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The publication discusses topical issues in the field of medical science, internal medicine and health care.

The publication is intended for researchers studying residency, master's degree doctoral studies, postdoctoral studies, teachers and students of medical universities, medical workers of practical health care.

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Content

«Astana Medical
University»
Vice-Rector for Research

Z. T. Shulgau

Dear participants of the conference, young scientists, colleagues and guests!

On behalf of the leadership of the NJSC «Astana Medical University» and on my own behalf, I congratulate you on the publication of the collection of abstracts of the I International Scientific and Practical Conference «Science and Health: Astana-Tashkent» of young scientists of Kazakhstan and Uzbekistan!

This large-scale event has become an international intellectual platform that brought together the most talented and purposeful young researchers from leading medical universities and scientific centers of our countries.

Over the course of two days, dozens of reports covering relevant areas of medicine were heard within the framework of scientific sections, and key issues of modern healthcare were discussed. A special place in the program was occupied by the competition «Artificial Intelligence in Medicine», the participants of which demonstrated a high level of professional and research readiness to integrate digital technologies and advanced solutions into the practice of medical science and healthcare.

This collection is the result of productive discussions, in-depth scientific research and successful international cooperation. Each published work is a valuable contribution to the development of medical science and the strengthening of partnerships between Kazakhstan and Uzbekistan.

I wish all participants, winners of the competition and guests of the conference successful implementation of new scientific ideas, joint international projects aimed at strengthening scientific cooperation between young researchers of Kazakhstan and Uzbekistan. Let this conference become a starting point for the formation of sustainable academic ties, mutual exchange of experience and joint search for innovative solutions in the field of medicine. I sincerely wish you inexhaustible inspiration, scientific productivity and significant achievements that contribute to the development of medical science and the strengthening of the health of mankind.

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THE INFLUENCE OF A FAT-ENRICHED DIET ON THE EFFICACY OF THE ANALGESIC EFFECT OF NONSTEROIDAL ANTI-INFLAMMATORY DRUGS IN PATIENTS AFTER URETERAL STENTING

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Introduction. Optimization of postoperative analgesia remains one of the priority tasks of modern medicine, especially in urological practice, where ureteral stenting is accompanied by severe pain syndrome in 70–80% of patients. The basis of therapy consists of nonsteroidal anti-inflammatory drugs (NSAIDs); however, their clinical efficacy often varies due to interactions with dietary components. Lipid load can exert a dichotomous effect on the pharmacokinetics of drugs: accelerating the solubilization of lipophilic compounds, such as ibuprofen, and potentially delaying the absorption of hydrophilic substances, which include ketorolac, due to changes in gastrointestinal (GI) motility. This study is aimed at providing a scientific rationale for personalized dietary regimens to improve the quality of analgesia in the early postoperative period.

Objective. To scientifically substantiate the effect of the lipid component of food on the onset time (Tons) and intensity of the analgesic effect of NSAIDs with various physicochemical properties in patients with irritative symptoms after the ureteral stenting procedure.

Materials and Methods. A prospective, randomized, open-label, parallel-group study was conducted at the National Coordination Center for Emergency Medicine (Astana). The sample included 60 patients (15 in each of the 4 subgroups) who underwent "Ureteral Stenting" surgery and presented with severe pain syndrome. Exclusion criteria were peptic ulcer disease, allergy to NSAIDs, severe renal failure, and intolerance to milk fats. Patients were allocated into groups: (A, B) – ketorolac 10 mg; (V, G) – ibuprofen 400 mg. Patients in the experimental groups (B and G) took the drug simultaneously with a standardized lipid load – 20 g of butter with 82% fat content. Control groups took the drugs on an empty stomach. Pain intensity was assessed using a 10-point visual analog scale (VAS). The researcher recorded the onset of analgesia using the "stopwatch" method (Tons), as well as pain dynamics at time points: 15, 30, 45, 60 minutes, 2, and 4 hours after the first intake. The non-parametric Mann-Whitney U test ($p < 0.05$) was used for statistical analysis.

Results. Pharmacokinetic parameter analysis indicates that ketorolac is a hydrophilic compound with a low partition coefficient (~1.1), ensuring its rapid absorption on an empty stomach within 30–45 minutes. However, in the presence of fats, cholecystokinin is released, slowing gastric emptying, which delays the entry of the drug into the small intestine and increases the time to reach peak concentration (Tmax). In contrast, ibuprofen is a lipophilic compound (coefficient ~3.9), for which solubilization in the GI tract is the limiting stage. Lipid load stimulates the secretion of bile acids and the formation of mixed micelles, which accelerate the dissolution of ibuprofen and its transport across the lipid membranes of enterocytes. The study expects to confirm the hypothesis that taking ibuprofen with fatty food shortens Tons and increases the sum of pain intensity difference (SPID), while for ketorolac, taking it on an empty stomach remains the most effective regimen. This will allow the development of differentiated algorithms for analgesic intake based on their chemical nature.

Conclusion. Ignoring dietary composition when prescribing NSAIDs leads to unpredictable variability in the analgesic effect. Lipid load acts as a barrier for hydrophilic compounds and a catalyst for lipophilic ones. The results of the study will serve as a basis for creating standardized nutritional support protocols to optimize pain relief and increase patient treatment adherence in urological practice.

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POSSIBILITIES OF USING SCORE 2 AND SCORE 2-OP SCALES FOR CARDIOVASCULAR DISEASE PREVENTION AT THE OUTPATIENT STAGE

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Introduction. In the outpatient practice of Kazakhstan, the SCORE scale is still used, whereas many countries have adopted the more modern SCORE 2 and SCORE 2-OP models, which offer greater predictive accuracy. The country has a circulatory system disease, starting at 40 and repeated every two years. However, its implementation remains formal: the examination is limited to the measurement of blood pressure and total cholesterol, without a comprehensive risk assessment or the provision of individualized preventive recommendations. In this context, investigating the use of SCORE 2 and SCORE 2-OP in outpatient practice holds particular scientific and practical significance.

Objective. To compare the predictive value and risk stratification capabilities of the SCORE, SCORE 2, and SCORE 2-OP scales in outpatient practice.

Materials and Methods. The study design is a prospective, cross-sectional, observational study. The work was carried out at the Municipal State Enterprise with the Right to Economic Management "City Polyclinic No. 14". The study included 350 patients aged 40 to 90 years without established cardiovascular disease. Data were collected on age, sex, smoking status, blood pressure, total cholesterol, high- and low-density lipoproteins, and the presence of chronic diseases. Based on these parameters, cardiovascular risk was calculated using the SCORE scale for patients aged 40 to 69 years, the SCORE 2 scale for the same age group, and the SCORE 2-OP scale for patients aged 70 to 90 years. The results were entered into an electronic database and analyzed using SPSS 27 with descriptive and comparative statistical methods.

Results. According to the SCORE scale, most of the patients were at low or moderate risk, with a mean value of 8.8%. Using SCORE 2, the mean risk increased to 11.5%, and all patients were reclassified into high or very high-risk categories; the differences were statistically significant ($\chi^2 = 143.5$, $p < 0.001$). In the group of over 70 years, the application of SCORE 2-OP also predominantly showed a high-risk level. The new models provide more accurate stratification and identify more patients with high cardiovascular risk compared to the classic SCORE scale.

Conclusions. The implementation of SCORE 2 and SCORE 2-OP scales in outpatient practice enables better stratification of cardiovascular risk and broader coverage of older age groups. This provides a foundation for personalized prevention and effective management of risk factors. Their use contributes to increasing the effectiveness of preventive measures and reducing the likelihood of cardiovascular complications.

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RAPID ASSESSMENT OF NUTRITIONAL STATUS IN PATIENTS WITH CHRONIC KIDNEY DISEASE

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Introduction. The prevalence of nutritional disorders in chronic kidney disease (CKD) ranges from 11-54% for patients with stages 3-5, and 28-54% for those on hemodialysis. There is no universally accepted diagnostic test for assessing nutritional disorders. A high-quality assessment is only possible with an individualized approach based primarily on a combination of patient history and clinical examination. Mini-questionnaires can quickly assess a patient's nutritional status, and based on the results, healthcare providers can plan more comprehensive assessment and intervention measures.

The objective of this study was to identify a mini-questionnaire that could be adapted for a rapid, preliminary assessment of nutritional disorders (malnutrition, protein-energy deficiency) in patients with CKD.

Materials and Methods. We conducted a 5-year review of available, valid literature using the keywords "eating disorders" and "mini-questionnaire" in English and Russian. The search was not limited to the recommendations of the International Society of Renal Nutrition & Metabolism (ISRNM) https://www.isrnm.org/contactandlinks.

Results. Most of the reviewed studies assess patients' dietary patterns using a significant number of indicators, including anthropometric data, biochemical tests, bioelectrical impedance analysis, and others. This is undoubtedly justified for the most accurate assessment of the nutritional status of individuals with CKD. However, given the limited time available for outpatient examinations, these scales do not seem appropriate.

We found the most interesting to be the Diet Quality Score (DQS, Masip G.; Keski-Rahkonen A.; Pietiläinen K.H.; Kujala U.M.; Rottensteiner M.; Väisänen K.; Kaprio J.; Bogl L.H., 2019) and the Mini Nutritional Assessment (MNA, https://www.mna-elderly.com ; Nasir K., Sultan S., Qureshi R., Dhrolia M., Ahmad A., 2022). The DQS includes questions about the frequency of habitual consumption of 14 food types over the previous 12 months. A healthcare professional then assigns points and assesses the patient's nutritional status. The DQS is more focused on assessing the adequacy of nutrition. A higher score indicates a better nutritional status.

The MNA assesses four different aspects: anthropometric indicators (body mass index, weight loss dynamics, mid-arm and mid-calf circumferences); a lifestyle assessment (medication use, mobility, and signs of depression); a brief nutritional assessment (number of meals, food and fluid intake); and the patient's subjective self-assessment. The MNA is aimed specifically at identifying malnutrition. One of the advantages of the MNA questionnaire is the availability of a validated Russian version https://www.mna-elderly.com/sites/default/files/2021-10/MNA-russian.pdf .

Conclusions. The DQS and MNA mini-questionnaires are simple and reliable tools that can be used in patients with CKD for rapid assessment of nutritional status both in cases of initial suspicion of nutritional disorders and as a control measure while these conditions are being corrected;

The DQS and MNA mini-questionnaires will be most relevant for general practitioners in primary care. GPs are responsible for long-term monitoring of patients with CKD. More accurate diagnosis of nutritional disorders should be performed by a nephrologist in a nephrology department or outpatient dialysis center.

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THE CARDIOVASCULAR SIGNS OF OBSTRUCTIVE SLEEP APNEA SYNDROME

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Introduction. Obstructive sleep apnea syndrome(OSAS) represents a sleep-related breathing disorder in which repeated obstruction of the upper airway occurs during sleep, leading to intermittent hypoxia and sleep fragmentation.The link between OSAS and cardiovascular diseases is still insufficiently studied: according to recent European cardiology recommendations, screening for OSAS is advised in patients with cardiovascular diseases such as heart failure and atrial fibrillation.

Our Study Aim. It is to characterize the cardiovascular impact of OSAS through echocardiographic comparison with control subject, hypertension, diastolic dysfunction, atrial dilation, ventricular hypertrophy and permanent atrial fibrillation.

Methods. This study enrolled 50 patients diagnosed with OSAS and a control group of 60 patients without the syndrome. Both group of patients underwent echocardiographic evaluation using Doppler imaging to assess cardiac structure and function. Patients: A total of 50 patients diagnosed with OSAS (AHI ≥ 5 events/h by cardiorespiratory monitoring) were enrolled from September 2025 to December 2025 in the Cardiology department of TSMU. Control group: B total of 60 patients without OSAS. Absence of OSAS was confirmed by validated questionnaires (STOP-BANG, Epworth Sleepiness Scale) and cardiorespiratory monitoring.

Results. The results of the present study demonstrate that OSAS has a significant impact on structural and functional cardiac alterations. In the univariate analysis, OSAS was associated with a 20.0-fold increase in the risk of left ventricular hypertrophy (LVH),a 3.2-fold increase in left ventricular diastolic dysfunction (LVDD),and a 2.4-fold increase in permanent Atrial fibrillation (AF). However, after adjustment for potential confounding factors such as age, body mass index, arterial hypertension, and other conventional risk factors in the multivariate analysis, these associations remained statistically significant: LVH: 13.2, LVDD: 1.7,AF: 2.1.These findings indicate that OSAS is an independent risk factor for cardiovascular structural and functional abnormalities. All observed associations were statistically significant ($p < 0.05$), confirming the reliability of the results. Hypertension was significantly more prevalent in the OSAS group (86%) compared to controls (67%). Left ventricular diastolic dysfunction occurred in 58.1% of OSAS patients versus 23% of controls. Left atrial enlargement and left ventricular hypertrophy were also more frequent in the OSAS group (27% and 62.4%, respectively) compared to controls (11% and 5%). Permanent atrial fibrillation was present in 16.1% of OSAS patients, significantly higher than the 6% observed in controls.

