis. Multiple micrometastases in the chest organs are possible already at the first stage. On average, several months pass from the end of treatment to the occurrence of a relapse, and about 2 years at the initial stages. In most cases, relapses occur outside the pelvic cavity. Five-year survival is 18-68% for all stages, for the first it can reach 85%.

Diagnosis of endometrial cancer

- Physical examination of the pelvic organs.
- Ultrasound examination.
- Hysteroscopy.
- Biopsy: This involves removing tissue and examining it to look for cancer cells. It usually involves a thin tube inserted through the vagina. A thin layer of tissue is scraped off the wall of the uterus, and then a pathologist examines the tissue under a microscope. Often, a biopsy is the only way to accurately diagnose a malignant uterine tumor.
- MRI of the pelvic region to determine the origin of the tumor (cervix or uterine body) and its local spread
- In the presence of highly differentiated carcinomas - CT of the chest, abdominal cavity and pelvis
- If metastatic disease is suspected based on physical examination or blood tests, positive PET-CT

Conclusion

Thus, the data obtained during the study demonstrate dominance in all age groups. Among all patients, adenocarcinoma is the most common histological type of tumor among different age groups, by alimentary factors, subject to the presence of endocrine diseases, by the factor of oral contraceptive use. The incidence of endometrioid cancer is 80-90%, compared with other forms of uterine cancer (non-endometrioid - serous and clear cell) with a frequency of no more than 10-15%. It should be noted that age-related features of the endometrium, where carcinomas develop, were identified. In the predominant number of cases, hyperplastic endometrium and atypical hyperplasia are the background for the develop-

ment of uterine cancer in reproductive patients, while in patients aged 45 years and older, the frequency of endometrial transformation by atrophic and mixed types increases.

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胆道镜治疗胆总管瘢痕狭窄的内镜入路优化

OPTIMIZATION OF THE APPROACH TO COMMON BILE DUCT CICATRICAL STRICTURES ENDOSCOPIC TREATMENT USING CHOLEDOCHOSCOPY

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摘要。研究目的: 优化经口胆道镜胆总管瘢痕性狭窄内镜探条置入方法。材料: 对177例胆总管瘢痕性狭窄患者(主要组)和38例对照组患者进行分析。研究了胆总管瘢痕性狭窄的性质和病史,以及在复杂临床情况下使用经口胆道镜对瘢痕性狭窄进行探条置入的可能性和有效性。结果: 在复杂临床情况下,当无法在X射线控制下将导丝穿过狭窄区时,我们提出的探条置入方法应用于5例患者。比较有效和无效微创干预的比例,主组的比例比对照组(78.9%)高12.1%(91.0%),比例差异具有统计学意义($p = 0.0329$, 即 $p < 0.05$)。结论: 引入胆道镜探条术可以显著降低主组受试者胆总管瘢痕狭窄微创治疗的失败率。

关键词: 胆道镜检查、瘢痕狭窄、胆总管、内镜探条术。

Abstract. *The aim of the study: to optimize the method of endoscopic bougienage for cicatricial strictures of the common bile duct by using an oral choledochoscope. Materials: An analysis of 177 patients with cicatricial strictures of the common bile duct of the main group and 38 patients of the comparison group was conducted. The nature and anamnesis of cicatricial strictures of the common bile duct, as well as the possibilities and effectiveness of using an oral choledochoscope for bougienage of cicatricial strictures in complex clinical situations were studied. Results: the method we proposed was used in 5 patients, in complex clinical cases, when it was not possible to pass the guidewire beyond the stricture zone under X-ray control. Comparing the proportions of effective and ineffective minimally invasive interventions, a higher rate was observed in the main group by 12.1% (91.0%) than in the comparison group (78.9%) with a statistically significant difference in proportions ($p = 0.0329$, i.e. $p < 0.05$). Conclusion: the introduction of the method of bougienage with a choledochoscope made it possible to statistically significantly reduce the percentage of failures of*

minimally invasive treatment of cicatricial strictures of the common bile duct in the main group of subjects.

Keywords: *Choledochoscopy, cicatricial strictures, common bile duct, endoscopic bougienage.*

Introduction

For decades, despite the improvement of diagnostic methods and treatment of iatrogenic damage (ID) to the common bile duct (CBD), the number of patients with this pathology not only does not decrease, but also has a slight tendency to increase. In the twentieth century, the incidence of CBD ID was stable and amounted to 0.05-0.2%. But with the introduction of laparoscopic cholecystectomy (LC), especially at the stage of mastering the technique, it increased to 0.3 - 3% [1,2,3,4]. At the same time, there is data that in 80-90% of cases of CBD ID during cholecystectomy end in the development of strictures of the bile ducts [5,6]. Despite the visible progress in surgery of cicatricial strictures (CS) of the common bile duct, this problem remains relevant. The results of surgical treatment of bile duct injuries indicate a high frequency of complications (10 - 48%), mortality (3.2 - 28.2%) and unsatisfactory remote results (10 - 38%). Both the immediate and remote results of minimally invasive interventions are far from desired. Patients with CBD strictures require multi-stage, complex and expensive interventions with a high risk of complications and failures [7,8].

Objective: To optimize the approach to endoscopic bougienage for cicatricial strictures of the CBD. To demonstrate the effectiveness of the developed and applied in practice bougienage method using an oral choledochoscope.

Materials and methods: We analyzed patients with CBD strictures who underwent examination and minimally invasive treatment in the conditions of the State Budgetary Healthcare Institution "RCH No. 2" from 2015 to 2022, their number was 177 people. As well as a comparison group, consisting of 38 patients hospitalized from 2011 to 2014. The comparison group was selected based on the criteria of identity to the main group.

Of the 177 patients in the main group, 58 (32.8%) were men, 119 (67.2%) were women. More than half of the patients had complications of the underlying disease in the form of mechanical jaundice (92 patients (52.5%)) and purulent cholangitis (27 patients (15.2%)). The comparison group (38 patients) consisted of 11 (28.9%) men and 27 (71.1%) women. 23 patients (60.5%) had mechanical jaundice upon hospitalization, 20 patients had cholestatic hepatitis (52.6%), and 3 patients (7.9%) had purulent cholangitis.

Study results: Analyzing the nature of surgical interventions performed in the anamnesis of 215 patients in the main and comparison groups in Table 1, we want to show the causes of CBD damage.

Table 1

Types of surgical interventions that caused CBD in patients in the main and comparison groups.

Type of surgical intervention	Main group (n=177)		Comparison group (n=38)	
	Abs. qty.	In %	Abs. qty.	In %
Traditional cholecystectomy	70	39,5	24	63,2
Laparoscopic cholecystectomy (LC)	57	32,2	8	21,0
LC complicated by cystic duct stump failure, for which laparotomy was performed with cystic duct stump suturing	1	0,6	-	-
Attempt at LC with subsequent conversion to laparotomy	9	5,1	-	-
Traditional cholecystectomy with CBD ID and choledochoduodenostomosis	6	3,4	1	2,6
Traditional cholecystectomy with CBD ID and plastic surgery with small intestinal transplant	6	3,4	2	5,3
Plastic surgery of common bile duct cyst	2	1,1	-	-
Right hemihepatectomy for gallbladder cancer	1	0,6	-	-
Traditional cholecystectomy with choledocholithotomy	3	1,7	1	2,6
Traditional cholecystectomy with CBD ID and plastic surgery of common bile duct	10	5,6	2	5,3
Condition after TBD, stricture of the choledochointerostomosis	1	0,6	-	-
LC with ID of the CBD, laparoscopic plastic surgery of the CBD	6	3,4	-	-
Open liver echinococcectomy	2	1,1	-	-
Traditional cholecystectomy with ID of the CBD, bulbo-choledochal anastomosis	1	0,6	-	-
Cholangiostomy under ultrasound	2	1,1	-	-
TOTAL	177	100	38	100

The table shows that the main cause of the CBD ID in both the main and comparison groups was traditional cholecystectomy.

All patients in both the main and comparison groups underwent an attempt to perform transpapillary interventions to decompress the biliary tree, and the following pathology was identified, presented in Table No. 2. The table compares both groups to prove the homogeneity of the patient sample.

Table 2

The nature and amount of pathology identified during retrograde contrasting in patients with the CBD ID.

Type of pathology	Main group (n=177)		Comparison group (n=38)	
	Abs. qty.	In %	Abs. qty.	In %
Cicatricial strictures of the CBD (iatrogenic nature)	65	36,7	14	36,8*
Cicatricial strictures of the CBD with combined choledocholithiasis	31	17,5	7	18,4*
Cicatricial stricture of the CBD with a point defect in the CBD wall	1	0,6	0	0,0*
Complete block of the CBD	19	10,7	4	10,5*
Point defect in the CBD wall (iatrogenic nature)	12	6,8	2	5,3*
Point defect in the CBD wall with combined total sclerosing cholangitis	1	0,6	0	0,0*
Incompetence of the cystic duct stump (class A of CBD damage)	34	19,2	8	21,1*
Strictures of bilio-digestive anastomoses	10	5,6	2	5,3*
Condition after the imposition of bilio-digestive anastomoses	4	2,3	1	2,6*
TOTAL	177	100	38	100

The main group and the comparison group used the whole range of transpapillary interventions aimed at decompression of the biliary tree. The most frequently used method of minimally invasive treatment of this group of patients is stenting of the CBD. And as is known, endoscopic stenting in CBD CS is not always successful. The main problem in case of failure is the difficulty or impossibility of passing the guidewire beyond the stricture zone.

We have developed a method of endoscopic bougienage using an oral choledochoscope, which allows passing the guidewire beyond the stricture zone under visual control, in cases where it is not possible to pass the guidewire under X-ray control.

In our clinic, the method was tested from 2012 to 2014. 5 endoscopic interventions were performed. A patent for invention No. 2618207 dated 02.05.2017 was received for this method: "Method of endoscopic bougienage of cicatricial strictures of the common bile duct using an oral choledochoscope."

Patients of the main group (177 people) with iatrogenic injuries of the common bile duct were divided into 2 subgroups: 129 patients with chronic injuries and 48 patients with acute injuries. In the subgroup of patients with chronic injuries, a new bougienage method was used in 5 patients, standard methods were used in the remaining 124 patients, endoscopic interventions were ineffective in 14 patients

out of 124 with standard methods. Patients with acute iatrogenic injuries were also treated with standard methods, they were ineffective in 2 patients. The analysis of the nature of complications of endoscopic interventions does not prove the effectiveness of the new method of bougienage in practice, however, it remains an important indicator of the effectiveness of the study as a whole. In the main group, ERCP-induced pancreatitis most often occurred in 7 patients (3.9%), and bleeding occurred in 2 patients (1.1%). In the comparison group, ERCP-induced pancreatitis occurred in 2 patients (5.3%), and bleeding occurred in 3 patients (7.9%).

A comparative analysis of the effectiveness of minimally invasive interventions in patients with iatrogenic injuries of the extrahepatic bile ducts of both groups was carried out (Table No. 3).

Table 3

Effectiveness of minimally invasive interventions in patients with iatrogenic injuries of the extrahepatic bile ducts of both groups

Intervention results	Main group (n=177)	Comparison group (n=38)	Level of confidence
Effective	161 (91,0%)	30 (78,9%)	p = 0,0329
Ineffective (unsuccessful)	16 (9,0%)	8 (21,1%)	p=0,0329
Complications	9 (5,1%)	5 (13,2%)	p=0,0672
Mortality	0 (0%)	0 (0%)	p=1

Comparing the proportions of effective and ineffective minimally invasive interventions, we see that in the main group the indicator was higher by 12.1% (91.0%) than in the comparison group (78.9%) with a statistically significant difference in the proportions ($p = 0.0329$, i.e. $p < 0.05$). The proportions of fatal outcomes in the compared groups do not differ. The proportions of complications are close to a statistically significant difference ($p = 0.0672$). Based on the presented data, the introduction of the method of bougienage with a choledochoscope made it possible to statistically significantly reduce the percentage of failures of minimally invasive treatment of CBD in the main group of subjects.

Conclusions: The method of endoscopic bougienage of cicatricial strictures of the common bile duct using an oral choledochoscope, developed in the clinic, is a statistically proven effective method of minimally invasive treatment of cicatricial strictures of the common bile duct, which made it possible to increase the effectiveness of transpapillary interventions in the main group by 12.1% compared to the comparison group with a statistically significant difference in proportions ($p = 0.0329$).

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胺碘酮相关药物性肺损害一例
**A CASE OF DRUG-INDUCED LUNG DAMAGE ASSOCIATED
WITH AMIODARONE**

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摘要。胺碘酮是一种用于治疗心律失常的药物，使用胺碘酮可能会导致间质性肺组织损伤，形成所谓的“cordarone 肺”（CL）。胺碘酮治疗的这种并发症需要保守治疗，并强制停用该药物。本临床案例描述了一名在心脏病科接受治疗的患者，在服用胺碘酮期间出现间质性肺损伤，其基础疾病为冠心病。由于鉴别诊断困难，患者接受了以下放射学检查：胸部器官计算机断层扫描、胸部 X 光检查和放射图像的回顾性分析，这使得及时诊断“cordarone 肺”并进行必要的保守治疗成为可能，从而防止病情进展。患者出院进行门诊康复。

关键词：胺碘酮、计算机断层扫描、药物性肺损伤。介绍。

Abstract. *Amiodarone is a drug used to treat arrhythmias, the use of which may cause interstitial lung tissue damage, the development of the so-called “cordarone lung” (CL). This complication of amiodarone therapy requires conservative treatment with mandatory discontinuation of this drug. This clinical example describes a case of a patient with interstitial lung damage, while taking amiodarone, with an underlying disease of coronary heart disease, who was treated in the cardiology department. Due to the difficulty of differential diagnosis, the patient underwent the following radiographic studies: computed tomography of the chest organs, chest X-ray and a retrospective analysis of the radiographic images, which made it possible to promptly diagnose “cordarone lung” and carry out the necessary conservative therapy, preventing the progression of the disease. The patient was discharged for outpatient rehabilitation.*

Keywords: *amiodarone, computed tomography, drug-induced lung damage.*

Introduction.

One of the urgent problems in clinical practice is the development of adverse reactions that require treatment, as well as correction of therapy for the underlying disease. At the same time, the lungs are one of the most common targets for drug-induced lesions, second in frequency only to the skin and digestive system [1,2]. It is difficult to diagnose drug-induced lung diseases, since clinical and morphological manifestations are highly variable.

One of these pneumotoxic drugs is amiodarone (Cordarone), which is widely used to treat ventricular and supraventricular arrhythmias. It is believed that amiodarone and its metabolites are capable of directly damaging lung tissue cells due to the cytotoxic effect, as they initiate the production of oxygen radicals [3]. Amiodarone metabolites bind phospholipids of alveolar macrophages, preventing their disintegration, as a result of which they are deposited in the form of lamellar bodies in the alveolar spaces and lead to a slowdown in gas diffusion [1, 3]. In addition, damage occurs indirectly, through an immune mechanism, which is confirmed by the presence of cytotoxic T cells in the bronchoalveolar lavage of patients [3]. It has been established that a dose-dependent effect is characteristic of the occurrence of toxic damage to lung tissue. The development of “amiodarone lung” is observed in 0.1-0.5% of patients taking the drug at a dose of 200 mg / day and in 15% taking it at a dose of more than 500 mg / day [4 - 6]. Also, one of the risk factors in the structure of the development of “amiodarone lung” is the duration of drug intake. Most often, this complication develops after 18-24 months of therapy [7].

Despite the fact that this pathology is known in the medical community, in some situations there are difficulties in diagnosing lung damage associated with taking amiodarone.

This publication presents a clinical case of the development of toxic lung tissue damage against the background of amiodarone therapy in a patient with atrial fibrillation.

Clinical case. Patient K., born in 1945, came to the emergency room of the State Healthcare Institution “Regional Clinical Hospital” in Chita with complaints of general weakness, shortness of breath that occurs when walking, pressing pain in the chest, the intensity of which increased with a deep breath, cough with a small amount of colorless sputum, body temperature of 37.5°C. Vesicular breathing, crepitation was determined in the basal parts of the lungs on both sides. In the general blood test, leukocytosis is $13.2-18.6 \times 10^9$ l and ESR acceleration to 16 mm/h.

It is known from the anamnesis that the patient was registered with a cardiologist for about 20 years. He constantly takes antihypertensive, cardiotoxic drugs and amiodarone for about 10 years at a dosage of 200 mg per day orally.

The man also reported that two weeks ago, when he went to the local clinic with complaints of shortness of breath, cough and fever, he underwent chest X-ray, according to the results of which he was diagnosed with bilateral polysegmental pneumonia. He refused hospitalization.

Upon admission to the hospital, a general chest X-ray was performed (Fig. 1). According to the results, the following conclusion was made: bilateral lower lobe polysegmental pneumonia. Enlargement of the cardiac shadow.



Figure 1. Chest X-ray of patient K., born in 1945.

The patient was hospitalized in the cardiology department with a diagnosis of ischemic heart disease: angina pectoris II FC. Atrial fibrillation, permanent form, tachysystolic variant. CHF stage II B (II FC), arterial hypertension grade 2, risk 4. Concomitant diagnosis: bilateral community-acquired polysegmental pneumonia.

Three days after hospitalization, the patient's relatives presented chest X-rays taken in the outpatient department ten days ago. A retrospective analysis of the presented images revealed an identical X-ray picture compared to the present study.

Taking into account the fact of taking amiodarone in the anamnesis, the lack of dynamics in the X-ray examination, the exclusion of infectious and other causes of lung tissue damage, as well as the ineffectiveness of antibacterial therapy, a drug-induced lung disease was assumed. Amiodarone was discontinued. A control X-ray examination was recommended in 3 months. As a control study, the patient underwent computed tomography of the chest a month later (Fig. 2): focal and infiltrative changes are not visualized in the series of tomograms. Polysegmental reticular changes in the form of fine-mesh reorganization, deformation and thickening of the intralobular septa are determined on both sides. The bronchi are passable. The roots are structural. No formations or enlarged lymph nodes are determined in the mediastinum. Conclusion: Interstitial lung disease.

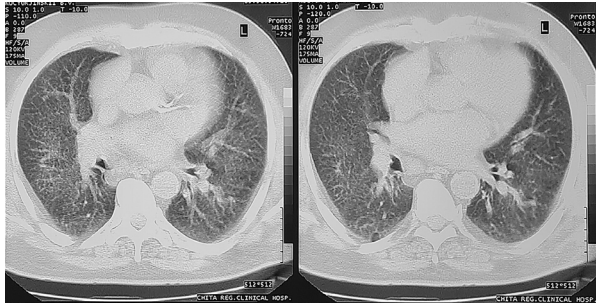


Figure 2. Computed tomography of the chest organs of patient K., born in 1945.

Thus, against the background of the withdrawal of amiodarone and treatment with prednisolone, positive dynamics were noted.

After 4 months, a control computed tomographic study of the chest was performed (Fig. 3), in which no manifestations of interstitial lung damage were detected.



Figure 3. Computed tomography of the chest organs of patient K., born in 1945, after 4 months.

After control studies and positive dynamics against the background of drug withdrawal, as well as based on anamnesis data (long-term continuous use of amiodarone, exclusion of other potential causes of pulmonary changes), a diagnosis was made: drug-induced interstitial lung disease associated with the use of amiodarone.

Discussion

The complexity of the diagnosis was due to non-specific clinical manifestations, lack of alertness of the attending physicians, superficial collection of drug history, lack of dynamic observation, as well as the low resolution of radiography in detecting interstitial damage. Radiological examination reveals such changes as ground glass opacity, bilateral, often asymmetric interstitial or alveolar infiltrates involving all lung fields, thickening of the interlobular and peribronchovascular

interstitium, pneumofibrosis and a honeycomb lung pattern [5]. It should be noted that the radiological picture is nonspecific and has a wide differential diagnostic range of diseases, including pneumonia, tuberculosis, occupational and systemic lung diseases, idiopathic pulmonary fibrosis and many others.

Conclusion

This clinical observation shows that differential diagnostics is possible provided that a detailed study of radiological changes, including dynamic observation, as well as a careful examination of the clinical picture and drug history.

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重度睡眠阻塞性呼吸暂停综合征的手术治疗困难
**DIFFICULTIES OF SURGICAL TREATMENT OF SEVERE SLEEP
OBSTRUCTIVE APNEA SYNDROME**

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简历。阻塞性睡眠呼吸暂停综合征 (OSAS) 是一种严重影响患者生活质量的疾病,因为它会对重要器官和身体功能造成并发症。

摘要。阻塞性睡眠呼吸暂停综合征 (OSAS) 的病因通常是口咽和下咽水平的软组织塌陷,这给外科治疗带来了一定的复杂性。OSAS 中的附加仪器检查有助于评估上呼吸道 (URT) 软组织的阻塞水平、形状和程度。对重度 OSAS 患者进行了多阶段和多水平手术治疗策略选择的临床观察。

对重度 OSAS 患者进行了多阶段和多水平手术治疗策略选择的临床观察 (鼻内窥镜外科手术、腭咽成形术、颏舌肌延长、颈甲固定术)。根据对照心肺监测 (CRM) 的结果,六个月后,呼吸暂停/低通气指数 (AHI) 从每小时 35 次觉醒减少到 28 次,上呼吸道 (URT) 计算机断层扫描 (CT) 显示口咽水平管腔增大。

根据对照睡眠内窥镜检查的结果,咽部软组织的吸气性塌陷减少,患者的总体健康和睡眠得到改善。

关键词: 阻塞性睡眠呼吸暂停综合征 (OSAS), 上呼吸道 (URT) 睡眠内窥镜检查, 重度 OSAS 患者的多级手术。

Resume. *Obstructive sleep apnea syndrome (OSAS) is a disease that significantly affects the patient's quality of life due to complications from vital organs and body functions.*

Abstract. *The etiological factor of obstructive sleep apnea syndrome (OSAS) is often the collapse of soft tissues at the oropharyngeal and hypopharyngeal levels,*

which presents a certain complexity of surgical treatment. Additional instrumental examinations in OSAS help to assess the level, shape and degree of obstruction of the soft tissues of the upper respiratory tract (URT). A clinical observation of the choice of tactics of multi-stage and multi-level surgical treatment in a patient with severe OSAS is presented.

A clinical observation of the choice of tactics of multi-stage and multi-level surgical treatment (endonasal endoscopic surgical interventions, uvulopalatopharyngoplasty, extension of the genioglossus muscle, chiothyroidopexy) in a patient with severe OSAS is presented. According to the results of control cardiorespiratory monitoring (CRM), six months later, there was a decrease in the apnea / hypopnea index (AHI) from 35 to 28 episodes of awakenings per hour, and computed tomography (CT) of the upper respiratory tract (URT) showed an increase in the lumen at the oropharyngeal level.

According to the results of the control sleep endoscopy, the inspiratory collapse of the soft tissues of the pharynx decreased, and the general well-being and sleep of the patient improved.

Keywords: *obstructive sleep apnea syndrome (OSAS), upper respiratory tract (URT) sleep-endoscopy, multilevel surgery of patients with severe OSAS.*

Introduction. Obstructive sleep apnea syndrome (OSAS) remains a common public health problem due to persistent severe hypoxemia and indirect effects on vital organs and body functions. Currently, polysomnography or cardiorespiratory monitoring (CRM), as well as sleep endoscopy (Sleep Endoscopy, or DISE (Drug Induced Sleep Endoscopy) of the upper respiratory tract (URT) are reliable and valuable diagnostic instrumental methods for a comprehensive examination of patients with moderate to severe OSAS) [1]. CRM allows you to assess the genesis of the disease (central or obstructive) and the severity of the disease according to the apnea/hypopnea index (AHI). Sleep endoscopy of the upper respiratory tract using a fibroscope in a state of drug-induced sleep, controlled by an anesthesiologist, indicates the level of their obstruction (nose and nasopharynx, soft palate, oropharynx, laryngopharynx), its degree and shape. It helps to obtain information not only for the development of treatment tactics (conservative or surgical) for this pathology, but, in the case of surgery, to select the required level of obstruction. With unsatisfactory results of previous interventions, it allows for its correct correction [2].

The 2014 European consensus document on sleep endoscopy NOHL (Nose - Oropharynx - Hypopharynx - Larynx) classifications most used in clinical practice, which assesses the nasal, oropharyngeal, hypopharyngeal, laryngeal levels of obstruction of the soft tissues of the upper respiratory tract, and VOTE (Velum - Oropharynx - Tongue base - Epiglottis) - collapse at the level of the soft palate, oropharynx, root of the tongue and epiglottis, excluding nasal obstruction [3].