Conclusions. The study findings confirm that OSAS is associated with a higher prevalence of cardiovascular abnormalities identifiable by echocardiography, emphasizing the importance of early cardiac evaluation in affected patients. Considering the systemic effects of OSAS that extend beyond sleep-related disturbances, early identification and management are essential to reduce cardiovascular risk and improve clinical outcomes.

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PREDICTORS OF RECURRENT ISCHEMIC EVENTS IN PATIENTS WITH ACUTE CORONARY SYNDROME AND ATRIAL FIBRILLATION AFTER PERCUTANEOUS CORONARY INTERVENTION

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Introduction. Patients with acute coronary syndrome and atrial fibrillation undergoing percutaneous coronary intervention have a high risk of recurrent ischemic events despite combined antithrombotic therapy. The prediction of such complications remains a significant clinical challenge. The clinical, laboratory, platelet function, and genetic factors may influence treatment outcomes and require comprehensive evaluation.

Objective. To identify predictors of recurrent ischemic events in patients with acute coronary syndrome and atrial fibrillation after percutaneous coronary intervention.

Materials and Methods. The study included 73 patients with acute coronary syndrome and atrial fibrillation after percutaneous coronary intervention receiving dual or triple antithrombotic therapy. The mean age was 69.0±8.7 years. Platelet function was assessed within 12-48 hours after intervention using light transmission aggregometry with evaluation of residual platelet reactivity and area under the aggregation curve after adenosine diphosphate stimulation (10 μg/ml). Genotyping of CYP2C19*2 and *3 polymorphisms was performed. Regression and receiver operating characteristic analyses were used.

Results. Recurrent ischemic events occurred in 15 patients (20.5%): myocardial infarction in 2 cases (2.7%), ischemic stroke in 5 cases (6.8%), stent thrombosis in 7 cases (9.6%), and restenosis in 1 case (1.4%). Patients with ischemic events more frequently had a history of myocardial infarction, chronic coronary artery disease, reduced left ventricular ejection fraction, elevated creatinine and platelet levels, and decreased glomerular filtration rate ($p<0.05$). Residual platelet reactivity and area under the curve values were significantly higher ($p<0.001$). Independent predictors included platelet count ($p<0.001$), creatinine level ($p=0.014$), reduced left ventricular ejection fraction ($p=0.001$), elevated D-dimer level ($p=0.006$), increased residual platelet reactivity ($p=0.002$) and area under the curve ($p=0.002$), as well as CYP2C19 polymorphism carriage ($p=0.006$). Residual platelet reactivity demonstrated high predictive value (AUC = 0.986); at a cutoff ≥72.4%, sensitivity was 100%; specificity was 93.1%. CYP2C19*2 carriage was associated with increased risk of ischemic events.

Conclusion. Recurrent ischemic events in patients with acute coronary syndrome and atrial fibrillation after percutaneous coronary intervention are associated with clinical, laboratory, and genetic factors. The most significant predictors are platelet function parameters, creatinine, platelet count, D-dimer level, reduced left ventricular ejection fraction, and CYP2C19 polymorphism. Their assessment improves risk stratification and optimization of antithrombotic therapy.

The study was carried out within the framework of grant funding from the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan for 2024-2026 IRN AP22688229.

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THE ROLE OF SURGICAL INTERVENTION IN OBSTRUCTIVE HYPERTROPHIC CARDIOMYOPATHY: SAFETY OR EFFICACY

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Introduction. Obstructive hypertrophic cardiomyopathy (OHCM) is one of the most significant inherited myocardial diseases characterized by pathological hypertrophy of the left ventricular myocardium and left ventricular outflow tract obstruction. This condition is associated with a high risk of heart failure, severe arrhythmias, and sudden cardiac death. Despite advances in modern diagnostics and treatment strategies, patients with symptomatic OHCM continue to experience reduced quality of life and significant functional limitations.

In patients with persistent high left ventricular outflow tract gradients despite optimal medical therapy, surgical intervention remains one of the most effective treatment options. The Morrow septal myectomy is currently considered the gold standard surgical approach for obstructive hypertrophic cardiomyopathy. This procedure not only improves intracardiac hemodynamics but also reduces clinical symptoms and enhances patients' functional capacity.

At the same time, the assessment of postoperative complications, including atrioventricular conduction disturbances, arrhythmias, and cardiac remodeling processes, remains highly important. Analysis of the experience of specialized cardiac centers is essential for improving surgical strategies and evaluating treatment outcomes.

Objective of the study. To evaluate the safety, clinical and hemodynamic efficacy, as well as cardiac remodeling after Morrow myectomy in patients with obstructive hypertrophic cardiomyopathy, based on the experience of the Republican Specialized Scientific and Practical Medical Center of Cardiology.

Materials and methods. Over a two-year period, a total of 20 patients with obstructive hypertrophic cardiomyopathy underwent Morrow myectomy. The mean age of patients was 43.55 ± 17.33 years (range 16–73 years), including 10 females. Systolic anterior motion (SAM) syndrome was detected in all patients (100%). Preoperatively, the left atrial size was 51.8 ± 11.4 mm, left ventricular myocardial mass was 355.89 ± 115.17 g, and interventricular septal thickness was 22.72 ± 5.75 mm.

Statistical analysis was performed using the "Statistica 6.0" software. Results were presented as mean ± standard deviation (M ± SD), and statistical significance was set at $p<0.05$.

Results. Evaluation of the effectiveness of the Morrow procedure in the studied group demonstrated positive dynamics in key intracardiac hemodynamic parameters.

Analysis revealed a significant reduction in interventricular septal thickness by 30% (from 22.72 ± 5.75 mm to 15.895 ± 3.23 mm) ($p < 0.05$). Accordingly, left ventricular myocardial mass decreased by 13% (from 355.89 ± 115.17 g to 311.27 ± 121.21 g). The transverse dimension of the left atrium did not change significantly (from 51.8 ± 11.4 mm to 51.55 ± 14.2 mm) ($p > 0.05$).

Non in-hospital mortality was observed. Postoperatively, systolic anterior motion syndrome was eliminated in all patients. In four patients (20%), permanent pacemaker implantation was required due to the development of complete atrioventricular block in the postoperative period. Atrial fibrillation was recorded in two cases, while in three patients, left bundle branch block developed early in the postoperative period during their stay in the intensive care unit. A positive clinical dynamic was observed. According to the 6-minute walk test, the mean walking distance increased from 125 m to 275 m, indicating improvement in heart failure functional class.

At admission, the mean NYHA functional class was III in all patients. After surgery, improvement in NYHA functional class was also observed.

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RESPIRATORY SUPPORT FOR CHRONIC HYPERCAPNIC RESPIRATORY FAILURE IN OUTPATIENT SETTINGS

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Introduction. Chronic respiratory failure (CRF) is the outcome of progressive chronic bronchopulmonary diseases and is associated with a high rate of hospitalizations, reduced quality of life, and increased mortality. The main treatment method for hypercapnic CRF is long-term non-invasive ventilation (NIV). NIV initiation is usually performed in hospital settings during disease decompensation, which increases hospitalization time and the risk of complications. Data on therapy initiation in outpatient settings are limited, and there are no established algorithms for patient selection and monitoring.

Aim. To evaluate the effectiveness and safety of initiating non-invasive respiratory support in outpatient settings for patients with chronic hypercapnic respiratory failure of various etiologies.

Materials and Methods. A prospective, non-randomized, controlled longitudinal study was conducted. Baseline clinical and functional assessment of patients, NIV parameter titration, and follow-up after 6 months of therapy were performed. The study included 32 patients older than 18 years with chronic hypercapnic respiratory failure ($PaCO_2$ >45 mmHg, pH >7.35) caused by chronic bronchopulmonary diseases, including COPD, bronchiectasis, interstitial lung diseases, and other conditions.

Results. The mean age of patients was 58±13 years, with 53.4% males. The most common causes of CRF were COPD (41.4%), bronchiectasis (25.3%), interstitial lung diseases (12.2%), and other chronic bronchopulmonary disorders. Baseline mean $PaCO_2$ was 59.8±10.7 mmHg, and mean SpO_2 was 79.4±5.2%. After 12 months of outpatient NIV, $PaCO_2$ decreased to 45.6 mmHg and SpO_2 increased to 87.8%.

Positive changes were observed as early as 3 months after therapy initiation and persisted throughout the follow-up period. Improvement in quality of life according to the SF-36 questionnaire was also noted, including physical functioning, vitality, and social functioning. Therapy demonstrated satisfactory tolerability and high patient adherence.

Conclusions. Initiation of NIV in outpatient settings is associated with improved gas exchange parameters in patients with chronic hypercapnic CRF. Positive clinical effects develop early and persist during long-term follow-up. The outpatient approach is safe and represents a promising strategy for managing patients with chronic hypercapnic respiratory failure. The obtained data confirm the need for further development of outpatient monitoring and support algorithms for this category of patients.

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IMMUNE-MEDIATED FORMS OF MYELODYSPLASTIC SYNDROME: DIAGNOSTIC DIFFICULTIES AND CLINICAL AND BIOLOGICAL HETEROGENEITY

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Introduction. Myelodysplastic syndrome (MDS) is a heterogeneous group of clonal hematopoietic disorders characterized by cytopenias, morphological changes in the bone marrow, and the risk of transformation into acute leukemia. In clinical practice, the diagnosis of MDS often masks conditions with different pathogenesis, including immune-mediated hematopoietic disorders, significantly complicating diagnosis and treatment decisions.

Purpose of the study. To assess the frequency and clinical and laboratory characteristics of immune-mediated forms of MDS in real clinical practice, and to demonstrate the diagnostic heterogeneity of patients with a formal diagnosis of MDS.

Materials and methods. A retrospective analysis of 50 patients with a confirmed diagnosis of MDS observed in the hematology department was conducted. Based on clinical, morphological, immunological, and therapeutic criteria, a subgroup of patients with a presumed immune-mediated disease mechanism was identified. Demographic parameters, bone marrow cellularity, the presence of autoantibodies, cytogenetic abnormalities, immunosuppressive therapy, and clinical outcomes were analyzed. Data analysis was performed using the Manney-Whitney and Fisher methods to calculate the p value. A p value of <0.05 was considered statistically significant.

Results. Immune-mediated MDS was detected in 10 of 50 patients (20%). Women predominated in this group (80%, n=8), the median age was 67.5 years. Bone marrow hypocellularity was detected in 10 of 10 patients (100%, p value<0.0001). Autoimmune markers (ANA, ENA, etc.) were detected in 5 patients (50%, p value=0.00036), and a clone of paroxysmal nocturnal hemoglobinuria was detected in one patient. Immunosuppressive therapy (including cyclosporine) was received by 6 of 10 patients (60%). Cytogenetic abnormalities in this group were detected in 2 out of 10 patients - trisomy 8 chromosome (20%), while in the rest of the cohort, cytogenetic abnormalities were detected in 22 out of 40 patients (p value=0.07). The median blast rate based on bone marrow examination was 2.8% in the immune-mediated form and 5.85% in the clonal group (p value = 0.066).

In the immune-mediated MDS group, no cases of transformation to acute leukemia were observed, while in the remaining group, transformation was observed in 8 patients (p value = 0.17). Also, the prognostic classes of both MDS groups were assessed, the results of which revealed the dominance of moderate and low risk according to IPSS in immune-mediated forms (intermediate risk -1 -8, low risk -2), while in the clonal group, high risk dominated (n = 23), moderate risk - 2 (n = 12) and moderate risk - 1 (n = 5). In addition, in the overall cohort, cases of combined forms of MDS/MPD, secondary MDS after auto-HSCT, as well as patients whose clinical picture did not meet the criteria for MDS, were identified, which emphasizes the diagnostic heterogeneity of this group of diseases.

Conclusion. Immune-mediated forms account for a significant proportion of patients diagnosed with MDS and are characterized by a predominance of hypocellular bone marrow, autoimmune manifestations, and a low risk of transformation into acute leukemia. The data obtained highlight that MDS in real-world clinical practice represents a heterogeneous group of conditions requiring careful differential diagnosis and an individualized therapeutic approach.

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AI-ASSISTED CLINICAL DECISION SUPPORT IN SEVERE BRONCHIAL ASTHMA WITH RESPIRATORY FAILURE DURING PREGNANCY: A CLINICAL CASE

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Introduction. Bronchial asthma affects 4 to 8 percent of pregnant women and represents the most prevalent chronic respiratory disease in this population. Severe exacerbations threaten both maternal and fetal oxygenation, and first-onset asthma during gestation is frequently misattributed to viral infection or physiological dyspnea, since minute ventilation rises by 40 to 50 percent in pregnancy, masking progressive bronchoobstruction. Artificial intelligence tools applied to clinical workflows offer new pathways for earlier pattern recognition, automated risk stratification, and treatment optimization. We present a case of severe first-onset bronchial asthma in a 26-week pregnant patient with decompensated respiratory acidosis and grade II respiratory failure and discuss concrete scenarios where AI-based decision support could have altered the clinical course.

Materials and methods. This clinical case originates from the Pulmonology Department of City Hospital No. 2 in Astana (2025). The patient was a 26-year-old woman. All data were anonymized.

Results. A 23-year-old woman at 26 weeks of her first pregnancy was admitted at 02:00 on November 14, 2025, after two months of worsening dyspnea initially attributed to viral infection and allergic rhinitis of pregnancy. At admission: respiratory rate 28 to 29 per minute, oxygen saturation without supplemental oxygen 92 percent, heart rate 115 beats per minute, orthopneic posture with diffuse expiratory wheezing. Arterial blood gas showed decompensated respiratory acidosis: pH 7.15, pCO2 73.4 mmHg, pO2 24.8 mmHg. Serum immunoglobulin E of 222 IU/mL confirmed atopic phenotype. Computed tomography revealed bronchial wall thickening, mucous plugs in subsegmental bronchi, and air trapping. Spirometry was contraindicated given acute severe exacerbation and 26-week gestation; post-partum verification was scheduled per Global Initiative for Asthma 2024 guidelines. Management included intravenous prednisolone, nebulized budesonide, oxygen therapy, and intensive care unit transfer within 30 minutes. By day three, oxygen saturation reached 97 percent, respiratory rate normalized to 20 per minute, and leukocyte count fell from 17.33 to 11.54 x 10 to the ninth per liter.

The patient was discharged on day five in satisfactory condition; fetal heart rate remained at 140 beats per minute with no obstetric complications. Four AI application domains emerge from this case. Natural language processing on outpatient records could detect escalating dyspnea across encounters and prompt earlier specialist referral. Machine learning models trained on blood gas trajectories can recognize impending ventilatory failure before conventional alerts; pH 7.15 combined with pCO2 73.4 in a pregnant patient is a composite signal suited to AI-driven escalation. Predictive algorithms using gestational age, body mass index, and immunoglobulin E could stratify patients for intensified second-trimester monitoring, the period of peak exacerbation incidence (Robijn et al., 2022). AI-supported perinatal monitoring could integrate maternal and fetal data for concurrent multidisciplinary assessment.

Conclusions. Bronchial asthma can debut during pregnancy while mimicking common infections, and delayed recognition leads to life-threatening decompensation for both mother and fetus. This case supports AI-driven clinical decision support integrating natural language processing, blood gas pattern recognition, and risk stratification to shorten diagnostic delay and improve outcomes in obstetric pulmonology.

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THE RELATIONSHIP BETWEEN POSTPARTUM DEPRESSION AND HORMONAL IMBALANCE IN WOMEN: A LITERATURE REVIEW

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Introduction: The perinatal period is accompanied by significant endocrine and psychoemotional changes that create an increased risk of developing postpartum depression (PPD). According to the WHO, PPD occurs in an average of 10-20% of women, with consequences affecting not only the mother's mental health but also the formation of maternal attachment, the child's emotional and cognitive development, family relationships, and social functioning. One of the key factors influencing the risk of PPD is hormonal imbalance, including a sharp decline in estrogen and progesterone after childbirth, dysregulation of the hypothalamic-pituitary-adrenal axis, and possible thyroid dysfunction. Furthermore, the development of PPD increases stress and can further disrupt hormonal regulation, creating a bidirectional pathogenetic cycle. Studying the relationship between psychoemotional and endocrine factors is essential for the early diagnosis and comprehensive prevention of PPD.

Objective of the study: To analyze current literature data on the relationship between postpartum depression and hormonal imbalance in women.

Materials and Methods. A systematic review of the literature from 2015 to 2025 was conducted using PubMed/MEDLINE, Google Scholar, and Web of Science. Systematic reviews, meta-analyses, and original studies.

Results. A literature review revealed that the prevalence of postpartum depression is 10–20% among women, and up to 25% in low- and middle-income countries. The postpartum period is accompanied by sharp fluctuations in estrogen and progesterone levels. Dysregulation of the HPA axis is common in women with postpartum depression. Thyroid dysfunction, including postpartum thyroiditis, is observed in 5–15% of women in the first six months. In some women, depression is associated with increased cortisol and decreased oxytocin and prolactin, which exacerbates hormonal imbalance. Early screening and psychoeducational interventions reduce the risk of postpartum depression, and social support improves outcomes.

Conclusions and discussion: Postpartum depression and hormonal imbalance are interconnected: hormonal changes increase the risk of postpartum depression, and depression exacerbates endocrine disorders. To prevent and treat postpartum depression, it is necessary to integrate screening for psychoemotional and hormonal disorders, implement psychological and educational interventions, and engage the woman's partner and social network. This approach reduces the risk of postpartum depression and improves the health of both mother and child.

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IRSTI: 76.29.56; 76.29.45

SIGNIFICANCE OF MODERN ECHOCARDIOGRAPHIC APPROACH IN EARLY DIAGNOSIS OF DIASTOLIC DYSFUNCTION IN PATIENTS WITH ISCHEMIC HEART DISEASE

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Introduction. Heart failure with preserved ejection fraction (HFpEF) is an increasingly prevalent phenotype of heart failure, clinically manifesting as dyspnea, reduced exercise tolerance, and impaired quality of life. Although traditional Doppler echocardiographic parameters (E/A ratio, E/e', left atrial volume index) are widely used, they do not always possess sufficient sensitivity to detect changes at the subclinical stage. Consequently, in recent years, global longitudinal strain (GLS) and left atrial reservoir strain (LASr), assessed via speckle-tracking echocardiography, have been studied as important diagnostic markers.

Objective. To evaluate the significance of GLS and LASr parameters in detecting occult diastolic dysfunction in patients with heart failure symptoms and preserved left ventricular ejection fraction.

Materials and methods. The study included 92 patients with ischemic heart disease, all of whom had a left ventricular ejection fraction (LVEF) of ≥50%. Standard echocardiography was used to assess E/A, E/e', and left atrial volume index (LAVI). GLS and LASr were determined using speckle-tracking analysis. A probable increase in left ventricular filling pressure was assumed in the presence of at least two of the following criteria: E/e' ≥13, LAVI >34 ml/m², and NT-proBNP >125 pg/ml. Data are presented as M±SD. Group comparisons were performed using Student's t-test. The relationship between parameters was assessed using Pearson correlation analysis.

Results. The mean age of the 92 patients included in the study was 57.9 ± 10.2 years, with 60% being female. All patients exhibited preserved left ventricular ejection fraction, with a mean value of 56.9 ± 4.6%. Analysis of standard echocardiographic parameters showed an E/e' index of 12.9 ± 3.5 and a left atrial volume index (LAVI) of 32.4 ± 3.9 ml/m², indicating the absence of overt signs of resting diastolic dysfunction in the majority of patients. The median NT-proBNP level was 221 [120–340] pg/ml, with a significant proportion of patients recording values above 125 pg/ml.

According to the results of the speckle-tracking analysis, the mean global longitudinal strain (GLS) was −16.8 ± 2.3%, and the left atrial reservoir strain (LASr) was 24.1 ± 5.6%. Based on a combination of clinical and echocardiographic criteria, 41% of patients were identified with a probable increase in left ventricular filling pressure. Accordingly, patients were divided into two groups: Group 1 with probable diastolic dysfunction (DD+) and Group 2 without diastolic dysfunction (DD−). In the DD+ group, GLS was −15.9 ± 2.1%, which significantly differed from the DD− group (−17.6 ± 2.0%; $p < 0.001$). LASr values were 21.8 ± 4.9% (DD+) and 26.3 ± 5.2% (DD−), respectively ($p < 0.001$). A moderate positive correlation was found between GLS and E/e' ($r = 0.49$; $p < 0.001$), while an inverse correlation was observed between LASr and E/e' ($r = −0.52$; $p < 0.001$).

Discussion. The results indicate that GLS and LASr parameters, when evaluated in combination with traditional echocardiographic parameters, may provide additional diagnostic value in detecting subclinical diastolic dysfunction. GLS reflects early functional changes in the subendocardial layer of the myocardium, while LASr characterizes the reservoir function and compliance of the left atrium. These two parameters reflect hemodynamic changes associated with left ventricular filling pressure from different perspectives. NT-proBNP, as a biomarker of cardiac wall stress, corroborates these changes.

Conclusion. The combined assessment of gls and lasr parameters complements traditional echocardiography and enhances the feasibility of early detection of subclinical myocardial and left atrial dysfunction.

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IMPACT OF LDL CHOLESTEROL LEVELS ON LEFT VENTRICULAR DIASTOLIC DYSFUNCTION AND STRUCTURAL CHANGES IN PATIENTS WITH ARTERIAL HYPERTENSION

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Introduction. Arterial hypertension and dyslipidemia, when combined, contribute to the development of early structural and functional myocardial alterations, and their joint effect exerts varying degrees of influence on left ventricular diastolic function as well as on electrocardiographic and echocardiographic cardiac parameters.

Objective. To determine the relationship between LDL levels in the setting of arterial hypertension and left ventricular diastolic function as well as hemodynamic parameters, and to assess its prognostic significance in early cardiac functional disorders.

Materials and Methods. The study included 50 patients aged 40–70 years diagnosed with arterial hypertension. All patients were divided into two groups according to low-density lipoprotein (LDL) levels: Group A (normal LDL) — 19 patients, Group D (high LDL) — 31 patients. The following parameters were evaluated: body mass index (BMI); maximum arterial blood pressure; ECG findings; echocardiographic parameters (EF, EDV, ESV); stages of left ventricular diastolic dysfunction; lipid profile (LDL); presence of type 2 diabetes mellitus.

Results. Left ventricular diastolic dysfunction in Group A was identified in 15 patients (78.9%), including 12 patients (63.2%) with Grade I, 2 (10.5%) with Grade II, and 1 (5.3%) with Grade III dysfunction. In Group D, diastolic dysfunction was observed in 20 patients (64.5%), including 16 (51.6%) with Grade I and 4 (12.9%) with Grade II dysfunction. Although Grade II diastolic dysfunction was more frequently observed in Group D, no statistically significant difference was found ($p=0.12$). In the analysis of systolic and volumetric parameters, ejection fraction (EF) was 51.2 ± 3.8% in Group A and 53.9 ± 4.1% in Group D ($p=0.12$). End-diastolic volume (EDV) was 126.9 ± 18.4 ml and 121.8 ± 16.7 ml, respectively ($p<0.2$). End-systolic volume (ESV) was 65.1 ± 10.2 ml and 58.7 ± 9.6 ml ($p=0.08$), with no statistically significant differences. ECG analysis revealed signs of left ventricular hypertrophy in 32.3% of patients in Group D and 10.5% in Group A, with a statistically significant difference ($p=0.042$). Type 2 diabetes mellitus was present in 21.1% of Group A and 29.0% of Group D patients, with no significant difference ($p=0.53$). Clinical and metabolic changes: BMI was 30.2 ± 3.6 kg/m² in Group A and 29.4 ± 3.2 kg/m² in Group D. Systolic blood pressure was 138 ± 12.4 mmHg and 132 ± 11.8 mmHg, respectively, with no significant difference ($p=0.48$).

Conclusion. Elevated LDL cholesterol levels were associated with a higher prevalence of left ventricular hypertrophy in patients with arterial hypertension, whereas no statistically significant differences were observed in functional parameters or in the prevalence of diabetes mellitus.

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CAUSES OF HOSPITALIZATION OF PATIENTS WITH CHRONIC BRONCHOPULMONARY DISEASES ACCORDING TO DATA FROM THE PULMONOLOGY DEPARTMENT

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Introduction. Chronic bronchopulmonary diseases, such as COPD and asthma, are among the leading causes of hospitalization and significantly impact morbidity and mortality. Analyzing the causes of severe exacerbations requiring inpatient treatment, as well as assessing the correct use of inhalation devices, allows us to identify key risk factors and therapeutic gaps. Research into this issue in pulmonology departments is crucial for optimizing treatment strategies and improving the quality of patient care.