According to the medical literature, there are often obstructions at the oro- and hypopharyngeal levels [4]. One of the main methods of treatment can be the use of a high-pressure apparatus (CPAP therapy) during sleep. However, not all patients can tolerate this treatment, reporting discomfort when using a face mask, and some cannot sleep while connected to a mechanical device. Sometimes CPAP therapy can cause complications. In these cases, surgical treatment should be considered, which has recently been gradually gaining recognition and fame among other methods. Its purpose is to eliminate the cause of obstruction at various levels. The solution to the problem can be achieved by one- or multi-stage approaches, depending on the volume of surgical interventions. The main problem of single-stage multilevel OSAS surgery involves its safety. Leaving an obstacle on one of the levels does not achieve an overall positive effect. According to some authors [5], it is possible to carry out interventions in one stage at the nasal and palatal levels, planning a complete resolution of the obstruction of the upper respiratory tract at another stage.

We present a clinical case of successful surgical treatment of a patient with severe OSA with multilevel obstruction.

Clinical observation.

In February 2022, the Department of Otorhinolaryngology of the Federal State Budgetary Institution “National Medical and Surgical Center named after N.I. Pirogov” of the Ministry of Health of the Russian Federation, patient K., 34 years old, complained of severe snoring, difficulty in nasal breathing on the right side, periodic flow of mucus down the back of the pharynx, poor quality of sleep, daytime sleepiness and, according to relatives, cessation of breathing during sleep.

A patient who has undergone a history of septoplasty has noted rises in blood pressure for a long time, up to a maximum of 160/100 mm Hg. The patient does not take antihypertensive therapy and leads a sedentary lifestyle.

An objective examination determined hypersthenic physique, signs of obesity (height 172 cm, weight 96 kg). The mass index was 32.45, the neck circumference at the level of the thyroid cartilage was 42 cm.

During the otorhinolaryngological examination, micrognathia and macroglossia were noted, the mucous membrane of the nasal cavity and pharynx was pink, the nasal septum in the midline, nasal breathing on the right was difficult, on the left it was free, hypertrophy of the palatine tonsils of the 3rd degree was determined, the palatine arches were thickened, the palatine uvula was wide and hypertrophied. The level and degree of oropharyngeal obstruction was also indirectly assessed by the position of the tongue in the oral cavity relative to the soft palate, according to M. Friedman, which amounted to 4 degrees of oropharyngeal obstruction [6].

Summing up these indicators with the data of hypertrophy of the palatine tonsils, macroglossia and body mass index (BMI), it was possible to predict a severe degree of OSA without resorting to additional examination methods.

Endoscopic examination of the upper respiratory tract of the patient under the control of fibroscopy in the sitting and lying positions, in conjunction with the Muller test (reverse Valsalve test, when the patient, after performing a forced exhalation, closes his mouth and nose with his hand and inhales), revealed moderate hypertrophy of the pharyngeal tonsil with signs of a fistula in its center, indicating the presence of Thornwaldt's cyst. The collapse of soft tissues was also determined at the uvulopalatal and oropharyngeal levels, moderate hypertrophy of the lingual tonsil.

CRM results confirmed the diagnosis of severe obstructive sleep apnea, and the apnea/hypopnea index (AHI) was 35 episodes of awakenings per hour.

During sleep endoscopy, in addition to the data obtained from native endoscopy of the upper respiratory tract, there was a concentric narrowing of the soft tissues at the oropharyngeal level. According to the results of computed tomography (CT) scan of the upper respiratory tract, there was a bullous alteration of the right middle turbinate, which led to moderate difficulty in nasal breathing on the right, as well as narrowing of the lumen at the uvulopalatal and oropharyngeal levels.

His Epworth Sleepiness Scale (ESS) score was 16.

Based on the data obtained as a result of the collection of complaints and anamnesis, general and otorhinolaryngological examination, the results of additional instrumental methods of examination, in accordance with the current "International Classification of Sleep Disorders of the Third Revision 2014", a clinical diagnosis of severe OSAS with multilevel obstruction of the upper respiratory tract at the uvulopalatal and oropharyngeal levels.

The tactic of treating the patient is determined. Both CPAP therapy and surgical interventions are proposed, and a variant of their combinations is considered. The patient categorically refused independent CPAP therapy. It was planned to simultaneously perform 1 stage endonasal endoscopic surgical interventions in the amount of correction of the right middle turbinate and removing Thornwaldt's cyst, uvulopalatopharyngoplasty modified by us according to K. Pang, as well as extension of the tongue using mandibular osteotomy on the genioglossus advancement, in order to increase lumen and reduce airway resistance at the above levels.

Surgical interventions were performed under endotracheal anesthesia. It is worth dwelling on the last two, which are of greater importance for the elimination of OSA. First, the uvulopalatal flap (UPF) procedure according to N. Powell was performed, which included shortening the soft palate by folding the distal soft palate with the uvula forward towards itself, while the latter was partially excised and thinned [6]. It is believed that this technique stabilizes the muscles of the soft palate and does not give cicatricial contractures, as with other techniques. Then the operation was expanded to bilateral tonsillectomy with subsequent isolation of the palatopharyngeal muscle, crossing its lower end and suturing it to the

arcuate muscle fibers of the soft palate. Vicryl sutures №. 4 were placed on the edges of the wounds. This technique of expansion of sphincter pharyngoplasty was described by K. Pang, the principle of which is to isolate the palatopharyngeal muscle, deploy it and create a certain tension in the lateral wall of the pharynx [7]. The extension of the tongue was carried out in such a way that the thinned osteotomized rectangular bone fragment of the lower jaw without turning was pulled up with the geniolingual muscle and fixed with a titanium plate using screws (Pic. 1).

The early postoperative period passed without complications. Antibacterial, symptomatic and CPAP therapy was carried out prophylactically. In the long-term period, the patient noted a significant improvement in the quality of life, sleep improved, but severe snoring persisted.

Six months later, the control CRM showed insignificant changes in AHI, up to 32 episodes per hour. During sleep endoscopy of the upper respiratory tract, an inspiratory collapse of the lateral walls of the pharynx at the hypopharyngeal level was noted, with the participation of the pectoral muscles.

The patient was offered the next stage of surgical intervention. In November 2022, the hyoid bone was sutured to the thyroid cartilage in order to stabilize the hyoid bone and the muscular skeleton as an integral complex of the hypopharynx, which also increases the airway space and neutralizes obstruction. Under endotracheal anesthesia, a horizontal skin incision up to 5 cm long was made at the level of the upper edge of the thyroid cartilage. The hyoid bone was mobilized in the antero-caudal direction and fixed to the thyroid cartilage with four permanent non-absorbable sutures. A surgical drain was installed 24 hours after surgery. The early postoperative period was managed as in the first case, and it also passed without complications.

Control CRM after six months showed a decrease in AHI, up to 28 episodes of awakenings per hour, and control CT showed an increase in tissue lumen at the oropharyngeal level (Fig. 2).

According to the results of the control sleep endoscopy, the inspiratory collapse of the soft tissues of the pharynx decreased, the patient's general health and sleep improved.

Discussion

OSAS of moderate and severe degree, according to foreign medical literature, is a common pathology that occurs more often in men. Its severity is confirmed by the results of CRM and sleep endoscopy due to various forms of obstruction of the soft tissues of the upper respiratory tract at different levels. CPAP therapy in some cases may be ineffective and difficult to tolerate by patients. The collapse of the lateral walls of the pharynx is one of the obstruction factors that is difficult to regulate.

Multi-level multi-stage surgery of the described pathology makes it possible to obtain positive effects of treatment with the use of optimal techniques of surgical interventions. This is confirmed by control methods of examination.

To date, various surgical approaches for the treatment of OSA have been described, but some of them are technically complex and associated with complications such as bleeding, persistent dysphagia, severe swelling and pain.

Understanding such a complex condition and its key factors involved in various patterns of obstruction can help determine the best surgical indications and targeted surgical strategies.

Conclusion

The correct tactics in the diagnosis of OSA allows you to determine the severity of the disease, the degree and level of airway obstruction, as well as choose the optimal method of treatment and achieve the expected result.

Surgical treatment of patients with moderate and severe OSAS usually requires multi-stage, multi-level and combined approaches.

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FIGURES AND DESCRIPTIONS

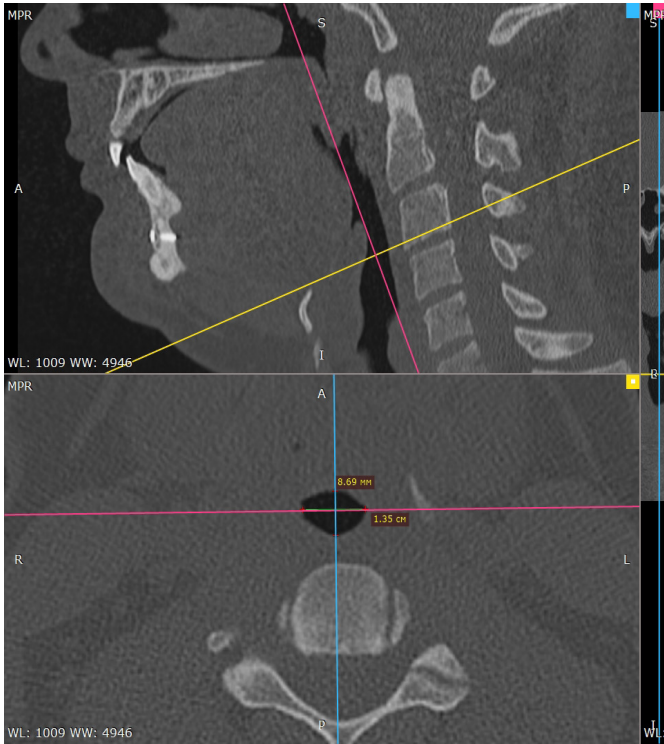


Figure 1. Stage of fixation of the bone fragment of the lower jaw titanium plate.



A

Figure 2. CT scan of a patient with severe OSAS and tissue obstruction at the oropharyngeal level (A - before surgery, B - after surgery).



B

Figure 2. CT of a patient with severe OSA and with tissue obstruction at the oropharyngeal level (*A* - before surgery, *B* - after surgery).

脑肿瘤钙化(砂粒体)是放射治疗的并发症

CALCIFICATIONS (PSAMMOSIS BODIES) OF BRAIN TUMORS AS COMPLICATIONS OF RADIATION THERAPY

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引言。现阶段,脑肿瘤中脑砂的发现是讨论其来源和功能意义的话题。一些研究人员认为,脑钙化和骨骺砂是伴随身体衰老的代谢紊乱的结果。然而,它们不仅在形状和大小上存在形态学差异,而且与血管的关系也不同。脑肿瘤钙化在组织学切片上的形状与血管腔的形状相对应,骨骺砂形状不规则且尺寸较大。它在 10 岁以上的人群中出现,而在精神分裂症患者中则不存在,这证实了它们的功能意义。在研究曾接受放射治疗的脑肿瘤复发患者的脑材料时,可以检测到沙粒体。总结了松果体脑砂和沙粒体之间的差异,作者认为,它们通过肿瘤突起区域的血管逆流实现对恶性肿瘤的适应,并通过将顺行血流转变为逆行血流来抵消肿瘤的扩散。

关键词: 松果体脑砂、沙粒体、肿瘤复发、放射治疗(RT)。

Introduction. *At the present stage, findings of brain sand in brain tumors are the subject of discussion on the issues of their origin and functional significance. A number of researchers believe that brain calcifications and epiphyseal sand are the result of metabolic disorders accompanying the aging of the body. However, not*

only morphological differences in shape and size are observed, but also different relationships with blood vessels. Brain tumor calcifications on histological sections correspond in shape to the lumen of blood vessels, epiphyseal sand has an irregular shape and large sizes. Its appearance at the age of over years and absence in patients with schizophrenia confirms their functional significance. Psammosis bodies are detected when studying the brain material of patients with relapses of brain tumors who had a history of treatment with radiation therapy. A conclusion was made about the differences between the pineal brain sand and psammosis bodies, which, according to the authors, implement adaptation to malignancy and counteract the spread of the tumor through vascular reversal in the area of the tumor process with a change in anterograde blood flow to retrograde.

Keywords: pineal brain sand, psammosis bodies, tumor recurrence, radiation therapy (RT).

Relevance. At the present stage, the pathogenesis of psammomatous meningioma — meningitogenic or fibrous with a large number of psammoma bodies (corpora arenacea) — is the least studied [2, 3]. Despite the development of molecular genetic studies and cellular technologies, targeted drug delivery, the dominant types of treatment for brain tumors remain surgery, radiation therapy and chemotherapy [17]. The median survival remains low and corresponds to one year in duration [1, 4]. The lack of a comparative analysis of histological and biochemical parameters of the pineal gland brain sand and brain calcifications is an obstacle to a correct understanding of the physiological aging of the brain and malignancy of its structures [5, 13]. This fact became decisive in choosing the direction of our scientific research.