The aim of the study to analyze the causes of severe exacerbations of COPD and bronchial asthma requiring hospitalization; to assess the technique of using inhalation devices in patients with chronic bronchopulmonary diseases.

Materials and methods: medical records of patients treated in the pulmonology department of City Multidisciplinary Hospital No. 1, Astana; patients currently receiving treatment in the pulmonology department. An analysis was conducted of the causes of COPD and bronchial asthma (BA) exacerbations leading to hospitalization; the volume of inpatient therapy provided; and the technique of using inhalation devices. Study period: December 2025 – February 2026. Study design: retrospective, cross-sectional, observational.

Results of research. 61 medical records were analyzed, including 47 cases of COPD, 14 cases of bronchial asthma, and 6 cases of combined COPD and asthma. The following causes of exacerbations were identified: infections, high exposure to pollutants/allergens, occupational factors, lack of regular daily therapy, and comorbidities.

The most common causes of severe exacerbations were infections (51.3% of cases), lack of adherence to therapy (34.6%), high exposure to pollutants/allergens (22.3%), occupational factors (15.7%), and comorbidities (11.1%). In some cases, a combination of causes was observed. The analysis of causes of exacerbations across different diseases revealed the following. In COPD, infections accounted for 66% of exacerbations, non-adherence to therapy for 27.7%, exposure to pollutants for 14.9%, and occupational factors for 10.6%. In bronchial asthma (BA), infections accounted for 85.7%, non-adherence to therapy for 42.9%, exposure to allergens for 28.6%, and comorbidities for 14.3%. In cases of combined BA and COPD, infections were also the most significant factor, accounting for 66.7%, while non-adherence to therapy accounted for 33.3%. Regardless of the causes of exacerbation, all hospitalized patients received antibacterial therapy in combination with other groups of medications.

The assessment of inhalation device technique in hospitalized patients revealed various errors in all cases. In 76.2% of cases there was a lack of synchronization between inhalation and inhaler actuation; incorrect body positioning during the maneuver was observed in 71.4%; absence of breath-holding after inhalation of the drug in 61.9%; and incomplete sealing of the mouthpiece in 4.8%. In 38.1% of cases, patients did not rinse their oral cavity after inhalation. In a proportion of patients (9.5%), errors occurred when switching devices.

Conclusions: The most common causes of severe exacerbations in COPD and bronchial asthma are infections and non-adherence to therapy. When using inhalation devices, the majority of patients make various errors even after long-term use of inhalation therapy.

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VENOUS THROMBOEMBOLIC COMPLICATIONS IN OBSTETRIC PRACTICE: A CLINICAL CASE

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Introduction. Venous thromboembolic complications (VTE) rank third among acute cardiovascular conditions, after myocardial infarction and stroke. In pregnant women, the risk of VTE increases 4–5 times compared to non-pregnant women, accounting for 0.5–2.0 cases per 1,000 pregnancies. Venous thromboembolic complications are responsible for 9.3% of maternal mortality in developed countries. The iliofemoral segment is affected in 64% of deep vein thrombosis cases in pregnant women, predominantly on the left side due to compression of the left iliac vein (May–Thurner phenomenon). Particularly dangerous is the combination of deep vein thrombosis with pulmonary embolism, requiring immediate multidisciplinary intervention.

Objective. To demonstrate the successful application of comprehensive treatment for massive pulmonary embolism against the background of extensive deep vein thrombosis of the lower extremities in a pregnant patient with implantation of a temporary inferior vena cava filter.

Materials and Methods. A clinical case is presented of patient A., born in 1993, who was admitted on an emergency basis at 28 weeks of pregnancy with complaints of swelling and pain in the left lower extremity, shortness of breath on exertion, and chest pain. Medical history: phlebothrombosis of the popliteal segment of the left lower extremity was identified in April 2025 against the background of medically induced termination of pregnancy and surgical intervention for nasal septum deviation in January 2025. Prior to hospitalization, the patient had been receiving enoxaparin 0.4 subcutaneously once daily. The following examinations were performed: Doppler ultrasound of the lower extremity veins, echocardiography, electrocardiography, and contrast-enhanced computed tomography pulmonary angiography.

Results. On admission, the patient's condition was severe: blood pressure 90/40 mmHg, pulse 120 beats per minute, respiratory rate 26 breaths per minute, oxygen saturation 92%. Doppler ultrasound revealed thrombotic masses in the lumen of the common femoral, superficial femoral, popliteal, and tibial veins on the left, with floating thrombus head in the common femoral artery extending more than 4.5 cm. Echocardiography demonstrated dilation of the right heart chambers, with estimated pulmonary artery systolic pressure of 50 mmHg. Computed tomography angiography confirmed pulmonary embolism of lobar, segmental, and subsegmental pulmonary artery branches bilaterally. The Pulmonary Embolism Severity Index (PESI) was 33 points (Class I, low mortality risk). A temporary inferior vena cava filter was implanted; anticoagulant therapy with heparin and enoxaparin was initiated. At follow-up examination 6 weeks later, signs of recanalization of thrombotic masses in the lower extremity veins and a significant reduction in thromboembolic changes in the pulmonary arteries were noted. Against the background of all the above, the patient delivered a healthy child vaginally.

Conclusions. This clinical case demonstrates the possibility of successful and safe treatment of massive pulmonary embolism in a pregnant patient using anticoagulant therapy and implantation of a temporary inferior vena cava filter. Timely diagnosis using Doppler ultrasound and computed tomography angiography, as well as a multidisciplinary approach, help reduce the risk of fatal outcome and ensure a favorable prognosis for both mother and fetus.

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SEVERE LUNG INVOLVEMENT IN NEWLY DIAGNOSED SYSTEMIC LUPUS ERYTHEMATOSUS MASKED AS COMMUNITY-ACQUIRED PNEUMONIA

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Introduction. Respiratory system involvement in systemic lupus erythematosus (SLE) is considered a prognostically unfavorable manifestation of the disease. Pulmonary complications, including lupus pneumonitis and pleuritis, often mimic infectious pneumonia, making timely diagnosis challenging and resulting in delays in the initiation of pathogenetic therapy. The combination of autoimmune inflammation and infection contributes to the rapid development of respiratory failure and multiple organ dysfunction.

Objective. To analyze a clinical case of severe community-acquired pneumonia in a patient with newly diagnosed highly active systemic lupus erythematosus, with a focus on pulmonary involvement and disease course characteristics.

Materials and Methods. A retrospective analysis of a clinical case involving a patient with bilateral pneumonia was conducted. Medical history, clinical findings, laboratory parameters, and instrumental examination results, including chest computed tomography (CT), were evaluated, as well as the patient's response to ongoing therapy.

Results. The disease developed over a period of 1.5 months, initially presenting with fever and cutaneous manifestations. Antibacterial therapy was ineffective. Following sun exposure, the patient's condition deteriorated, accompanied by progressive respiratory failure. Upon admission, the patient's condition was severe, with an oxygen saturation (SpO_2) of 82% and tachypnea. Chest CT revealed bilateral multilobar pneumonia, bilateral hydrothorax, compression atelectasis, and hydropericardium. Laboratory findings demonstrated leukocytosis up to 24 × 10^9/L, lymphopenia, hypoalbuminemia, serum creatinine of 265 μmol/L, D-dimer levels up to 5000 ng/mL, and ferritin levels exceeding 1500 ng/mL. Immunological testing showed ANA titers greater than 1:640 with positive anti-SS-A, anti-SS-B, and anti-Sm antibodies, confirming the diagnosis of highly active systemic lupus erythematosus. Pulmonary involvement was interpreted as a combination of infectious pneumonia and lupus pneumonitis. Acute kidney injury and multiple organ failure subsequently developed. Comprehensive treatment was administered, including antibiotics, glucocorticoid pulse therapy, anticoagulants, infusion therapy with correction of hypoalbuminemia, diuretics, and oxygen support. Despite intensive treatment, the patient's condition progressively worsened with the development of acute cardiopulmonary failure, likely associated with thromboembolic complications, ultimately resulting in death.

Conclusions. This clinical case demonstrates that pulmonary involvement in systemic lupus erythematosus may present as severe community-acquired pneumonia and be accompanied by the rapid development of respiratory failure. The coexistence of infectious and autoimmune components significantly aggravates the disease course and worsens prognosis. Lack of response to antibacterial therapy combined with systemic manifestations necessitates early exclusion of systemic rheumatologic diseases. Timely diagnosis and early initiation of immunosuppressive therapy are key factors influencing disease outcome.

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ASSESSMENT OF QUALITY OF LIFE IN PATIENTS WITH ACUTE FORMS OF ISCHEMIC HEART DISEASE USING THE MACNEW QUESTIONNARE

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Introduction. Cardiovascular diseases remain the leading cause of morbidity and mortality worldwide. Assessment of quality of life in patients with cardiovascular pathology is a key indicator of treatment effectiveness, reflecting physical, psychological, and social functioning. The MacNew questionnaire is a disease-specific instrument for patients with ischemic heart disease (IHD) that evaluates the impact of the illness on daily life. The questionnaire includes 27 items across three domains: social, physical, and emotional, rated from 1 (low quality of life) to 7 (high quality of life). In this study, the MacNew questionnaire was used to assess quality of life in patients with acute forms of IHD—STEMI, NSTEMI, and unstable angina—to identify the most affected domains and prognostically significant factors.

Objective. To assess the quality of life in patients with acute forms of ischemic heart disease using the disease-specific MacNew questionnaire.

Materials and Methods. The study included 21 patients with ischemic heart disease who underwent inpatient treatment in the cardiology department of City Multidisciplinary Hospital. The sample was formed using a continuous inclusion method.

Quality of life assessment was performed using the international MacNew questionnaire. Statistical data analysis was conducted using SPSS software (version 6.0).

Results. Patients were stratified by sex and age and categorized by diagnosis: STEMI (n=3, 14%), NSTEMI (n=5, 24%), and unstable angina (n=13, 62%). The mean age of the cohort was 61 ± 14.9 years. All STEMI patients demonstrated low global quality-of-life scores (3.8 ± 0.9). In NSTEMI and unstable angina, global scores were moderately reduced (4.8 ± 1.3 and 4.9 ± 0.8, respectively). In the NSTEMI group, 40% had low, 40% moderate, and 20% high quality-of-life levels, while in unstable angina 54% had reduced, and 23% moderate and high levels each. STEMI patients showed low scores across all three MacNew domains. In NSTEMI, social and emotional scores were slightly higher than physical scores (5.0 ± 1.4, 5.0 ± 1.3, and 4.9 ± 1.5, respectively).

Among patients with unstable angina, a moderate reduction in quality of life was observed across all domains (approximately 5.0 ± 0.9 points). Clinical significance was defined using the Minimal Clinically Important Difference (MCID ≥0.5). Differences in quality-of-life scores between STEMI, NSTEMI, and unstable angina exceeded this threshold, indicating clinical relevance.

Conclusion. Patients with STEMI demonstrated a more pronounced reduction in quality-of-life scores compared with NSTEMI and unstable angina. Although statistical significance was not reached, the differences exceeded the minimal clinically important threshold (≥0.5 points), indicating a greater impact of STEMI on perceived health status. The absence of statistical significance is likely due to the small sample size in the STEMI group.

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FEATURES OF THE COURSE OF CHRONIC KIDNEY DISEASE AGAINST THE BACKGROUND OF PERSONALIZED DIET THERAPY

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Introduction: Chronic kidney disease (CKD) is a significant public health problem associated with irreversible decline in renal function. According to statistics of the Republic of Kazakhstan, in the period from 2015 to 2022, the level of diseases of the genitourinary system in the structure of total morbidity is in fourth place, amounting to 6.1% in 2022 (Darmen N. J. 2024). In Kazakhstan, the prevalence of CKD reaches 10-12% of the population, and the number of patients on RRT exceeds 8000 people. Among them, 4.5% are at stages 3-5, and 7.1% are at stages 1-2. The number of patients requiring dialysis and transplantation is growing rapidly, doubling every 10 years (KazNMU, 2023). However, studies show that the level of awareness of kidney diseases among the population remains low. Limiting the intake of protein, sodium, potassium, and phosphorus in the diet can slow the progression of CKD and reduce the risk of complications. Early studies have shown that reducing protein intake slows the progression of CKD, although more recent studies indicate a modest effect. Limiting sodium helps control blood pressure and reduce swelling, which is important for patients with CKD. Controlling the level of potassium and phosphorus in food prevents the development of hyperkalemia and hyperphosphatemia, which can lead to serious complications. Optimal nutritional status plays an important role in improving the quality of life and reducing the risk of hospitalization in patients with chronic kidney disease (CKD) (National Kidney Foundation. 2024).