The aim of the study was to investigate psammosis bodies of brain tumors and their relationship with radiation therapy and malignancy in brain structures.

Materials and methods. A total of 142 biopsies of brain tumors, as well as 98 epiphyses of deceased patients of different ages and sexes with a history of stroke and schizophrenia, as well as tumors of the visceral systems with brain metastases were studied. Histological slide images were obtained using CellSens proprietary imaging software (Olympus Life Science, Tokyo, Japan), and digital slides were prepared using Aperio Scan Scope (Leica Biosystems Inc., Buffalo, Grove, IL).

Results of our own studies and their discussion. It was found that only round formations corresponding in shape to blood vessels are identified against the background of brain tumors. The formed calcifications do not extend beyond the lumen and wall of the blood vessel, and can be represented by single formations identified in the lumen of the vessel, or located diffusely in the tumor interstitium. Not all vessels undergo calcification; unchanged vessels containing erythrocytes and leukocytes in the lumen are identified next to the obliterated vessels. We have noted

the dynamics of calcification intensity along the vector from the tumor periphery to the center. The sizes of psammosis bodies depend on the diameter of the lumen of the vessels that have undergone calcification, and have a rounded shape. Morphological data indicate that the process of vessel obliteration begins with hyperplasia and hypertrophy of endotheliocytes, followed by dystrophic processes and calcification. The diversity of the morphological picture observed in the dynamics of the formation of psammous bodies in brain tumors in the center of the tumor and its surroundings allows us to conclude that the leading factor in the pathogenesis of malignancy in this type of tumor process is the death of the endothelium, but not all vessels are calcified, some of them are obliterated due to fibrinoid structures. According to our research, the forming masses that obliterate the vessel with the formation of psammous bodies have a linear direction, and not a spiral or concentric one. Psammous bodies of brain tumors, when using phase-contrast microscopy, clearly show the vertical direction of the cells in relation to the vessel wall in the lumen in the dynamics of calcification. Causes of vascular intracranial calcification include early presentation of atherosclerosis in children with risk factors such as hyperhomocysteinemia, familial hypercholesterolemia and others, healed hematoma, old infarction and microvascular disorders such as COL4A1 and COL4A2-related diseases [6, 8, 12]. Intracranial calcification is also observed in some childhood brain tumors [14]. Clinical and family information such as age at presentation, maternal exposure to teratogens including viruses and association with chromosomal abnormalities, pathogenic genes and postnatal infections facilitate narrowing the differential diagnosis of multiple causes of intracranial calcification [2]. The formation of psammosis bodies in brain tumors, although associated with the death of endotheliocytes due to hypoxia, is the primary cause of cerebral ischemia, neuronal apoptosis and malignancy [7]. The presence of psammosis bodies in malignant organs of the visceral systems and their presence in the thyroid gland requires additional study and confirmation of malignancy, not as a local process, but as a result of systemic disorders in the body of a patient with oncological pathology.

Conclusion. A proprietary conceptual model of the origin and significance of psammosis bodies is proposed. The data obtained in the study expand the range of diagnostic measures in identifying malignancy of brain structures and can be used to predict the outcome and prevent tumor recurrence and can be considered as key target structures in the development of targeted conservative therapy for brain tumors and the prevention of complications after radiation therapy. A conclusion is made about the origin, functions and role in malignancy of neuronal intracellular and interstitial inclusions of calcifications in brain tumors and the pineal gland. Age-related features of brain sand and features associated with pathology of the nervous system of ischemic etiology are revealed. A proprietary conceptual model

of the origin and significance of psammosis bodies is proposed. The data obtained in the study expand the range of diagnostic measures in identifying malignancy of brain structures and can be used in predicting the outcome and preventing relapse of tumors as key target structures in the development of targeted conservative therapy for brain tumors.

The obtained histopathological data and comparative analysis of psammous bodies of brain tumors will serve for the further development of magnetic resonance imaging (MRI) technologies and the expansion of diagnostic criteria for differential diagnosis and characterization of malignant tissues *in vivo*. Many authors associate the appearance of brain calcifications in the form of psammous bodies with the development of metastasis to the brain of primary tumors, as well as complications after treatment of tumors with radiation therapy [11, 12]. Against the background of these data, the differences from psammous bodies of brain tumors of sand detected in the human pineal gland, which is normally detected throughout a person's life, starting from the age of 3 and is absent in patients suffering from schizophrenia, are understandable [1, 14]. Some authors note an increase in calcifications with age not only in tumor tissue, but also in the vascular plexuses of the brain [10-13], which is consistent with the calcifications we observed in the periventricular zone of the hypothalamus of patients who died from a stroke, which were smaller in size compared to those in the pineal gland. It is known that there is a significant correspondence between calcification of the pineal gland and lumbar degeneration of intervertebral discs, as well as atherosclerosis of the abdominal aorta. It is known that calcification is a distinctive feature of oligodendroglioma (ODG), and can be used as a diagnostic factor with unclear prognostic consequences. It was also noted that ODG with calcification had larger tumor diameter; lesser extent of resection; higher tumor grade; higher MGMT methylation level; higher Ki-67 index; and higher rates of midline crossing, enhancement, cyst, and 1q/19p copolysomy [9, 15]. Calcification is a negative independent prognostic factor in patients with brain tumors and holds promise for the development of personalized treatment and prediction of tumor outcome.

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慢性心力衰竭患者的生活质量和运动耐受性：重点关注心率
**QUALITY OF LIFE AND EXERCISE TOLERANCE IN PATIENTS
WITH CHRONIC HEART FAILURE:
FOCUS ON HEART RATE**

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注释。简介。慢性心力衰竭 (CHF) 是一种持续进展性疾病,会导致患者生活质量 (QOL) 下降和运动耐受性下降。大量研究证实,心率增加会使左心室收缩功能障碍和窦性心律的 CHF 患者预后恶化: 心率超过 75 次/分钟时,有必要降低心率以优化患者的临床状况。

本研究旨在确定目标心率,以了解其对左心室射血分数低的 CHF 患者生活质量和运动耐受性的影响。

材料和方法。为了优化左心室射血分数低的充血性心力衰竭患者的治疗,我们进行了一项前瞻性比较研究,研究对象为 80 名 (54 名男性和 26 名女性,平均年龄 66.3 ± 7.9 岁) 患有心肌梗塞后心肌硬化和窦性心律的患者,根据 NYHA 心功能分级,充血性心力衰竭为 II-III 级,射血分数低于 40%。结果。基线心率为每分钟 60 至 69 次的患者在治疗期间的生活质量明显更好。功能活动指标最差的患者平均心率为每分钟 55-59 次,社会心理指标最差的患者心率为每分钟 70-75 次。心率为每分钟 60-69 次的患者运动耐受性 (根据 6 分钟步行测试) 较高,心率为每分钟 70-75 次的患者运动耐受性最低。

讨论。CHF 治疗方法应个性化。因此,在 PEAKS 背景下,达到 CHF 患者的目标心率范围可以有针对性地滴定 β 受体阻滞剂剂量,同时改善患者的生活质量以及临床和功能状态。

结论。在收缩性 CHF 患者中,在个性化选择 β 受体阻滞剂和伊伐布雷定治疗的背景下,心率为每分钟 60-69 次的患者表现出最佳的身体活动和生活质量指标,同时保持最佳血压水平 $120-129/70-79$ mmHg。

关键词: 生活质量、心力衰竭、心率、运动耐受性。

Annotation. Introduction. *Chronic heart failure (CHF) is a steadily progressive disease that causes a deterioration in the quality of life (QOL) of patients and a decrease in exercise tolerance. Numerous studies have confirmed the role of increased heart rate in worsening the prognosis of patients with CHF with systolic dysfunction of the left ventricle and sinus rhythm: with a heart rate above 75 beats/min, it is necessary to reduce it in order to optimize the clinical status of patients.*

The aim of the work is to determine the target heart rate in terms of its impact on quality of life and exercise tolerance in patients with CHF with a low left ventricular ejection fraction.

Materials and methods. *In order to optimize the treatment of patients with CHF with a low LV ejection fraction, we conducted a prospective comparative study in which 80 patients (54 men and 26 women, average age 66.3 ± 7.9 years) with postinfarction atherosclerosis and sinus rhythm with CHF II-III FC according to NYHA with an ejection fraction of less than 40% were examined. Results. Significantly better quality of life during therapy was observed in patients with a baseline heart rate from 60 to 69 per minute. The worst indicators of functional activity were recorded at an average heart rate of 55-59 beats per minute, and socio-psychological - at a heart rate of 70-75 beats per minute. Exercise tolerance (according to the 6-minute walk test) is higher in the group of patients with a heart rate of 60-69 beats per minute, and lowest at a heart rate of 70-75 beats per minute.*

Discussion. *The approach to CHF therapy should be personalized. Thus, achieving the target heart rate range in patients with CHF against the background of PEAKS allows targeted titration of the beta-blocker dosage, while improving QOL and the clinical and functional status of patients.*

Conclusion. *In patients with systolic CHF, against the background of individualized selection of therapy with beta-blockers and ivabradine, the most optimal indicators of physical activity and QOL were demonstrated by patients with a heart rate of 60-69 per minute while maintaining an optimal blood pressure level of 120-129/70-79 mmHg.*

Keywords: *quality of life, heart failure, heart rate, exercise tolerance.*

Conflict of interest. The authors state that there are no obvious and potential conflicts of interest.

Introduction

Chronic heart failure (CHF) is the terminal stage of many cardiovascular diseases. The prevalence of CHF in various countries of the world varies from 0.3% to 5.3% [1]. According to the data of the large EPOCH-CHF register in Russia,

there is a high prevalence of CHF of functional classes I-IV with a steady increase over the period from 1998 to 2017 (from 6.1 to 8.2%) [1,2].

Aspects of the quality of life (QOL) of patients who are first prescribed hemodynamic drugs that affect the prognosis for CHF (RAAS or ARNI blockers, beta-blockers) are still debatable, or the “basic” therapy of CHF is resumed after acute decompensation. In this case, the analysis of QOL indicators is an important criterion for evaluating the effectiveness of therapy [3] and is closely interrelated with the patient’s condition, primarily hemodynamic parameters: blood pressure, heart rate. This allows for the correction of ongoing therapy, which is especially important in severe patients with CHF and elderly patients. Various validated questionnaires are used to assess QOL, among which the Minnesota questionnaire “Minnesota Living with Heart Failure Questionnaire” (MLHFQ) is the “gold” standard for use in patients with CHF [4].

The aim of the work is to analyze the effect of heart rate on quality of life and exercise tolerance in patients with CHF with a low left ventricular ejection fraction.

Materials and methods

A prospective comparative 6-month study was conducted on the basis of the Central City Hospital No. 7 in Yekaterinburg, dedicated to optimizing the treatment of patients with CHF with a low LV ejection fraction. 80 patients (54 men and 26 women, average age 66.3 ± 7.9 years) with postinfarction atherosclerosis and sinus rhythm, with CHF II-III NYHA class with LVEF less than 40% were examined. 56% of patients had CHF II (NYHA), 44% - III. The assessment of exercise tolerance was carried out using a 6-minute walk test (6-MWT), and the assessment of quality of life was carried out using the Minnesota questionnaire “Life with Heart Failure” (MLHFQ).

The MLHFQ questionnaire includes 21 questions and consists of physical and socio-psychological scales, has sufficient reliability and a fairly high sensitivity [8].

Initially, all patients received basic therapy: perindopril 2.5 – 7.5 mg / day, iNGLT-2, AMCR, beta-blockers (BB). BB was titrated starting from minimum doses in two-week increments, striving to achieve the target (10 mg bisoprolol / 25 mg carvedilol), with intolerance to target doses - as portable as possible. If the target doses of BAB were not reached against the background of arterial hypotension, the If channel inhibitor ivabradine (5 or 7.5 mg 2 times a day) was additionally added to patients. The target heart rate was considered to be less than 70 beats per minute.

Statistical processing of the results was carried out in the Statistica 10.0 software package (StatSoft Inc.). with the calculation of the median (Me) and the interquartile interval (25; 75%). The influence of the studied signs was determined by the relative risk index (RR) within 95% CI. The differences were recognized as significant at $p < 0.05$.

Results

In the examined group of patients initially the average distance of a 6-minute walk was 350 (240÷400) meters. The average quality of life index was 33 (21÷52) points, while on a physical scale -17 (12÷24) points, on a socio-psychological scale - 16 (8÷26) points.