Objective: To study the effect of personalized diet therapy on the course of chronic kidney disease in patients with grade 3b, 4, 5.

Materials and methods: The study included 92patienta with CKD 3a-5 at the end of hypertensive or diabetic nephropathy. Participants were divided into a control group (standard diet # 7) and an experimental group (personalized diet therapy based on comorbid conditions). Evaluation was performed before and after the intervention. Methods of descriptive and comparative statistics were used.

Results: The experimental group with personalized diettherapy showed statistically significant improvements ($p<0.05$) in a numberof parameters in comparison with the control group. When comparing the creatinine level between the experimental and control groups, it was found that in the experimental group, the median creatinine value was statistically significantly lower than in the control group: 170.0 (122.0; 221.5) vs. 202.5 (162.5; 271.5), $p = 0.037$. This indicates a more favorable dynamics of the indicator in the group that received diet therapy. In the control group, the median glomerular filtration rate (GFR) was 29.55 [22.65; 38.0] ml/min/1.73 m2, while in the experimental group it was 34.5 [23.0; 52.5] ml/min/1.73 m2 ($p=0.019$). When analyzing the level of phosphorus, significant differences were found. In the control group, the median value was 1.54 [1.45; 1.65] mmol / L, while in the experimental group it was 1.42 [1.30; 1.45] mmol/L ($p<0.001$). Thus, a comparative analysis of indicators of electrolyte metabolism and kidney function showed statistically significant differences between the control and experimental groups in terms of potassium, phosphorus and GFR levels.

Conclusions: The results obtained indicate a more favorable state of renal function in patients of the experimental group, which may indicate a positive effect of personalized diet therapy on slowing the rate of GFR reduction. Personalized diet therapy is more effective than standard approaches and can be recommended for inclusion in the comprehensive management of patients with CKD.

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FORMATION OF AN UP-TO-DATE WAITING LIST FOR KIDNEY TRANSPLANTATION IN THE REPUBLIC OF KAZAKHSTAN: A PRELIMINARY ANALYSIS

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Introduction. Kidney transplantation is one of the most effective methods of renal replacement therapy for end-stage chronic kidney disease. The effectiveness of a transplant service is largely determined by the timely updating of the waiting list, patient routing, availability of donor resources, and regular monitoring of recipients. For the Republic of Kazakhstan, prolonged waiting for transplantation, regional disparities in access, limited use of deceased donation, and insufficient public awareness remain relevant problems.

Objective. To conduct a preliminary analysis of the current state of the waiting list for kidney transplantation in the Republic of Kazakhstan and to identify the main organizational aspects affecting its updating and functional efficiency.

Materials and methods. A descriptive analysis was performed using data from the Republican Center for Coordination of Transplantation and High-Tech Medical Services for 2012–2023, as well as open data from the center as of December 29, 2025. The structure of the kidney transplantation waiting list, waiting time, type of donation, transplant dynamics, donor process indicators, and delisting due to death were assessed.

Results. In 2012–2023, among 3,971 patients included in the organ waiting list, 3,624 patients (91.2%) were waiting for kidney transplantation. In the structure of the kidney transplantation waiting list, adults accounted for 97.4%, and men accounted for 58.7%. The largest number of recipients was registered in Almaty (17.6%), Astana (11.2%), and the Aktobe region (8.8%). The length of stay on the waiting list was as follows: 1 to 5 years in 52.7%, 5 to 9 years in 39.1%, and more than 10 years in approximately 8% of patients. During the specified period, 1,876 kidney transplantations were performed: 90.2% from living related donors and 9.7% from deceased donors. As of December 29, 2025, 4,052 patients were waiting for kidney transplantation: 3,958 adults and 94 children; the share of this area was 89.9%. In 2025, among 184 identified potential donors, family consent was obtained in 19 cases (10.3%), 18 donors were medically suitable (9.8%); 68 transplantations were performed, and 342 patients were delisted due to death.

Discussion/Conclusions. The formation of an up-to-date waiting list has both clinical and organizational significance. The main problems include prolonged stay of patients on the waiting list, a low share of deceased donation, territorial concentration of recipients, limited realization of donor potential, and the need for regular updating of information on patients' clinical status. System improvement should include updating the registry, regular monitoring of recipients, development of donor coordination, and reduction of organizational barriers affecting transplant waiting times. These directions may be used to justify an algorithm for inclusion and prioritization of potential kidney transplant recipients.

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SYSTEM FOR PREDICTING THE SEVERITY OF RETINAL DAMAGE IN ARTERIAL HYPERTENSION

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Introduction. Hypertensive retinopathy (HR) is one of the leading causes of vascular eye damage, resulting in visual impairment up to irreversible blindness. According to international epidemiological studies, a substantial proportion of irreversible blindness is associated with retinal damage caused by arterial hypertension (AH). Contemporary approaches to patient management require the identification of early and clinically significant predictors of disease progression.

Purpose of the study. To identify early biomarkers of hypertensive retinopathy and, based on these findings, to develop a prognostic model.

Materials and methods. A retrospective analysis of clinical data from 540 patients with AH and a five-year follow-up period (2019–2024) involving 84 patients was conducted. Inclusion criteria were a confirmed diagnosis of AH and availability of ophthalmological examination data. Patients with comorbid conditions such as diabetes mellitus and autoimmune diseases were excluded. Correlation and regression analyses were applied for statistical evaluation. Polynomial algorithms and a machine learning architecture (XGBoost) were used to develop the prognostic model.

Results. The most significant ophthalmoscopic predictor of severe HR progression was the arteriovenous crossing sign, graded according to the Salus-Gunn classification, which demonstrated a high degree of correlation with disease progression. Among biochemical parameters, reduced high-density lipoprotein (HDL) levels showed independent prognostic significance (AUC = 0.86; 95% CI 0.78–0.93), reflecting an unfavorable lipid metabolism profile associated with systemic vascular dysfunction. The multifactorial model combining ophthalmoscopic and biochemical markers demonstrated high predictive accuracy for HR progression (AUC = 0.92; 95% CI 0.86–0.97).

Conclusion. The identified predictors represent accessible markers of high risk for HR progression. It is important to note that external validation of the model is ongoing, including assessment of predictive accuracy, calibration, and robustness under real clinical conditions. Therefore, at the current stage, the pilot model should be considered a promising clinical decision-support tool for physicians.

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PREDICTORS OF ENDOTHELIAL AND METABOLIC DYSFUNCTION IN PATIENTS WITH ISCHEMIC HEART DISEASE

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Introduction. Endothelial dysfunction and metabolic disturbances are key mechanisms underlying the progression of ischemic heart disease. Asymmetric dimethylarginine, an endogenous inhibitor of nitric oxide synthase, has been recognized as a sensitive biomarker of endothelial impairment and cardiovascular risk.

Aim: To identify independent predictors of endothelial and cardiometabolic dysfunction in patients with ischemic heart disease and to develop a clinically applicable risk stratification model.

Materials and Methods: A prospective observational study included 149 patients with ischemic heart disease (functional class I–II). All patients underwent comprehensive clinical, biochemical, and instrumental evaluation, including measurement of asymmetric dimethylarginine levels, lipid profile, transaminases, metabolic indices (TyG index and TG/HDL ratio), as well as vascular parameters such as flow-mediated dilation and carotid intima-media thickness. Multivariate logistic regression analysis was performed to identify independent predictors of combined endothelial and metabolic dysfunction. Diagnostic performance was assessed using ROC curve analysis.

Results: Elevated asymmetric dimethylarginine levels were strongly associated with endothelial dysfunction. Patients with asymmetric dimethylarginine levels of 121–160 ng/mL demonstrated a significantly increased risk (OR=8.6; 95% CI: 1.8–41.2; $p<0.01$), while levels >160 ng/mL were associated with an extremely high risk (OR=114.8; 95% CI: 6.8–1935.0; $p<0.001$). Multivariate analysis identified the following independent predictors: hepatic steatosis (OR=4.0; 95% CI: 1.9–8.3; p=0.002), elevated transaminases (OR=3.2; 95% CI: 1.5–6.7; p=0.003), reduced flow-mediated dilation <10% (OR=3.4; 95% CI: 1.6–7.1; p=0.001), increased carotid intima-media thickness >0.9 mm (OR=2.6; 95% CI: 1.2–5.4; p=0.01), TyG index ≥8.6 (OR=2.1; 95% CI: 1.1–4.0; p=0.02), TG/HDL ratio ≥2.3 (OR=2.5; 95% CI: 1.3–4.8; p=0.01), and BMI >29 kg/m² (OR=2.5; 95% CI: 1.2–5.1; p=0.02).

ROC analysis demonstrated good predictive performance of metabolic indices: TyG index showed an AUC of 0.76 (95% CI: 0.69–0.83; $p<0.001$) with sensitivity of 74.0% and specificity of 70.5% at a cut-off ≥8.6. TG/HDL ratio showed an AUC of 0.73 (95% CI: 0.65–0.81; $p<0.001$) with sensitivity of 71.8% and specificity of 66.7% at a cut-off ≥2.3. The developed prognostic model demonstrated high discriminative ability and allowed stratification of patients into low, moderate, and high-risk categories.

Conclusion: Asymmetric dimethylarginine is a powerful and independent biomarker of endothelial dysfunction in patients with ischemic heart disease. The combination of asymmetric dimethylarginine with metabolic and vascular parameters significantly improves risk stratification. The proposed model enables early identification of high-risk patients and may serve as a practical tool for personalized management and prevention of disease progression.

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IRTI: 76.29.30

PROGNOSTIC ANALYSIS OF COGNITIVE IMPAIRMENT IN THE SYSTEM OF CARDIAC REHABILITATION AFTER CORONARY ARTERY BYPASS GRAFTING

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Introduction. Cognitive impairment is observed in 30–65% of patients after coronary artery bypass grafting and negatively affects quality of life, treatment adherence, and prognosis. In clinical practice, there are no unified approaches to the diagnosis and correction of these disorders within the system of cardiac rehabilitation, which limits the effectiveness of restorative treatment.

Objective. To analyze current evidence on cognitive impairment within the system of cardiac rehabilitation after coronary artery bypass grafting.

Materials and Methods. A literature review was conducted using PubMed and Cochrane Library databases over the past 5 years.

Results. It has been established that the inclusion of cognitive training and neuropsychological support in cardiac rehabilitation programs significantly improves memory, attention, and psychomotor speed, reduces anxiety and depression, and increases treatment adherence and quality of life. According to a meta-analysis of 16 randomized controlled trials (1335 patients), the incidence of postoperative cognitive dysfunction decreased by 65%. An improvement in cognitive performance by 2.54 points and an increase in the mental component of quality of life by 5.22 points were observed. A significant reduction in anxiety and depression levels was also identified. A multidisciplinary approach involving cardiologists, rehabilitation specialists, neuropsychologists, and other professionals enhances rehabilitation effectiveness and improves long-term outcomes.

Conclusions. Cognitive impairment after coronary artery bypass grafting is a common and prognostically significant complication. Early diagnosis and prediction of cognitive disorders enable the development of individualized rehabilitation programs. The implementation of comprehensive multidisciplinary approaches improves the effectiveness of cardiac rehabilitation and enhances patients' quality of life.

UDC: 614.2:378.6:61
IRSTI: 76.75.75

COMPREHENSIVE ASSESSMENT OF THE HEALTH STATUS OF MEDICAL UNIVERSITY STUDENTS

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Introduction. Medical education is associated with a high academic workload and pronounced psycho-emotional stress, which may adversely affect students' health and the formation of risk factors. Therefore, a comprehensive assessment of their health status is of great importance for preventive medicine.

Objective. To assess the health status of medical students, taking into account psycho-emotional, somatic, and behavioral factors, as well as the level of medical activity.

Materials and Methods. A cross-sectional descriptive-analytical study was conducted using an anonymous survey of 480 sixth- and seventh-year students (aged 21–26). For multifactorial analysis, 388 respondents with complete data were included (75–80% female). The questionnaire covered self-rated health, levels of stress and fatigue, sleep quality, presence of complaints and chronic diseases, lifestyle, healthcare-seeking behavior, and awareness of health status. Statistical analysis included descriptive methods and logistic regression.