The recommended heart rate in the treatment of coronary heart disease (55-60 per minute) was achieved in 100% of patients in 1 to 1.5 months period. However, a number of patients noted symptoms that reduce the quality of life: 12 patients (20%) suffered from frequent dizziness, 16 (26.7%) - from orthostatic hypotension, 32 patients (53.3%) - increased weakness and fatigue with habitual loads. Tactics have been changed to reduce the dose of beta-blockers (and/or ivabradine). The developed undesirable effects were associated precisely with a decrease in heart rate, since during the titration of the BB dose, the doses of other drugs affecting blood pressure did not change.

After 6 months, the patients were divided into 4 subgroups:

- 1) Heart rate 55-59 per minute – 13 patients (16.3%)
- 2) Heart rate 60-64 per minute – 21 (26.3%)
- 3) Heart rate 65-69 per minute – 32 (40%)
- 4) Heart rate 70-75 per minute – 14 (17.4%).

When analyzing the prevalence of adverse events (AE) after 6 months of therapy, it was found that in the group with a heart rate of 60-69 beats per minute, AE is twice less common than in groups with a heart rate below 60 and above 70 beats per minute (OR 2; 95% CI: 0.8 – 4.7, $p < 0.05$).

Against the background of therapy and achieving optimal heart rate and blood pressure, significantly better QOL indicators were noted in patients with a baseline heart rate from 60 to 70 per minute. The lowest indicators of functional activity were noted in the subgroup of heart rate 55-59 beats per minute, socio-psychological - in the subgroup with heart rate 70-75 beats per minute. Exercise tolerance is also higher in the group of patients with a heart rate of 60-69 beats per minute, and the lowest rates of exercise tolerance were noted in the subgroup with a heart rate of 70-75 beats per minute (Table 1).

Table 1.
Quality of life and the 6MWT parameters depending on the achieved heart rate in patients with CHF (n=80) after treatment (Me; 25; 75%)

Heart rate	55-59	60-64	65-69	70-75
6MWT (m)	355 (300÷450)	400 (310÷445)	400 (200÷450)	300 (190÷360)
QoL, total score, points	32 (16,5÷49)	24 (19÷47,5)	25 (18÷45,8)	30 (15÷43,5)

QoL, physical scale points	14 (8÷24)	13 (6,5÷19)	13,5 (8,3÷19,8)	12 (5,8÷17)
QoL, socio-psychological scale, points	15 (7÷25)	12 (9,5÷24,5)	13,5 (4,3÷26,5)	16,5 (10÷22,5)

Note: bold indicators have statistical significance ($p < 0.05$)

Discussion

Meta-analyses of studies on the use of beta-blockers in CHF have demonstrated a decrease in the risk of death in patients with sinus rhythm against a background of a decrease in heart rate [5,6]. The maximum effect of therapy depends on the degree of heart rate reduction [7,12]. It is important that the heart rate below the hypothetical “norm” of 75-76 beats/min has a minimal effect on the prognosis in patients with CHF [8,9]. It is still uncertain which degree of increase in heart rate (compared to the “norm”) is “compensatory” and which is “destructive”.

According to the recommendations of the American Heart Association, patients with symptomatic (II-III NYHA class) CHF ($LVEF \leq 35\%$) and sinus rhythm who are on iNGLT-2 therapy together with BB in maximum tolerated doses, ivabradine may be added at rest at heart rate ≥ 70 to reduce the risk of hospitalization and death. Therefore, the target heart rate for CHF and sinus rhythm is also less than 70 beats/min.

Also, there is currently no consensus on what the target heart rate should be in patients with systolic CHF on the background of postinfarction atherosclerosis and below which limit a decrease in heart rate leads to a worse prognosis [8]. During the present study, it was possible to determine the optimal heart rate range of patients with CHF against the background of PEAKS, within which the best indicators of self-assessment of the quality of life of patients and parameters of exercise tolerance were noted: 60-69 beats per minute, as well as optimal limits of blood pressure levels ensuring high-quality functioning of patients: 120-129/70-80 mmHg.

Summarizing the above, it can be concluded that for patients with CHF with a reduced left ventricular ejection fraction with sinus rhythm, it is effective to reduce heart rate less than 75 beats /min (optimally – less than 70 beats /min) by BB, with their intolerance - ivabradine, and in most patients with CHF - their combination. This treatment strategy can affect the improvement of prognosis, while it is important that a decrease in heart rate affects myocardial contractility, increases LVEF and maintains an optimal level of minute blood volume [9-11]. However, the bradycardia is less than 50 beats/min. Against the background of pulse-reducing therapy, it is independently associated with an increase in patient mortality and the risk of atrial fibrillation [13], which is important to take into account when optimizing therapy in patients with CHF and coronary heart disease. The best

indicators of the quality of life of patients were noted in the range of blood pressure 120-129/70-80 mmHg, therefore, with a decrease in blood pressure below 120/70 mmHg against the background of an inappropriate heart rate (above 70 beats per minute), in order to avoid the progression of hypotension and a decrease in the quality of life of patients with CHF, it is more preferable to add ivabradine to therapy than further titration of BB doses. At the same time, ivabradine monotherapy without the addition of a beta-blocker does not have a sufficient effect on the prognosis in this cohort of patients.

Conclusion

In the group of patients with CHF, against the background of careful selection of therapy with beta-blockers and ivabradine with slow titration of doses from minimum to target (maximum tolerated), the most optimal physical indicators (according to the 6-minute walk test) were demonstrated by patients with a heart rate of 60-70 per minute, they also showed the best results of self-assessment of QOL. At the same time, the best quality of life was demonstrated by patients with an achieved blood pressure level of 120-129/70-80 mmHg.

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患有下尿路神经源性功能障碍并发神经系统器质性损伤的儿童生物反馈治疗方法

**A METHOD OF BIOFEEDBACK IN CHILDREN WITH
NEUROGENIC DYSFUNCTION OF THE LOWER URINARY
TRACT COMPLICATED BY ORGANIC DAMAGE TO THE
NERVOUS SYSTEM**

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摘要。本文讨论了儿童神经源性下尿路功能障碍的问题以及包括生物反馈方法在内的现代综合康复方法，近年来，生物反馈方法在神经源性排尿障碍的治疗中越来越有用。作者提供了关于该方法对患有神经源性下尿路功能障碍的儿童的有效性的数据。

关键词：儿童、神经源性下尿路功能障碍、生物反馈、遗尿症。

Summary. *The article discusses the problems of neurogenic dysfunction of the lower urinary tract in children and the modern approach to comprehensive rehabilitation with the inclusion of the biofeedback method, which in recent years has become increasingly available in the treatment of neurogenic urination disorders. The authors present their own data on the effectiveness of the method in children with neurogenic dysfunction of the lower urinary tract.*

Keywords: *children, neurogenic dysfunction of the lower urinary tract, biofeedback, enuresis.*

Relevance. Prevalence of urinary system diseases (USDs) accompanied by impaired urodynamics of the lower urinary tract ways, increases every year. The main volume of activities related to the diagnosis, determination of the nature and treatment of this pathology is assigned to the pediatric urological service. In recent years, the need for the participation of representatives of other specialties, and especially neurologists, to successfully solve the problem has become increasingly obvious. This is determined by the exceptional prevalence of congenital and acquired diseases and pathological conditions of the urinary

tract, accompanied by neurogenic dysfunction of the lower urinary tract (NLUT), which is associated not only with an increase in the incidence of the disease, but also with an improvement in the quality of diagnosis. NLUT can be one of the causes of urinary incontinence, which affects the psychological status of the child and reduces the quality of life of the entire family. NLUT can occur as a result of various diseases of the central and peripheral nervous system or pathological conditions accompanied by a disorder of nervous regulation of the bladder function. Complex rehabilitation of NLUTD in children includes reflexology, psychotherapy, pharmacological treatment, biofeedback method (BFB), physiotherapy [1-7]. The popularity of these methods is explained by their influence on the main links of pathogenesis, synergism of action on the system of detrusor-stabilizing reflexes and antihypoxic effect, which justifies the appropriateness of the complex use of these factors in medical rehabilitation, the absence of side effects and the possibility of use in young children. Taking into account our own clinical experience [8-10], as well as the data of the literature review, the biofeedback method should take its place in the complex treatment of overactive bladder in children with urination disorders of various origins [1, 2].

Purpose of the study. Evaluation of the effectiveness of complex medical rehabilitation including the method of biological feedback (BFB) in children with NLUTD.

Materials and methods. Clinical observations and special studies were conducted in 60 children with overactive bladder aged 5 to 16 years. The main group consisted of 40 children who received therapy including the BFB method, and 20 children formed a comparison group (without using the BFB method in complex therapy). All studies were conducted with signed informed consent to participate in the study (parents and (or) guardians of children). All children underwent complete urological and neurological diagnostics using objective neuroimaging, electrophysiological and functional research methods. The groups were formed by randomization, and observation was carried out simultaneously. The effectiveness of the BFB method was assessed in the dynamics of clinical manifestations according to the overactive bladder (OAB) scale, as well as in the quality of life according to the QOL scale, visual analogue scale (VAS). The effectiveness of therapy was assessed based on the recommendations (International Conference on Computational Science (ICCS)) for assessing the dynamics in response to treatment:

1. complete response – reduction of clinical symptoms by more than 50%;
2. partial response (improvement) – reduction of clinical symptoms by more than 25%;
3. lack of response – reduction in clinical symptoms by less than 25% or lack of response to therapy.

The dynamics of the presence of residual urine after therapy was also assessed.

A standard statistical software package was used in data processing. Differences between independent groups were found using the t-test. Differences between dependent groups were analyzed using the nonparametric method (Pearson's test) and variance analysis. The dependence between two variables was assessed using the Spearman correlation coefficient and regression analysis methods. Data were considered reliable at $p < 0.05$. Results significant at the $p < 0.01$ level were usually considered statistically significant, and results with $p < 0.005$ or $p < 0.001$ were considered highly significant.

Results and discussion. NLUTD is a frequent consequence of perinatal lesions of the nervous system. Dysfunction of the bladder and muscles of the urogenital diaphragm in children of this group can be accompanied by severe urodynamic disorders, with the possibility of complications in the form of chronic recurrent urinary tract infection, vesicoureteral pelvic reflux, nephrosclerosis, renal atrophy, chronic renal failure [11]. In the conditions of the Donetsk Republican Clinical Center for Neurorehabilitation of the Ministry of Health of the DPR, the rehabilitation of neurogenic dysfunction of the bladder, carried out by us, consisted of basic therapy of the central nervous system lesion, as well as symptomatic therapy aimed at normalizing the functional state of the bladder. In most cases, during the rehabilitation of the underlying disease, the complications that developed were stopped within a year. Children with NLUTD, as a rule, had clinical symptoms of neurogenic dysfunction of the bladder, worsening the quality of life of patients. Children with significant neurological deficits and fairly severe damage to the lumbosacral spinal cord developed complications that worsened the somatic health of patients in this group.

Currently, it is widely implemented as the most effective, painless and safe method of biofeedback for the correction of neurogenic urination disorders, which, affecting all links of pathogenesis, is currently the most promising of all methods of non-drug treatment. For the first time in the 30s of the XX century, this method was used by E. Jacobson, improved by J. Basmadzhan, D. Kamiya, N. Miller, T. Budzinsky [3, 4]. Biofeedback, recording biological signals of the child's body, does not have a direct physical effect, while promoting, at the same time, the improvement of peripheral blood circulation in the pelvic area. At the beginning of the course of therapy by the biofeedback method, to "recognize" the necessary muscles of the pelvic floor, their electrical stimulation is carried out. The advantages of biofeedback include the use of interactive game plots as an interface and supporting video sequence, which allows for the general relaxation of the child, to optimize the formation of the final coordination of the pelvic floor muscles and the sphincter apparatus of the bladder. The multimedia interface facilitates the child's perception of biological feedback signals, which he usually ignores. The use of

personal computers in providing the biofeedback therapeutic method has led to its wide and widespread use in Europe, the USA, Canada, Israel and Japan. Thus, in the USA, this method is included in the list of compulsory medical insurance. However, in Russia, biofeedback therapy has not yet become widespread; only a few centers have mastered this method and use it in clinical practice [4]. The undeniable advantages of the biofeedback therapy method in children include [4]:

- 1) non-invasive;
- 2) conducting sessions in a playful manner;
- 4) convenience of demonstrating to the patient his own successes;
- 5) ease of changing regulatory strategies;
- 6) ease of instruction;
- 7) absence of absolute contraindications;
- 8) sufficiently high efficiency and versatility of the method for various forms of NDNMP [4].

Conclusions. The results of the application of complex rehabilitation using the BFB method in the conditions of the Donetsk Republican Clinical Center for Neurorehabilitation of the Ministry of Health of the DPR for children with various forms of NNSTI demonstrated a fairly high result of 86.5% in the form of relief of clinical symptoms in 79% of patients (enuresis manifestations decreased or completely disappeared), a normal number of urinations with the absence of urgency and urgent urinary incontinence was noted. A reliable decrease in residual urine in all patients and a significant improvement in the quality of life. In the control group, a 60% decrease in hyperactivity symptoms was noted in a smaller percentage of cases (50.0%). According to the functional study of the bladder, in 30% of children in the main group, the rapid type of urination changed after treatment to the normal type of urination, the maximum and average volumetric speed of urination significantly decreased to the conditional norm. After performing cystometry, a reliable increase in the maximum volume of the urinary bladder ($p < 0.02$) was revealed in most children of the main group (80.0%). In the comparison group, the dynamics of uroflowmetry and cystometry indices was less pronounced and less reliable. The BFB method does not pose any risks for patients, and the feasibility of complex treatment of children with NLUTD has been demonstrated. The introduction of treatment methods using BFB in children allows bringing therapy to a new level, contributing to the personalization of therapy, stabilization of treatment results and improving the quality of life of children with NLUTD.

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伊朗与俄罗斯在统一油气市场形成背景下的合作
**COOPERATION BETWEEN IRAN AND RUSSIA IN THE CONTEXT
OF THE FORMATION OF A SINGLE OIL AND GAS MARKET**

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摘要。本文作者研究了俄罗斯联邦和伊朗伊斯兰共和国在出口俄罗斯石油生产技术和伊朗油田开发设施综合服务领域开展技术合作的可能性。本文以单个油田为例，简要分析了伊朗伊斯兰共和国石油生产工业在机械化采矿技术提供、井服务和钻井工艺维护手段可用性以及运输原材料准备方面的状况。确定了伊朗伊斯兰共和国工业对俄罗斯石油生产设备制造商技术解决方案的基本需求。对俄罗斯生产专用产品的企业在伊朗石油工业技术市场的发展进行了短期评估。

关键词：俄罗斯联邦、伊朗伊斯兰共和国、石油工业、技术合作、石油生产、综合服务。

Abstract. *The authors of the article examined the prospective possibilities of technological cooperation between the Russian Federation and the Islamic Republic of Iran in the field of export of Russian oil production technologies and complex service of developed facilities of oil fields of Iran. The article conducts a brief analysis of the state of the oil production industry of IRI in terms of provision of mechanized mining technologies, service of wells and availability of means of maintenance of drilling processes and preparation of raw materials for transportation on the example of a single field. The basic needs of the industry of the Islamic Republic in technical solutions of the Russian producers of oil production equipment have been determined. A short-term assessment of the development of the oil industry technology market in Iran by Russian enterprises producing products of special purpose was conducted.*

Keywords: *Russian Federation, Islamic Republic of Iran, oil industry, technological cooperation, oil production, comprehensive service.*

Growing interaction within BRICS, expansion of transit and communication systems and routes with the global South force, in the context of the 3rd Lebanon war with the Levantine and Israeli states, to think about the energy security of their states in order to increase defense capabilities and to keep their governments, previously globalized industries, from collapsing their national economies [1]. This is especially difficult when the United States, represented by Donald Trump, recommends that the Jewish state attack Iran's nuclear facilities in order to reduce the ability to conduct any resistance or support its proxies throughout the Middle and Near East. At the same time, in the current conditions of the sanctions blockade in Iran's oil industry, the Islamic Republic finds the strength not only not to reduce oil production, but also demonstrates its multiple growth. The volume of production has almost doubled over the past two years. Along with this, there is also an increase in the volume of crude oil exports from Iran. China, as before, is the main importer. What is the reason for such an increase in production and export volumes? [2]

The key factor in such a trend is the growth of oil consumption within Iran itself, which is engaged in the re-industrial renewal of its own infrastructure, primarily for the needs of the oil and gas chemistry. Tehran managed to quickly implement an export-oriented strategy for oil and gas chemical production, a very wide range of goods that require the necessary equipment and technologies for the deep separation of hydrocarbons and have already been partially recreated from the best world analogues of the global fuel and energy complex at the enterprises of the former Persia. This has become one of the reasons why production is growing in the country, production and processing technologies are progressing, and innovations are being used that are available for acquisition or copying from their competitors engaged in their transit to the Eastern region, from the standpoint of alternatives to import substitution, and restraining the very scientific schools of high-tech chemistry in Iran [3].

The factor of practical drive of the ongoing transformation of the region's fuel and energy complex itself and within Iran itself can be considered the volumes that have formed in it in the form of significant reserves of oil itself, both on land and in tankers at sea. Therefore, we see that exports sometimes even grew faster than production, balancing within the OPEC+ framework with the scale of prices for extracted, previously quota-quoted barrels of a certain quantity and grade... Currently, Tehran's reserves have decreased, but are still at a very high level, and therefore there is an opportunity to sell more oil than usual, preparing either "black swans" for the global energy market, or engaging in strategic planning in the area

of growing conflicts and hedging risks in the process of their flowing into a single global war [4]. As a result, the growth in the volumes of production and export of “black gold” in the Islamic Republic is obvious, and therefore the need for new, improved drilling technologies, servicing of facilities at the fields and mechanization of production processes is becoming more than relevant. In addition, it is becoming obvious that some of the most painful sanctions imposed against the Iranian oil industry are bans on any investment and support for the energy development of the industry in technological terms. At the same time, the previously efficient oil and gas equipment park, inherited from Western oil companies after the 1979 revolution, is significantly outdated and is not subject to modernization, nor to high-quality maintenance or major repairs [5].

In addition to the significant technological gap created as a result of the introduction of sanctions against the scientific and technological potential of Iran’s leading industry, the Islamic Republic has certain development nuances, as well as features of various natures: from political, geographical, economic to technical, social, religious and mental, creating certain difficulties in achieving the tasks at hand, preventing their multidirectionality from achieving synergy in industry, and with the expected response to challenges in matters of ensuring energy self-sufficiency, without creating the expected multiplier effects necessary to maintain the stable operation of the national economy of the state, as a whole. [6] The consideration of the engineering and technical potential of Iran’s oil producing companies was carried out using the example of those industry representatives who carry out production operations in the territory of one of the most oil-bearing provinces of Khuzestan, which is located in the southwest of the country on the border with Iraq. Russian oil industry specialists have practical experience of interaction with colleagues from the Islamic Republic in matters of rehabilitation of the existing well stock and increase of oil recovery by repair of oil wells, as well as transition to mechanized production method using Russian-made technologies. [7]

Joint work was carried out at the Aban and West Peydar fields. In the course of practical joint activities, a number of features of the sanctions impact were identified that prevent more effective and high-quality implementation of the tasks facing the Iranian oil industry.

It is advisable, having mentioned the features, to describe them in general terms. Some of them are:

Geographical

The work was carried out in conditions of sharply continental and continental climate. Air temperature in summer reaches 65-70 degrees Celsius. Desert and semi-desert landscape. There is an acute shortage of water. There are only a few water supply wells in the immediate vicinity. As a result, the cost of preparing drilling and acid solutions, and the implementation of measures to kill wells of a longer cycle increase.

Most of the total well stock is located on the border with Iraq. From September 1980 to August 1988, this territory was one of the main combat zones during the Iran-Iraq armed conflict [8]. Part of the territory has not yet been cleared of mines. This fact significantly complicates the work and increases the overall costs of the project. A rather expensive item of expenditure called demining appears. This picture of industrial underdevelopment and technological backwardness is further aggravated by the fact that in winter, during heavy rains, minefield maps lose relevance due to the migration of mines caused by the buoyancy of the soil. The territory of the province is considered seismically active, where tremors periodically occur. This leads to jamming of casing columns and other negative consequences, such as reduced production and increased risks of extracting valuable components from wells [2; 9]. Due to the relative proximity of the hydrocarbon production area to the Persian Gulf, there is a high level of water cut in the wells, which increases the risk of quicksand and destruction of the entire underground infrastructure. Due to the fact that Iranian colleagues do not have primary water discharge installations, they practice the use of so-called evaporation pools to drain water mixed with emulsion and other well fluid. This method of water removal is ineffective, since the emulsion oil film prevents evaporation, even in hot weather.

Often, the lens of an oil field extends partly into the territory adjacent to Iran, that is, into the territory of Iraq, where continuous production is carried out, just like in Iranian territory. Due to the higher level of provision of the technology park in Iraq, production is carried out much more intensively and more safely. As a result, the water cut of wells on the Iranian side increases, and, as indicated above, forces additional efforts and resources to combat this phenomenon. Accordingly, the well flow rate decreases significantly and the risks of further operation increase exponentially.

Methodological

The fund of operating wells on the drilling carpet in the studied province is up to 2,000 units. To repair this fund, Iranian specialists use heavy rigs designed for exploratory and commercial drilling, which significantly increases the financial, time and human costs of project implementation, creating inconsistency in cycles and shifts, reducing production efficiency. For example, it can be reported that Russian specialists use light mobile rigs when performing well repair work, where the team size is up to 18 people, and the standard repair period is 16 days. Iranian colleagues have much more modest standard indicators. Assembly-dismantling, moving the rig 75 days, the standard well repair period is up to 35 days, the team size is 72 people. Based on this, the cost of well repair using a heavy rig by Iranian specialists is comparable to the cost of the operation for the initial drilling of a full cycle of a well by Russian specialists in the territory of the Russian Federation. Due to the high degree of wear and tear and the dilapidation of the main systems

inherited from the West (the degree of wear reaches more than 80%) and the lack of capacity, Iranian specialists resort to the method of drilling single wells. They, unlike the drilling method used by our specialists, the so-called “artisanal drilling”, when several wells are drilled at a standard distance from each other, cannot be used en masse and increase the profitability of the project as a whole. In the case of our drilling method, it has been proven by international IEA experts that it is more convenient to test the well before commissioning [3; 10]. Although it is fair to admit the fact that the flow rate of the so-called Iranian well and our “cluster” of wells is comparable, due to the shallow occurrence of oil in Iranian fields and can be systematized within a single ecosystem of hydrocarbon production and pumping. Separately, it is necessary to note the so-called “production culture”, Iranian specificity, which is practically based on the complete absence of the practice of carrying out major repairs of wells. About 10 years ago, Iranian specialists did not have this practice at all, but sanctions and the scientific and technological revolution brought this sad trend. Due to the relatively shallow occurrence of oil and the gushing of so-called natural lift of oil flows from wells, it was easier for Iranian drillers at that time to drill another well rather than resort to repairing the current wells [11]. However, over time it became obvious that the cross-section of the wells was decreasing and it was absolutely necessary to repair, flush, remove asphaltene-paraffin deposits and return the entire production infrastructure to reverse operation of system drilling along previously developed domes and according to the corresponding international oil production methods.

Standardization

Since almost the entire oil production infrastructure was built by the United States of America, Iran has adopted the American standardization system API (American Petroleum Institute). They are not yet able to abandon this standardization system, for certain political reasons, which are losing relevance in the current geopolitical realities, and their own system was not developed in principle. However, the Iranians are not in a hurry to accept our system ROST, OST and TU for management, realizing that this will lead to even greater chaos in the oil industry. The feasibility of creating a single standardization system to ensure energy security of both countries at the ministerial level has been discussed for a long time, but a unified point of view has not yet been developed. However, the level of harmonization of existing standards clearly requires improvement. As a result, the supplied equipment is operated outside the requirements of the general regulations, not at full capacity and without options for potential subsequent repair and upgrade. [12]

Our and Iranian specialists have a completely different approach to compliance with industrial safety requirements in matters of equipment operation. The Iranian side often neglects to comply with the useful life of the equipment. For example,

according to the standards in the Russian Federation, a heavy machine is used for up to 25 years and after modernization, it is allowed to extend the service life for another 10 years, then the machine is subject to write-off from the point of view of its full depreciation and technical obsolescence. In Iran, the service life is extended annually, so to speak, until it falls or fails. During joint work at the fields, Iranian specialists used machines manufactured in the 1980s, no longer having any opportunity to somehow achieve the declared data from the technical passport of the equipment.

And this is only part of the so-called features and implemented principles of “long patience” in the sanctions conditions of long-term Iranian survival.

Based on the analysis of the listed features, Russian specialists developed a number of proposals for optimizing technological processes in the context of the transfer of existing wells to a mechanized method of oil production, comprehensive repair of wells and related support measures. Optimization of the mentioned processes is planned to be carried out by introducing Russian-made technologies into them.