Results. More than 60% of students reported pronounced fatigue, and over half experienced frequent or constant academic stress. Sleep disturbances were noted in approximately 40% of respondents. Health complaints were identified in two-thirds of students, mainly involving the gastrointestinal, nervous, and cardiovascular systems. About 30% reported having chronic diseases. Less than half of the students engaged in regular physical activity, while the rest did so occasionally or rarely. Alcohol consumption was generally infrequent, and smoking was observed in a small proportion. A significant share of students had not sought medical care during the past year. Awareness of basic health indicators (blood pressure, glucose, hemoglobin) remained low. Attitudes toward vaccination were predominantly positive. Multivariate regression analysis showed that independent factors associated with poor health status included academic stress (adjusted OR > 2.0), poor sleep quality (adjusted OR > 1.8), low physical activity (adjusted OR ≈ 1.5–2.0), and the presence of chronic diseases (adjusted OR > 2.5) ($p < 0.05$). Harmful habits did not demonstrate statistically significant effects.

Conclusion. Factors adversely affecting health—such as stress, fatigue, sleep disturbances, and insufficient physical activity—are widely prevalent among medical students. Health formation is multifactorial, with psycho-emotional burden playing a leading role. The findings support the need to develop preventive programs aimed at improving adaptive capacity and promoting a healthy lifestyle among students.

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IRSTI:76.23.30

PREDICTORS OF ELEVATED ARTERIAL BLOOD PRESSURE BASED ON PREVENTIVE SCREENING DATA

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Introduction. Arterial hypertension remains one of the leading causes of cardiovascular morbidity and mortality. Early identification of risk factors associated with elevated blood pressure is of particular importance at the primary healthcare level.

Objective. To identify predictors of elevated arterial blood pressure based on preventive medical examination data in outpatient settings.

Materials and Methods. A cross-sectional analytical study was conducted among adults at the "Shipager" PHC center in Astana. A total of 3.387 individuals were examined, and data from 1.055 participants with complete clinical, anthropometric, and laboratory parameters were included in the multivariate analysis. Blood pressure, body mass index (BMI), blood glucose, and total cholesterol levels were assessed. Elevated blood pressure was defined as ≥140/90 mmHg. Statistical analysis included descriptive, correlation, and univariate analyses, as well as multivariate logistic regression with calculation of odds ratios (OR) and 95% confidence intervals (CI). Age, sex, BMI, glucose, and total cholesterol were included in the model ($p<0.05$).

Results. Elevated blood pressure was identified in approximately 27% of participants. Females predominated in the sample (about 60–70%), while males accounted for 30–40%. The mean age ranged from 49 to 55 years. Statistically significant associations were found between blood pressure levels and age, BMI, blood glucose, and cholesterol levels. In the multivariate logistic regression model, independent predictors of elevated blood pressure were age (OR 1.04; 95% CI 1.03–1.05), BMI (OR 1.12; 95% CI 1.07–1.18), male sex (OR 1.65; 95% CI 1.15–2.35), and blood glucose level (OR 1.20; 95% CI 1.02–1.42). After adjustment for confounding factors, total cholesterol lost statistical significance. The model demonstrated good explanatory power (Nagelkerke $R^2 \approx 0.41$).

Conclusion. The main risk factors for elevated blood pressure are age and excess body weight. The findings highlight the importance of comprehensive assessment of anthropometric and metabolic parameters during preventive screenings.

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IRSTI: 76.29.51

SCREENING DIAGNOSTICS FOR EARLY DETECTION OF CARBOHYDRATE METABOLISM DISORDERS IN OUTPATIENT PRACTICE

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Introduction. The prevalence of type 2 diabetes mellitus (DM) and latent disorders of carbohydrate metabolism is steadily increasing. These conditions can be asymptomatic, leading to severe complications.

The purpose of the study. To evaluate the frequency of detection of carbohydrate metabolism disorders during screening and the relationship of blood glucose levels with the main anthropometric and clinical indicators among the adult population.

Materials and methods. A retrospective study was conducted of 3,237 patients who underwent preventive screening at Shipager clinics (2024-2025). Capillary glucose data were evaluated in accordance with the instructions of the Accu Chek blood glucose meter manufacturer and the recommendations of ADA and WHO. The patients also had their TC, BMI, and SAD measured. The threshold of 7.0 mmol/l is used as a screening, not diagnostic. They were stratified by gender, age groups, BMI categories, and SAD level. The statistical analysis is performed in RStudio.

Results. The distribution of patients was as follows: the norm was 2,238 (69.1%), the borderline value was 649 (20%), fasting glycemia disorder (FGD) was 265 (8.2%), and diabetes was suspected (85 (2.6%). Laboratory confirmation (venous blood plasma glucose / HbA1c/ PHTT) was necessary when pathological values were detected. One in five (20%) had PD or had already been diagnosed with FGD, one in ten (10.8%) had prediabetes or newly diagnosed DM (possible). There was a weak but statistically significant positive correlation between glucose levels and BMI ($r=0.21$, $p<0.001$), as well as statistically significant differences between age groups ($p<0.001$).

Multifactorial logistic analysis revealed the following independent predictors of diabetes development: BMI, age, SAD, and TC level ($p<0.001$). The risk of developing diabetes increases with: a 1.73–fold increase in total cholesterol by 1 mmol/L (95% CI 1.33–2.24), each increase in BMI per 1 kg/m2 by 8.6% (OR = 1.086, 95% CI 1.043-1.131), with each 1-year increase by 4.3% (OR = 1.043, 95% CI 1.019–1.068), and each 1 mm. Mercury by 2.4% (OR = 1.024, 95% CI 1.009–1.038). Sex differences are not significant, but there is a tendency for men to have a higher risk ($p = 0.076$). Model (AUC = 0.78, AIC = 676.7).

Conclusions. Screening showed a high prevalence of previously undetected disorders of carbohydrate metabolism - 20% (prediabetes + DM). The relationship between predictors and the risk of developing diabetes: cholesterol - 73%, BMI - 8.6%, SAD - 2.4%, age (each year) - 4.3%, gender (men) - 1.5 times higher.

UDC: 616.24–036.1
IRSTI:76.29.29

PHENOTYPIC CHARACTERISTICS AND QUALITY OF LIFE OF PATIENTS WITH CYSTIC FIBROSIS IN THE REPUBLIC OF KAZAKHSTAN

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Introduction. Cystic fibrosis is a hereditary multisystem disorder characterized by progressive damage to the respiratory and gastrointestinal systems. Data on adult patients with CF are limited in the Republic of Kazakhstan, and the lack of a national registry makes it difficult to evaluate the clinical and functional characteristics of this population.

Objective. To assess clinical and functional characteristics, quality of life, and anxiety levels, as well as to analyze their relationships in patients with cystic fibrosis aged 16 years and older.

Materials and Methods. The study included 62 participants: the main group (n = 31)-patients with cystic fibrosis (pwCF), and the control group (n = 31)-conditionally healthy individuals. The groups were comparable in terms of age and sex. The analysis included medical history data, age at diagnosis, frequency of exacerbations, and duration of intravenous therapy, as well as pulse oximetry and spirometry data. The following tools were used: the modified Medical Research Council (mMRC) dyspnea scale, quality of life questionnaires (Short Form-36, SF-36; Cystic Fibrosis Questionnaire-Revised, CFQ-R), and the Generalized Anxiety Disorder scale (GAD-7).

Results. Quality of life indicators in pwCF, were significantly lower compared to the control group. According to the SF-36 questionnaire, the lowest scores were observed in role functioning due to emotional state (43.7) and general health (41.1). The highest scores were found in physical functioning (69.1), pain intensity (61.1), and social functioning (56). Vitality and role functioning due to physical state were 49.8 and 50 points, respectively, which were significantly lower than in the control group (86.13 and 100). The mean anxiety level in the main group was 7.83 points, exceeding that of the control group (2.5 points).

Age was associated with irritability, difficulty relaxing, and increased anxiety ($p< 0.05$). According to the CFQ-R questionnaire, the lowest scores in pwCF were observed in body image (49.46), weight (47.31), and vitality (50.27), while in the control group these indicators were within normal ranges. A weak negative correlation was found between body mass index (BMI) and domains of general physical ($p = -0.08$) and emotional state ($p = -0.23$). A moderate positive correlation was observed between body image and BMI ($p = 0.51$), as well as with forced expiratory volume in one second (FEV1) ($p = 0.53$). A weak positive correlation was identified between BMI and the weight domain ($p = 0.51$). Moderate positive correlations were found between FEV1 and physical functioning ($p =0.58$), vitality ($p=0.57$), and general health ($p = 0.52$). A weak positive correlation was observed between the number of days of intravenous antibiotic therapy and increased nervousness ($p=0.18$).

Conclusion: Patients pwCF are characterized by reduced quality of life and increased anxiety levels, which necessitates a comprehensive approach to treatment and rehabilitation, taking into account psychological factors.

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IRSTI: 76.29.30

ULTRA-HIGH-FREQUENCY ECG FOR COMPARATIVE ASSESSMENT OF ELECTRICAL SYNCHRONY DURING PHYSIOLOGICAL AND RIGHT VENTRICULAR PACING

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Introduction. Physiological cardiac pacing, including left bundle branch area pacing, is considered an alternative to conventional right ventricular pacing. Right ventricular pacing may be associated with QRS widening and the development of electrical dyssynchrony. Ultra-high-frequency electrocardiography provides a quantitative approach for assessing ventricular electrical dyssynchrony and may improve the accuracy of comparing different cardiac pacing strategies.

Aim of the study. To compare changes in QRS duration and ventricular electrical synchrony parameters during left bundle branch area pacing and right ventricular pacing.

Materials and methods. A single-center comparative analysis was performed in patients after permanent pacemaker implantation: 16 patients underwent left bundle branch area pacing and 17 patients underwent right ventricular pacing. Parameters were assessed in a paired manner during intrinsic rhythm and during pacing. Ultra-high-frequency electrocardiography was recorded using specialized equipment for high-frequency analysis of the electrocardiographic signal, followed by calculation of ventricular activation parameters. QRS duration, absolute VED16 value, and mean ventricular delay were analyzed. Data are presented as mean ± standard deviation; paired comparisons were performed using the Wilcoxon signed-rank test.

Results. In the left bundle branch area pacing group, QRS duration decreased from 119.8 ± 34.9 to 108.1 ± 12.9 ms; however, the difference did not reach statistical significance (p=0.215). The absolute VED16 value remained stable: 16.3 ± 15.2 versus 16.9 ± 12.9 ms (p=0.594). Mean ventricular delay also did not change significantly: 43.5 ± 15.7 versus 42.2 ± 10.4 ms (p=0.679). In the right ventricular pacing group, QRS duration increased from 102.9 ± 20.3 to 137.3 ± 18.2 ms (p=0.0008), the absolute VED16 value increased from 12.5 ± 14.7 to 30.0 ± 14.9 ms (p=0.0046), and mean ventricular delay increased from 38.8 ± 8.4 to 54.1 ± 10.9 ms (p=0.0011).

Discussion and conclusions. Left bundle branch area pacing was associated with preservation of ventricular electrical synchrony. In contrast, right ventricular pacing was accompanied by significant QRS widening and an increase in electrical dyssynchrony parameters. These findings support the value of ultra-high-frequency electrocardiography as a quantitative method for assessing ventricular activation.

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IRSTI: 76.29.60

COMPREHENSIVE REHABILITATION FOR CHRONIC INFLAMMATORY JOINT DISEASES

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Introduction. Chronic inflammatory joint diseases (rheumatoid arthritis, ankylosing spondylitis, etc.) are a significant medical and social problem leading to reduced quality of life, loss of working capacity, and disability in patients. Despite advances in modern drug therapy, many patients continue to experience pain syndrome and functional limitations, which determines the need for comprehensive rehabilitation.

Study objective. To investigate modern approaches to the comprehensive rehabilitation of patients with chronic inflammatory joint diseases and evaluate their effectiveness.

Materials and methods. An analysis of scientific publications from 2015–2025 in the PubMed, Scopus, and Web of Science databases was conducted. Randomized controlled trials, systematic reviews, and meta-analyses were included. Keywords: rheumatoid arthritis, inflammatory joint diseases, rehabilitation, physiotherapy, exercise therapy, occupational therapy. The impact of rehabilitation on pain syndrome, functional activity, range of motion in the joints, and patients' quality of life was assessed.

Results. Comprehensive rehabilitation includes therapeutic exercise, physiotherapy, occupational therapy, hydrotherapy, psychological support, and educational programs. Therapeutic exercise helps improve joint mobility, reduce pain, and increase muscle strength. Physiotherapeutic methods provide anti-inflammatory and analgesic effects. Hydrotherapy and kinesiotherapy improve functional status by reducing stress on the joints.

Occupational therapy is aimed at restoring self-care skills. Psychological support reduces anxiety levels and increases motivation for treatment. Educational programs contribute to the development of self-monitoring skills and improve adherence to therapy.