The list includes:

- mobile drilling rigs with high installation capacity;
- mobile primary water discharge units,
- top drives;
- pumping units of various types;
- systems for measuring the quantity;
parameters of oil and gas;
- cluster pumping stations;

As well as other related technologies. A number of technologies included in the agreed technological list of the required update of the work carried out are already being used in the course of joint practical activities and, frankly speaking, quite successfully. The criterion for successful application can definitely be considered a significant reduction in financial costs, a reduction in the time for carrying out operations, and a decrease in the number of teams within the framework of the project implementation due to the effective configuration of technological processes.

One example of the effectiveness of solutions developed by Russian specialists and already implemented technologies is the optimization of the number of field personnel at facilities due to the use of mobile drilling rigs with high installation capacity during comprehensive well repair activities.

Before this, since the technological process implied the sequence of operations, all contractors performing certain operations were on site in a constant technological readiness mode, with equipment ready for use, waiting for their turn to perform their stage of work and regardless of the current work available/absent.

As a result, they incurred additional costs to compensate for equipment downtime and organize a field camp.

This example confirms the fact that with competent analysis, a verified qualified approach to planning and implementation of technological solutions, the technologies of Russian production used in this case definitely have the potential to become a calling card of domestic producers of oil production technologies, thereby enhancing the image of their creators. There is also the potential to gain a foothold in the Iranian technology market at first and, in the future, systematically conquer leading positions in their segment. There is already demand and, according to some verified data, there are prerequisites for its rapid growth. With the assistance of representatives of the Russian oil production industry, a nomenclature list of oil production and oilfield services technologies imported from Russia was created in Iran and significantly expanded in a short time. Until relatively recently, it did not exist in principle. Which created many difficulties in importing the first samples of technological products. [13]

It is also necessary to take into account the fact that the “pioneers” created and put into operation a base for storing, servicing and repairing the supplied technologies. This indicates that the approach to solving the problems facing industry specialists is thorough and focused on development.

Taking into account all of the above, Russian technologies have a unique opportunity, having accepted the challenge, not only to level out the mentioned features inherent in a rather difficult, and also specific region, in the depths of which lies one of the largest reserves of oil formations, but also to become a tool for effectively solving the problems facing the oil producing industries of both countries.

Of course, this is only the beginning of the large-scale work that needs to be done, but the beginning is definitely effective. Nevertheless, there are a series of slopes and potholes ahead in the form of bureaucratic red tape, features of the customs system, and other Eastern wisdom, but the matter is extremely important and worthwhile, and we have no other options than to saddle it and do it efficiently, and with benefit for the country. In addition, the unique experience for our specialists in using Russian technologies in completely new terrain and situation conditions contributes to increasing the already worthy level of their qualifications. By the way, the level of training and qualifications of Iranian oil workers in the engineering and operational sectors also deserves respect, after all, it is an American school. There is a good prospect for exchanging experience. Of course, our specialists have something to teach them, but they also have something to learn from them. And Iranian fields are a suitable testing ground for Russian technologies and at the same time a demonstration platform for their capabilities and a kind of exhibition of the achievements of Russian manufacturers. The con-

clusions of this study include the main risks of today's region, both political, and it is necessary to understand that Iran is currently preparing for a protracted war for its proxies in Lebanon, Syria and Yemen with Israel and the United States, and therefore oil concerns will not yet be as much of a priority as nuclear facilities and the infrastructure of uranium enrichment centrifuges, marine logistics and military-industrial complex products. At the same time, the tasks of diversifying the risks of the Iranian oil and gas industry are facing BRICS and its main players: China and Russia. Therefore, work on harmonizing standards and replacing equipment during oil and gas production during their subsequent transportation will be decided on a planned basis, and it is necessary to be appropriately needed and not intrusively in demand. [2;13]

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能源损失计算与分析技术和软件的开发

**DEVELOPMENT OF TECHNICAL AND SOFTWARE FOR
CALCULATION AND ANALYSIS OF ENERGY LOSSES**

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摘要。本文探讨了减少电网电力损失的措施。考虑了各种分类方法。结果表明，从计算现代条件下的效率的角度来看，中小企业最可接受的分类是通过效果形成机制。分析了俄罗斯联邦燃料和能源部指导材料规定的制定和规划实施减少能源损失措施的程序。值得注意的是，实施中小企业的程序（从低成本组织开始）可能并不总是导致制定一套最佳措施，以确保最大限度地减少经济上合理的能源损失。分析了评估减少能源损失措施有效性的方法。结果表明，在现代经济条件下，计算中小企业的经济效率时，必须使用的不是降低的成本，而是净现值或整体回收期。

关键词：电力损失、电网、减少损失的措施、算法、劳动力成本、效率。

Abstract. *The article considers measures to reduce electricity losses in electrical networks. Various approaches to their classification are considered. It is shown that from the point of view of calculating their efficiency in modern conditions, the most acceptable classification of SMEs is by the mechanisms of effect formation. An analysis is made of the procedure for developing and planning the implementation of measures to reduce energy losses, regulated by the instructive materials of the Ministry of Fuel and Energy of the Russian Federation. It is noted that the procedure for implementing SMEs, starting with low-cost organizational ones, may not always lead to the development of an optimal set of measures that ensure the greatest economically justified reduction in energy losses. An analysis of methods for assessing the effectiveness of measures to reduce energy losses is made. It is shown that in modern economic conditions, when calculating the economic efficiency of SMEs, it is necessary to use not the reduced costs, but the net present value or the integral payback period.*

Keywords: *electricity losses, electrical networks, measures to reduce losses, algorithm, labor costs, efficiency.*

The development of methods for calculating and analyzing electrical energy losses in networks is closely related to the technical equipment of 0.38-110 kV networks with automated dispatch control systems (ADCS) and automated information and measuring systems for commercial electricity metering (AIMS KEM), which allow obtaining the information necessary for a more accurate and detailed analysis of electrical energy losses (EL). The industry methodological material "Basic scientific and technical requirements for the creation and development of automated control systems for electrical network areas (ACS ENA)" characterizes the state of the technical means for automating the control of 0.38-110 kV electrical networks that developed by the mid-90s. It is noted that the level of telemechanization, communication and automation of these networks, which are under the operational management of electrical network enterprises (ENE), is clearly insufficient. Thus, up to 70% of 35-110 kV substations for agricultural purposes are telemechanized using the simplest equipment in the volume of emergency warning telesignaling, which in no way meets the requirements for reliability and efficiency of dispatch control. As for the telemechanization of 6-10 kV networks, it has not left the stage of experimental work. For a number of years, work on the implementation and production of telemechanic equipment was practically not carried out at all.

The greatest progress in the field of informatization and solving regime problems for distribution networks in the 80-90s was achieved in Latvenergo. At the same time, the developments of the Kyiv OKP Energosetproekt were used as software for solving state assessment problems - a set of programs for calculating and analyzing modes in real time ESKIZ-RV for a computer type SM-1420.

For 6-10 kV networks at that time, the most widespread telemechanics system was the TRS-1 developed by VNIIE and the SKB of the Electropult plant. The modernized telemetry system TRS-1M, unlike its predecessor, the TRS-1 system, which performed only telesignaling and telecontrol functions, was also capable of providing telemetry functions, i.e. it could serve as a technical basis not only for control, but also for analyzing network modes. One of the shortcomings of this system was the absence of an interface (adapter) for communication between the telemetry system and a computer in the factory supply. Since the mid-90s, developments of telemetry systems for 6-110 kV electric networks began to appear in Russia, implemented on a microprocessor element base and having an advanced interface for communication with computer equipment. In fact, these systems can be classified as so-called SCADA systems, since they include computing equipment, and therefore the problem of interfacing computers with telemetry has al-

ready been solved in them. The implementation of operational information control systems on the basis of such telemetry systems in the divisions of JSC-energo, which allow for the automation of the functions of collecting, processing, archiving and displaying information on the current state of network elements and mode parameters, as well as organizing remote control of objects, provides the opportunity to obtain a significant amount of additional information for calculating and analyzing PE.

The following can be attributed to such new generation systems capable of providing the functions of the automated control system (ADCS) and manufactured by the domestic industry:

- the Om telemetry system manufactured by NPF Mir [2],
- the MicroSCADA/Open++/RTU560 dispatch control system developed by ABB Automation [3],
- the DISK-110/0.4 kV integrated dispatch system for monitoring and control of network power supply [4],
- the Sirius software and hardware complex based on the QNX multitasking network OS [5],
- the KORAT radio telemetry complex developed and manufactured by the State Enterprise KTC “Automation and Metrology” [6],
- the SISTEL SCADA system developed by SISTEL-A CJSC [7].

The above list, of course, does not reflect all the developments in the field of telemechanization and informatization of electrical networks that have appeared recently.

In addition to the tasks of the ADCS, a number of modern domestic automated systems are designed to solve the problems of monitoring and accounting of electricity consumption, i.e. the tasks of the AIMS KEM. These include, for example:

- AIMS KEM “KAPS-Mius”, developed by the Scientific and Design Bureau “Mius” of the Taganrog Radio Engineering University [8],
 - the complex of technical means “Energy-micro+” [9],
 - the domestic software package TRACE MODE 5 from Adastra Research Group [10], and a number of other developments, described, in particular, in [11].
- These systems are designed to ensure the collection, transmission and processing of information on energy flows across connections.

The advent of electronic meters with a digital output makes it possible to receive from them not only power and electricity parameters, but also other parameters (current, voltage, parameters characterizing the quality of electrical energy). This circumstance also contributes to an increase in the level of information support for calculations and analysis of electricity losses.

From a review of foreign experience in developing technical support for analyzing and managing power grid modes, it can be concluded that distribution

power grids in developed countries are practically not inferior to the backbone networks of these countries in terms of the level of saturation with automated control tools and are many times superior to the 0.38-110 kV networks of Russia.

The main areas of development of technical means of automation abroad include the following:

1. Creation of smart meters, i.e. meters with built-in devices for monitoring power quality parameters, as well as meters that record consumer load graphs [12-14].

2. Use of all kinds of means and devices, including satellite communications and the Internet, as information transmission channels [15, 16]. Global automated systems are being developed. Thus, the ABB company is creating a centralized integrated automated system for monitoring electricity consumption, which will serve industrial and commercial consumers, covering more than 10 thousand cities in the USA and Puerto Rico. Information is transmitted via satellite communications [14].

3. Construction of automated network management systems based on the latest information technologies, such as distributed control systems (MIS), management information systems (DMS), global information systems (GIS), supervised control, management and data processing systems (SCADA), etc. [17].

Significant successes in the field of automation and informatization of distribution electric networks in many countries are explained by the fact that this area is currently recognized as a strategic direction in the energy sector, since it allows for a significant increase in the reliability and quality of electricity supply to consumers. In this sense, the amounts of investment costs of US energy companies for network automation in 2000 are indicative [18]:

- for the creation of ASDU and telemechanization - 140 million dollars;
- for the automation of substations - 170 million dollars;
- for the automation of distribution networks - 600 million dollars.

In parallel with the development of technical means of informatization of distribution electric networks and computing technology, there is a development of software that allows, on the basis of new data, to solve problems of calculation, analysis and reduction of energy losses.

In Russia and abroad, several software packages have been developed for solving various problems related to the specified topic. These packages differ both in the set of functional and service capabilities, and in the operating systems used, cost, reliability and other parameters. The following software packages are the most widespread:

- CTL-3 software package (calculation of technical losses) - developed by VNIIE [19];

- AMUR PC software and computing complex (SCC) (analysis and modeling of distribution network mode control) - developed by FAO CES OJSC Amurenergo [20];
- Network software and information complex - developed by SRSTU [21];
- RAP software package (calculation and analysis of losses) - developers VNIIE and STC “Selezh-electro” [22];
- a set of process-control programs RersPC (calculations of electric distribution networks) – developer SevKavSTU [23].

The RTP-3 complex, developed by JSC VNIIE, is designed to calculate and standardize losses, permissible, actual imbalances and the amount of unaccounted electric energy in 0.38-220 kV distribution electric networks and has been implemented in many power systems of the country.

The complex consists of three programs: RTP-3.1, RTP-3.2 and RTP-3.3, each of which solves the following problems:

- RTP-3.1

- calculation of the steady-state mode with determination of currents and power flows in branches, voltage levels in nodes, line and transformer load factors in open electric networks of 6 (10), 35, 110, 220 kV using a network diagram (by voltage steps and in an electric network of several nominal voltages);

- calculation of power and electrical energy losses in open electrical networks of 6 (10), 35, 110, 220 kV using the network diagram (by voltage stages and in an electrical network of several nominal voltages);

- calculation of two-phase and three-phase short-circuit currents in open electrical networks using the network diagram of 6 (10), 35, 110, 220 kV;

- assessment of the regime consequences of operational switching in repair and post-emergency modes of distribution networks;

- calculation of electrical energy losses in additional equipment: in metering devices (current and voltage transformers, electricity meters), in valve arresters, shunt reactors, synchronous compensators, in surge suppressors, in high-frequency communication connection devices, in connecting wires and substation buses, from leakage currents along overhead line insulators;

- formation of a summary table of the standard for electric power losses by voltage stages with a breakdown into structural components;

- calculation of power and electric power losses in the insulation of cable lines taking into account the service life;

- calculation of power and electric power losses due to corona in 110-220 kV overhead lines taking into account the climatic zone of the region;

- RTP-3.2

- calculation of the steady-state mode with determination of currents and power flows in branches, voltage levels in nodes, line load factors in 0.38 kV electrical

networks using the network diagram (taking into account the asymmetrical phase load and open-phase execution of sections);

- calculation of power and electric power losses in 0.38 kV electrical networks using the network diagram (taking into account the asymmetrical phase load and open-phase execution of sections);

- calculation of power and electric power losses in 0.38 kV electrical networks without entering diagrams (by generalized parameters or by voltage loss);

- RTP-3.3

- maintaining databases on electricity consumption by subscribers with the linking of their metering points to the network diagram;

- calculation of permissible, actual imbalances and the amount of unaccounted electricity in open electrical networks taking into account the actual consumption of subscribers connected to network nodes and the permissible metrological component of electricity losses;

- calculation of permissible, actual imbalances and the amount of unaccounted electricity in open electrical networks based on data from metering systems and the permissible metrological component of electricity losses.

The program implements two methods for calculating losses in the 6-10 kV network depending on the available initial information: by the release of active electricity into the network or by current measurements on regime days.

Calculation of power and electricity losses in the 0.38 kV network is carried out using the method described, in particular, in [2, 6].

Joint calculation of the 6-10 kV electrical network and all 0.38 kV networks fed from it allows you to clarify the flow distribution, voltage, power and electricity losses in the 6-10 kV network due to a more accurate assignment of the loads of the connected 6-10/0.38 kV transformer substations (TS).

The complex has a developed graphical system for entering information about the electrical network diagram, which, according to the developers, allows you to relatively easily create a complete database of power system network diagrams. The RTP-3 program is one of the modules of a multi-level integrated system for calculating and analyzing electric power losses in electric networks, in which the calculation results for a given structural unit are summarized with similar calculations for other units and for the power system as a whole.

The software and information complex “Network” has been developed at SRS-TU (Novocherkassk), which allows calculating electric power losses in 0.38 and 10 (6) kV networks and optimizing 10 (6) kV network schemes. To calculate electric power losses in 10 (6) kV networks, the program uses a calculation based on a T-shaped equivalent in accordance with the average load method recommended by the industry instruction [6]. The program’s features include the ability to automatically generate a calculation scheme based on its graphical image. Electric

power losses in a 0.38 kV network are also calculated using the method, taking into account the additions proposed by the authors of the development. Optimization of network sectioning locations is performed by minimizing electric power losses using the gradient method by moving the sections. The complex includes a module for input, correction, display, storage and printing of graphic documents of the main substation diagrams and plans of the premises of distribution points and substations.

The AMUR RS software and computing complex, developed as an integral part of the ADCS of the electric networks district, has advanced functional capabilities.

The calculation tasks of the PVK include:

- Calculation of electricity losses both for an individual 6-10 kV feeder and for the network in the volume of a substation, district or electrical network enterprises (ENE) as a whole with simultaneous assessment of energy losses in 0.38 kV networks based on generalized characteristics.

- Calculation of voltages on 0.38 kV buses of the TP and settings of the PBB of transformers, ensuring the best approximation of the voltage level on the 0.38 kV buses to the nominal one using the equivalent four-terminal method.

- Calculation of steady-state mode of 6-10 kV feeder using iterative method “in two stages” under assumption of initial distribution of load of head section proportional to nominal capacities of transformers multiplied by load factor.

- Calculation of three-phase and two-phase short-circuit currents.

- Calculation of maximum current load of head section of 6-10 kV feeder, at which permissible voltage level is maintained at all consumers.

- Optimization of voltage of 6-10 kV network power supply center based on energy losses while observing restrictions on voltage quality at consumers.

- Calculation of two-way power supply mode of network, formed by two 6-10 kV feeders connected at certain place with and without equalizing currents, as well as finding best place for network disconnection in terms of energy losses.

- Assessment of possibility of power supply to low voltage (LV) buses of 35-220/6-10 kV substation from LV buses of another substation when first one is disconnected from power supply network. The voltage levels on the LV buses of the substation being extinguished and at all consumers fed from the feeders of this substation and the communication feeder are determined. The minimum permissible voltage on the LV buses of the supply substation is calculated based on the condition of ensuring the specified voltage level at consumers.

The main features of the AMUR RS PVK are:

- solving various regime problems on a single database (SD);
- a graphical system for entering information on the configuration and parameters of 6-10 kV feeders, as close as possible to the natural form of presenting this information in the form of a feeder diagram;

- the presence of a work area for performing variant calculations associated with the need to make temporary changes to the data stored in the database;
- taking into account the change in the resistance of 6-10/0.38 kV transformers when changing the settings of the NLTC switch and the dependence of the resistance of steel wires on the magnitude of the flowing current;

The universality of the DB structure and software allows you to increase the computing capabilities of the complex by connecting new calculation tasks. The AMUR RS complex can operate in two versions: local and network in file server mode.

The main disadvantage of the AMUR RS PVK is that it was developed for the outdated MS DOS operating system.

A distinctive feature of the RAP software package is its integrated approach to calculating all components of electricity losses and their standard characteristics in networks of all voltage classes of JSC-energo and in the equipment of networks and substations.

The software package includes the following programs:

- RAP-OS program, designed to calculate technical losses in closed networks of 35 kV and higher;
- RAP-110 program, designed to calculate technical losses and their standard characteristics in radial networks of 35-110 kV;
- RAP-10 program, designed to calculate technical losses and their standard characteristics in distribution networks of 6-10 kV;
- ROSP program, designed to calculate technical losses in 0.38 kV networks, corona losses in networks of 220 kV and higher, losses in compensating devices, losses in measuring transformers and standard consumption of electricity for the auxiliary needs of substations;
- NP-1 program, designed to calculate the standard characteristic of losses for closed networks of 35 kV and higher based on the results of variant calculations, previously carried out using the RAP-OS program;
- RAPU program, designed to calculate commercial losses caused by errors in electricity metering.

All programs operate in an autonomous mode, as they are intended for different users - some of them are used in power system mode services, others - in PES, and others - in energy sales companies.

The programs solve the following problems:

- a) calculation and structural analysis of losses;
- b) identification of sources of technical and commercial losses and determination of reserves for their reduction;
- c) selection of measures for loss reduction;

d) calculation of technical components of standard characteristics of networks for electricity losses (NEL).

A special feature of the software package is the calculation of their guaranteed values in the form of the lower and upper boundaries of the uncertainty interval in addition to the estimated value of losses.

The RersPC software package is designed to automate calculations and analysis of steady-state modes, short-circuit currents, power and electricity losses, measures to reduce electricity losses in electrical networks of various forms of ownership (RSK, municipal enterprises, etc.), and to conduct an examination of calculations of electricity loss standards.

The software package solves the following tasks:

- calculation and analysis of normal and post-emergency modes of open and closed 0.38-220 kV electrical networks (currents, flows and power losses, line and transformer load factors, voltage levels and deviations in network nodes, structure of total active and reactive power losses);
- calculation of technological and commercial electric power losses in 0.38-220 kV networks with subsequent structural analysis of losses by structural divisions (the enterprise as a whole and the electrical network areas included in it) and components (variable and conditionally constant losses in lines, transformers, losses due to the technically permissible error of electricity metering systems);
- optimization of regulating taps of PBB distribution transformers and typical daily voltage regulation schedules in power supply centers of 6 (10) kV networks;
- calculation of two-phase and three-phase short-circuit currents in open 6-35 kV networks;
- optimization of locations for opening closed circuits of distribution networks;
- preparation of recommendations for the dispatcher on localization of damage and optimal reconfiguration of the 6-35 kV network, ensuring the best (in terms of loading of network elements and voltage deviations) post-emergency modes.

The distinctive features of the complex are:

– a powerful specialized vector editor of electrical circuits, allowing input, correction, viewing and printing of information on the topology and parameters of networks with display of their graphical representation in any form familiar to the personnel;

– the ability to automatically apply and link the passport data of objects and calculation results to the corresponding network elements, as well as link one passport to various graphic primitives. The latter option allows to represent the same physical objects on different diagrams in the form of any images;

- the ability to view various information on the same diagrams in any required combinations and its rapid change, ensured by the use of the “layers” technology;
- integration with geographic information systems (GIS), operational management information complexes, programs for automation of energy sales activities.

The main areas of integration of GIS, OIMC and the RersPC complex are:

- output of calculation results from RersPC and telemetry (TM) and telesignals (TS) data from OIUK to images of various types of diagrams in the GIS;
- linking the RersPC calculation scheme database and screen forms for presenting information in the GIS;
- automation of the formation of calculation schemes in RersPC from the vector graphic representation of feeder reference schemes in the GIS;
- exchange of vector images of operational dispatch schemes between the GIS, the OIMC and RersPC via a standard exchange format.

The module available in the editor for importing schemes prepared in the format used in the electric power industry GIS GRIM (developed by Index LLC, St. Petersburg) allows eliminating duplication of information and automating the process of forming calculation schemes for electrical networks.

The developers of the complex have extensive experience in coupling RersPC with various OIMCs. The RersPC complex was interfaced with: the OIUK developed by MNU ECM (Moscow) on the SM-1420 computer, with the OIUK Stavropolenergo on the ES-1010, SM-1700, VAX, Alpha-Station computers, the OIUK SCADA NT (developed by JSC Stavropolenergo), the OIMC VNIIE on the SM-1800 computer, the OIMC “KOMPAS” (Krasnodar) and the OIMC (Alma-Ata) on IBM PC compatible computers.

From the point of view of using the advantages of binding to the GIS and OIMC, the RersPC complex in its parameters is close to the well-known software package `0ren++`, developed by ABB and implemented in Russia by ABB Cheboksary. However, the RersPC complex surpasses the `0ren++` package in its advanced mathematical and software support for calculating EL and developing MSP. Table 1 shows the functional capabilities of the considered software packages from the point of view of their use for solving problems of analysis and reduction of EL in the networks of the RSC.

A comparison of the considered domestic software packages allows us to conclude that the greatest capabilities in terms of the set of tasks to be solved in the field of analysis and reduction of energy losses in the networks of the RSC and the use of modern computer technologies are possessed by the RTP-3 and RersPC software packages.

Table 1

Tasks to be solved and functional capabilities of the software packages

Software suite	Problems to be solved							Possibilities			
	SS	NS	MO	ПЭ в сети, кВ:				MSE	GIS	DB	OIMC
				0,38	6(10)	35	110				
RTP-3	+	-	-	+	+	+	+	+	+	+	-
AMURRS	+	+	+	+	+	-	-	-	-	-	-
Network	+	+	-	+	+	-	-	-	-	-	-
RAP	-	-	-	+	+	+	+	+	-	-	-
RersPC	+	+	+	+	+	+	+	+	+	+	+

Note: The following abbreviations are used in the table:

- SS – steady state;
- NS – network sectioning points;
- MO – mode optimization;
- EL – electric power losses;
- MSE – electric power metering system errors;
- DB – database integration;
- GIS – integration with GIS;
- OIMC – integration with OIMC.

A review of the current state of problems of calculation, analysis and reduction of electric power losses in Russia and abroad allows us to draw the following conclusions:

The modern classification of EL components, given in regulatory documents, is much more developed and detailed compared to that used in the last century, but is still not without shortcomings and requires further clarification and revision. The classification presented in the work of V.M. Peyzel [1] should be recognized as the most developed.

The current regulatory documents in the field of calculation, analysis and reduction of PE in electric networks do not contain a mechanism for selecting, planning and calculating the economic efficiency of measures to reduce energy losses, which, in our opinion, is a step back compared to the situation in this area in the 80-90s of the last century.

The main trends in the application of modern information technologies, including in the calculation, analysis and reduction of energy losses in networks, are: combining several calculation modules in a single complex, working with a single DB integrated with GIS, OIMC, AIMS KEM systems and other subsystems of the ACS. The greatest potential in terms of the set of solutions in the field of analysis and reduction of energy losses in electric networks and the use of modern

computer technologies are possessed by the RTP-3 and RersPC software packages.

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