Conclusions. Comprehensive rehabilitation is an important part of the treatment of patients with chronic inflammatory joint diseases. A multidisciplinary approach helps reduce pain syndrome, improve functional status, and enhance patients' quality of life. Early initiation and individualization of rehabilitation programs increase their effectiveness.

UDK: 616.12-008.46:616.12-008.331.1
IRSTI: 76.29.30

EVALUATION OF THE PREVALENCE OF LEFT VENTRICULAR RELAXATION DISORDERS IN PATIENTS WITH ARTERIAL HYPERTENSION WITHOUT COMORBID PATHOLOGY ACCORDING TO ECHOCARDIOGRAPHY

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Introduction. The pattern of relaxation disorders is the main predictor of left ventricular diastolic dysfunction, which further leads to the development of chronic heart failure in patients with hypertension. According to the recommendations of the ASE (American Society of Echocardiography) from 2025, the first stage in the diagnosis of diastolic dysfunction of the left ventricle is to measure the lateral and medial velocity of the e' mitral ring using a tissue doppler.

Objective. To study the features of relaxation disorders in patients with arterial hypertension, normal body weight and without comorbid pathology, depending on the degree of hypertension in Almaty (Kazakhstan).

Materials and methods. The study included 146 patients with arterial hypertension, sinus rhythm, body mass index less than 25 and without comorbid pathologies who came to the outpatient appointment at the Vector Vita clinic (Almaty). The patients were divided into subgroups according to the degree of arterial hypertension (grades 1, 2 and 3). All patients underwent transthoracic echocardiography using standard modes according to ASE/EACVI recommendations. Relaxation of the left ventricle was assessed using Doppler methods: the analysis included the speeds of movement of the mitral ring (e'lat, e'med, average value of e').

Results and discussion: The average age of the patients was 56.2 years. Among patients with arterial hypertension with a normal body mass index without comorbid pathologies, grade 1 hypertension (41%) and grade 2 hypertension (30.8%) were more common. The number of patients with grade 3 hypertension was minimal and amounted to 28%.

It was found that with an increase in the degree of arterial hypertension, the relaxation of the left ventricle worsens: with grade 1 hypertension, e'average was 9.54 cm/s, with grade 2 hypertension, e'average was 8.72 cm/s, with grade 3 hypertension, e'average was 7.68 cm/s. The frequency of detection of relaxation disorders in patients also increased with the progression of hypertension: 15% with grade 1 hypertension, 17.7% with grade 2 hypertension, and 26.8% with grade 3 hypertension. This indicates a gradual deterioration in the diastolic function of the left ventricle, even in the absence of metabolic risk factors.

Conclusion: The frequency of left ventricular relaxation disorders, estimated by e'lat, e'med, and e' average, increases naturally with increasing hypertension and reaches maximum values with grade 3 hypertension. In the absence of metabolic risk factors, these indicators reflect the effect of the degree of arterial hypertension on the diastolic function of the left ventricle. Thus, the assessment of the speeds of movement of the mitral ring (e'lat, e'med, average value of e') is of important prognostic value for the early detection of initial disorders of the diastolic function of the left ventricle and timely prevention of the progression of chronic heart failure.

UDC: 616.24:618.2
IRSTI: 76.29.35;16.29.48

PULMONARY ARTERIOVENOUS MALFORMATION IN PREGNANCY AFTER CHILDHOOD EMBOLIZATION: A CASE STUDY

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Introduction. Pulmonary arteriovenous malformations (PAVMs) represent abnormal direct communications between pulmonary arteries and veins that generate a persistent right-to-left intrapulmonary shunt. Their prevalence is estimated at 1 in 1,315–5,555 individuals. Pregnancy substantially worsens the hemodynamic burden through a 40–50% rise in circulating volume, estrogen-driven vasodilation, and elevated vascular endothelial growth factor, collectively accelerating shunt progression. Endovascular embolization the standard treatment carries a recanalization rate of 10–49% over five to seven years, with recurrence documented up to three decades post-procedure, necessitating lifelong imaging surveillance.

Materials and methods. This clinical case originates from the Pulmonology Department of City Hospital No. 2 in Astana (2024). The patient was a 34-year-old woman. All data were anonymized.

Results. We report a 34-year-old woman (Patient N.) who underwent bilateral PAVM embolization at ages 14 and 15, then had no specialist follow-up for 18 years. She was admitted at 36 weeks and 2 days of gestation during her second pregnancy, complicated by fetal growth restriction and oligohydramnios since 20 weeks. Vital signs were stable and she had no active complaints; however, resting pulse oximetry on room air registered 83%, prompting urgent pulmonology assessment. A structured artificial intelligence-assisted analytical framework (large language model, Claude, Anthropic) was applied retrospectively to integrate her longitudinal laboratory data, imaging reports, and obstetric history. The framework identified persistent compensatory erythrocytosis – hemoglobin 168 g/L at age 14, 163–166 g/L at age 34 – as a sentinel marker of decades-long tissue hypoxia rather than a physiological variant, and ranked PAVM recanalization highest in the differential. Chest radiography (23 November 2025) showed non-homogeneous infiltration of the right upper field; contrast-enhanced computed tomography (26 November) confirmed active arteriovenous malformations in segments VI, VIII, and IX of the right lung (maximum diameter 11.8 mm) and segment VIII of the left lung (7.5 mm). Spontaneous labor precluded planned cesarean delivery; intrapartum management was conservative, with continuous cardiotocographic monitoring and supplemental oxygen. A live male preterm infant (1,780 g; Apgar 8/9) was born on 23 November; maternal saturation recovered to 92–94% on room air by postpartum day three. Discharge recommendations included elective re-embolization and computed tomography angiography surveillance every three to five years.

Conclusions. First, hemoglobin exceeding 140 g/L in pregnancy should prompt investigation for chronic hypoxaemia rather than be accepted as a favorable finding. Second, childhood embolization does not confer permanent protection against PAVM recurrence; surveillance and pre-conception reassessment are obligatory. Third, artificial intelligence integration into clinical reasoning can accelerate recognition of rare diagnoses by cross-referencing heterogeneous longitudinal data – laboratory trends, imaging findings, and obstetric complications — thereby reducing diagnostic delay in conditions where timely intervention is life-saving.

UDC: 618.3:616.379-008.64
IRSTI: 76.29.37; 76.29.48

GESTATIONAL DIABETES MELLITUS: THE RELATIONSHIP BETWEEN UTERO-PLACENTAL BLOOD FLOW, FETAL CONDITION AND PREGNANCY OUTCOMES

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Introduction. Gestational diabetes mellitus is a significant problem in modern medicine, affecting the course of pregnancy and leading to adverse obstetric and perinatal outcomes. According to the World Health Organization and the International Diabetes Federation, the global prevalence of gestational diabetes mellitus ranges from 5% to 20%.

The study of fetal condition in multiparous women with gestational diabetes is of considerable clinical importance. According to the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of Kazakhstan, 365,923 children were born in Kazakhstan over 12 months in 2024. The number of births by birth order in 2024 was as follows: 4th – 60,155; 5th – 35,661; 6th – 15,121; 7th – 4,880; 8th – 1,297; 9th – 366; 10th – 129.

Objective. To identify the characteristics of uteroplacental blood flow, assess fetal condition in multiparous women with gestational diabetes mellitus, and evaluate their obstetric and perinatal outcomes in a prospective cohort study conducted among pregnant women in the Women's Health Department of City Multidisciplinary Hospital No. 2 (obstetric unit) in Astana.

Materials and Methods. This study is a prospective cohort study aimed at a comparative analysis of the course of pregnancy, timing and methods of delivery, as well as obstetric and neonatal outcomes in pregnant women.

The study included three cohorts of pregnant women:

1. Multiparous pregnant women without gestational diabetes mellitus;
2. Multiparous pregnant women with gestational diabetes mellitus;
3. Pregnant women with parity less than four and with gestational diabetes mellitus.

The management and examination of pregnant women are carried out in accordance with the current clinical protocols of the Ministry of Health of the Republic of Kazakhstan (Clinical Protocol No. 214: Diabetes Mellitus in Pregnancy, Childbirth and the Postpartum Period, 2024; Clinical Protocol No. 185: Antenatal Care, 2023).

According to these protocols, pregnant women undergo obstetric examination, laboratory tests (plasma glucose levels and HbA1c), as well as instrumental diagnostic methods (fetal ultrasound, Doppler studies, biophysical profile, and cardiotocography).

Results. The results of the study can be used in clinical practice to improve the effectiveness of antenatal monitoring of multiparous women with gestational diabetes mellitus. The findings will help identify optimal monitoring strategies for the timely detection of fetal complications.

Conclusion. The obtained data will help optimize pregnancy management and reduce the risk of adverse perinatal outcomes, thereby expanding current understanding of the management of pregnancies complicated by gestational diabetes mellitus in multiparous women.

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IRSTI: 76.29.37; 76.31.29

SGLT2 INHIBITORS AND TRIGLYCERIDE METABOLISM: CLINICAL EVIDENCE

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Introduction. Type 2 diabetes mellitus is almost inseparable from dyslipidemia — elevated triglycerides, low HDL, and a predominance of small dense LDL particles together form what is often called the atherogenic lipid triad. SGLT2 inhibitors (empagliflozin, dapagliflozin, canagliflozin) were first approved as glucose-lowering agents, but their cardiovascular benefits in the EMPA-REG OUTCOME, DECLARE-TIMI 58, and CANVAS trials turned out to be far greater than glycemic improvement alone could explain. This prompted a closer look at how exactly these drugs interact with lipid metabolism — and triglycerides in particular emerged as an interesting target.

Aim of the study. To analyze the available clinical and experimental data on the effects of SGLT2 inhibitors on plasma triglyceride levels and to assess the proposed underlying mechanisms.

Materials and methods. A narrative review of literature published between 2018 and 2024 was conducted using PubMed and Medscape databases. Search terms included: "SGLT2 inhibitors," "triglycerides," "lipid profile," "lipoprotein metabolism," and "dyslipidemia." Studies included randomized controlled trials, meta-analyses, and mechanistic preclinical investigations. A total of 5 key sources were selected based on relevance and methodological quality, covering over 147,000 patients across 60 randomized trials.

Results. The most comprehensive evidence comes from Bechmann et al. (Atherosclerosis, 2024), who pooled data from 60 randomized controlled trials including 147,130 individuals. SGLT2 inhibitor therapy consistently reduced plasma triglycerides by approximately 0.10 mmol/L (95% CI: 0.06–0.14). The effect was present regardless of the specific drug used within the class. Notably, the reduction was somewhat more pronounced in Asian populations, which the authors linked to ethnic differences in baseline lipoprotein metabolism. A separate meta-analysis by Sánchez-García et al. (Pharmacological Research, 2020), covering 48 trials, reported nearly identical results — triglyceride reduction of −0.10 mmol/L ($p < 0.00001$) — alongside increases in HDL cholesterol, which together suggest a meaningful shift toward a less atherogenic lipid profile. On the mechanistic side, Basu et al. (ATVB, 2018) demonstrated in a humanized transgenic mouse model that SGLT2 inhibition raised lipoprotein lipase activity, accelerated VLDL clearance from circulation, and reduced postprandial lipemia. In simple terms — less triglyceride-rich lipoprotein stays in the blood, and the particles that remain get broken down faster. Weight loss caused by glucosuria also plays a role: less visceral fat means less free fatty acid delivery to the liver, which translates to reduced hepatic VLDL production. In patients with heart failure specifically, a 2024 meta-analysis found a positive trend in triglyceride levels with SGLT2 inhibitor use, though it did not reach statistical significance — likely due to the complexity of lipid regulation in that population.

Conclusions. SGLT2 inhibitors produce a modest but consistent reduction in plasma triglycerides, driven by enhanced peripheral lipolysis and decreased hepatic VLDL output. While the triglyceride-lowering effect on its own may not be dramatic, it contributes to an overall improvement in lipid profile — particularly when combined with the observed rise in HDL cholesterol. Taken in the broader context of cardiovascular protection, this lipid-modulating activity likely plays a supporting role in the cardiovascular outcomes benefit seen across major trials. Further studies with detailed lipoprotein subfractionation would help clarify the exact clinical weight of this effect.

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IRSTI: 76.29.30

COMPARATIVE ASSESSMENT OF LEFT VENTRICULAR RELAXATION IMPAIRMENT IN PATIENTS WITH ARTERIAL HYPERTENSION GRADE AND BODY MASS INDEX ACCORDING TO ECHOCARDIOGRAPHIC DATA

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Introduction. Arterial hypertension (AH) is a predictor of the development of diastolic left ventricular dysfunction (DLVD), which in turn often leads to chronic heart failure with a preserved ejection fraction (HFpEF). Patients with hypertension are often overweight and obese. According to the updated recommendations of the American Society of Echocardiography from 2025, the first step in the diagnosis of diastolic dysfunction is to assess the relaxation of the left ventricle (LV) by recording the velocities of the e' lateral and medial rings of the mitral valve and the e'average tissue doppler.

Objective. To study the features of left ventricular relaxation disorders in patients with hypertension depending on body mass index (BMI) in Almaty (Kazakhstan).

Materials and methods. The study was conducted on the basis of the Vector Vita clinic in Almaty in the period from January to September 2024.

Each patient was examined once. At the reception, the degree of hypertension and BMI were determined, an ECG was recorded to confirm the sinus rhythm, and echocardiography was performed on a PHILIPS CX-50 device using B and M modes, pulse wave (PWD) and tissue doppler (TDI), according to the recommendations of ASE/EACVI (2025). The following parameters were included in the analysis: the septal velocity of the lateral and medial fibrous rings of the mitral valve and their average velocity - e' average. Patients with primary mitral insufficiency, mitral stenosis, prosthetic valves, and atrial fibrillation were excluded from the study. A total of 230 AH patients with obesity and/or overweight were included in the study, while some patients in this group had concomitant pathology: diabetes mellitus, coronary heart disease.

Results and discussion. The average age of patients (n = 230) was 63.5 years, the distribution by degrees of hypertension: grade 1 hypertension – 46 (20%), grade 2 hypertension – 63 (27.4%) and grade 3 hypertension – 121 patients (52.6%). All the examined patients were distributed according to BMI. With grade 1 hypertension, the e'average was 7.10 cm/s in pre-obesity and 7.39 cm/s in obesity, and the frequency of relaxation disorders was 22.2% and 32.1%, respectively. With hypertension of the 2nd degree: e'average = 7.23 cm/s (pre-obesity) and 7.89 cm/s (obesity), the incidence of disorders is 37.5% and 35.4%, respectively. The most pronounced changes were recorded in grade 3 hypertension: e'average decreased to 6.39 cm/s in pre-obesity and to 6.81 cm/s in obesity, and the frequency of relaxation disorders reached 64.1% and 45.1%, respectively. Thus, in patients with hypertension, starting from pre-obesity, a high prevalence of LV relaxation disorders has been revealed. The most pronounced disorders were noted in patients with grade 3 hypertension.

Conclusions:

1. Increased BMI is a significant modifiable risk factor for LV relaxation disorders: in overweight and obese patients, a decrease in e' is recorded significantly more often and more pronounced, and the combination of obesity with grade 3 hypertension is accompanied by a maximum frequency of disorders, indicating a synergistic effect of hemodynamic overload and metabolic factors on the myocardium.

2. Assessment of relaxation parameters (e'lat, e'med, e'average) as the first and mandatory stage of the diagnostic algorithm, LVEF should be included in routine echocardiography in all patients with hypertension, especially in the presence of elevated BMI, in order to timely detect initial diastolic function disorders and prevent the progression of HFpEF.

UDC: 615.03
IRSTI: 76.31.29

DYNAMICS OF ANTICOAGULANTS IN THE FORMULARY LIST OF A MULTIDISCIPLINARY MEDICAL ORGANIZATION FOR 2006-2026

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Introducrion. Over 20 years, the anticoagulant formulary in Kazakhstan has evolved from a limited set of traditional agents to a more structured and clinically flexible list. The key changes were specification of low-molecular-weight heparins and introduction of direct oral anticoagulants, which made therapy more predictable and more convenient for outpatient use.

Objective. To compare anticoagulants in the formulary list of a multidisciplinary medical organization in 2006 and 2026, taking into account the current Kazakhstan National Drug Formulary.

Materials and methods. A retrospective comparative analysis of formulary lists was performed. Drugs in group B01A were classified as vitamin K antagonists, unfractionated heparins, low-molecular-weight heparins, direct oral anticoagulants, and other anticoagulants.

Results. In 2006, the anticoagulant segment included warfarin, sodium heparin, and a generalized category of low-molecular-weight heparins. In 2026, warfarin and sodium heparin were retained, while LMWHs were specified by INNs as enoxaparin and nadroparin. Newly represented agents were dabigatran, rivaroxaban, apixaban, edoxaban, fondaparinux sodium, and antithrombin III. Clinically, this reflects a shift from therapy closely linked to INR monitoring and parenteral use toward a more individualized model. Warfarin retained its role in mechanical heart valves and selected valvular disease. Unfractionated heparin remains important in acute care, severe renal impairment, and high bleeding risk. LMWHs became a standard group for VTE prevention and treatment, perioperative management, and pregnancy. The emergence of DOACs reduced the need for routine laboratory monitoring, lowered the burden of food interactions, and improved the convenience of long-term therapy.

Conclusion. Changes during 2006-2026 indicate a qualitative evolution of the anticoagulant formulary: the core agents were preserved, but the list became broader, more standardized, and closer to current clinical practice. At the same time, drug selection still requires consideration of renal function, bleeding risk, pregnancy, and mechanical heart valves.

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IRSTI: 76.29.56; 76.29.34

ASSOCIATION OF ARRHYTHMIAS AND RECURRENT CARDIOVASCULAR EVENTS IN PATIENTS WITH BRONCHOOBSTRUCTIVE DISEASES

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Introduction. Despite timely revascularization and optimal medical therapy, approximately 6% of patients with acute coronary syndrome (ACS) develop ventricular tachycardia or atrial fibrillation/flutter during the early hours after symptom onset. In patients with chronic obstructive pulmonary disease (COPD), arrhythmias significantly increase the risk of recurrent cardiovascular events.

Materials and Methods. A retrospective study included 90 patients aged 35–70 years referred for coronary angiography due to suspected ACS. The main group consisted of 45 patients with COPD, and the comparison group included 45 patients without bronchoobstructive diseases.

Results. The main and comparison groups were comparable in terms of age and sex. In the main group the median age (Me; 25–75%) was 62 (56–66) years, 73,3% male. COPD category B was diagnosed in 22 (48.9%) patients and category E in 23 (51.1%) patients; 15 (33.3%) patients had concomitant chronic cor pulmonale. Patients with COPD had a higher smoking burden (30(0–40) vs 0 pack-years), heart rate (88(72–113) vs 75(62–95) bpm), and respiratory rate (22.5(18–25) vs 17(17–18) breaths/min), while blood pressure levels were comparable between groups SBP/DBP 130 (120–133)/60 (60–70) mmHg. In 17 (38%) of patients in the COPD group exacerbations and long smoking history, against the background of respiratory failure (hypercapnia, hypoxemia) and chronic pulmonary hypertension, an increased incidence of recurrent cardiovascular events (myocardial infarction, stroke) was observed. Laboratory parameters reflected a more pronounced systemic inflammatory activity in patients with COPD. Hematological parameters were comparable: RBC 4.7 vs 4.8 $\times 10^{12}$/L, Hb 141.5 vs 143 g/L, WBC 8.9 vs 8.5 $\times 10^{9}$/L, and platelet count 243 vs 208 $\times 10^{9}$/L. Thus, the level of C-reactive protein in the main group was 36.4 (6.5–64.2) mg/L, which was significantly higher compared to the comparison group — 12 (3.9–12.45) mg/L. Lipid profile, glucose, creatinine, and coagulation parameters did not differ significantly between the groups; however, patients with COPD demonstrated a tendency toward higher LDL cholesterol levels (3.3 (2.4–3.8) vs 3.0 (2.7–3.6) mmol/L) and prolonged PT (13.3 (12.3–14.1) vs 12.7 (11.8–13.8) sec). HDL cholesterol was lower in the main group (1.02 (0.8–1.2) vs 1.12 mmol/L) ($p<0.05$). Arrhythmias were more frequent in patients with COPD. In the main group, the most common rhythm disturbances were sinus tachycardia (37.8%), atrial fibrillation (AF) (26.7%), ventricular premature beats (PVBs) (11.1%), and first-degree atrioventricular block (8.9%); acute respiratory failure was present in 40% of patients. In the comparison group, AF was observed in 11.1%, PVBs in 15.6%, and atrioventricular blocks in 6.7% of patients.

Echocardiographic parameters were comparable between groups: EF 56% vs 55%, systolic pulmonary artery pressure 28 vs 25 mmHg, and left ventricular dimensions and volumes showed no substantial differences. MV-CAD was more prevalent in COPD patients (25% vs 11.1%), whereas single-vessel disease (40%) and the absence of significant coronary stenosis (24.4%) were more common in the comparison group. A moderate positive correlation was found between systolic pulmonary artery pressure and respiratory rate, SBP, smoking index, LDL cholesterol, and INR, as well as a

moderate negative correlation with blood oxygen saturation. The smoking index positively correlated with age, systolic pulmonary artery pressure, PT, CRP levels, and neutrophil count ($p<0.05$). Recurrent cardiovascular events in the main group occurred predominantly in patients with arrhythmias, frequent COPD exacerbations, and signs of acute and chronic respiratory failure.

Discussion/Conclusions. Patients with frequent COPD exacerbations and long smoking history demonstrate severe respiratory failure (hypercapnic, hypoxemic, or mixed) and cardiac rhythm disturbances (sinus tachycardia, AF, polymorphic PVBs). These changes are associated with a higher incidence of MV CAD and recurrent cardiovascular events, indicating the adverse effect of smoking on the progression of atherosclerosis and coronary artery disease.

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IRSTI: 76.29.36

FROM SYMPTOMS TO GENE: A CASE OF DELAYED DIAGNOSIS OF X-LINKED HYPOPHOSPHATEMIA IN AN ADULT PATIENT

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Introduction. X-linked hypophosphatemia (XLH) is a rare hereditary phosphate-wasting disorder characterized by impaired bone mineralization resulting from excessive renal phosphate excretion caused by pathogenic variants in the *PHEX* gene. Early diagnosis of this condition is crucial for preventing the development of severe skeletal complications and improving long-term clinical outcomes.

Objective. To present a clinical case of delayed diagnosis of X-linked hypophosphatemia confirmed by molecular genetic testing.

Materials and Methods. A clinical case of delayed diagnosis of XLH in an adult patient was retrospectively analyzed based on clinical, biochemical, genealogical, and molecular genetic findings.

Results. A 46-year-old female patient presented with complaints of joint pain, lower back pain, and muscle weakness. Since the age of five years, she had been followed up with a diagnosis of rheumatic disease. According to the patient, both her mother and son had a history of lower-limb deformities and growth retardation. In the present case, delayed diagnosis and the absence of pathogenetic treatment resulted in severe skeletal deformities and permanent disability (Group I disability status). Identification of a pathogenic *PHEX* mutation enables definitive diagnosis of XLH and facilitates timely initiation of targeted therapy with burosumab (Crysvita®).

Conclusions. The diagnostic challenges encountered in this clinical case were largely attributable to the lack of routine serum phosphate assessment and limited awareness of phosphate-wasting disorders among healthcare professionals. Identification of a pathogenic *PHEX* mutation early treatment can prevent progressive skeletal deformities and substantially improve patients' functional status and quality of life.

UDC: 616.24-036.12:616-082
IRSTI: 76.29.47, 76.75.75

ASSESSMENT OF THE EFFICACY AND SAFETY OF TARGETED THERAPY IN ADULT PATIENTS WITH CYSTIC FIBROSIS IN KAZAKHSTAN

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Introduction. Cystic fibrosis remains a severe hereditary disease associated with progressive respiratory dysfunction and reduced quality of life in adult patients. The advent of CFTR modulators, including the triple combination elexacaftor/tezacaftor/ivacaftor, has significantly changed therapeutic strategies worldwide, yet data on their efficacy and safety in Kazakhstan are limited.

Objective. To assess the efficacy and safety of the generic CFTR modulator elexacaftor/tezacaftor/ivacaftor (Trilexa®, Tutor S.A.S.I.F.I.A., Buenos Aires, Argentina) in adult patients with cystic fibrosis in real-world clinical practice in Kazakhstan.

Materials and Methods. A retrospective observational study was conducted, including 19 adult patients aged over 18 years with a confirmed diagnosis of cystic fibrosis who received pathogenetic therapy with elexacaftor/tezacaftor/ivacaftor (Trilexa®) for 12 months. Treatment efficacy was assessed based on nutritional status (BMI), lung function (FEV_1, FVC), sweat chloride test results, frequency of pulmonary exacerbations. Safety was evaluated by recording adverse events, monitoring biochemical blood parameters (transaminases, bilirubin).

Results. The use of elexacaftor/tezacaftor/ivacaftor in adult patients with cystic fibrosis during 2023–2024 was associated with a reduction in the frequency of pulmonary exacerbations (5.5±2.7 vs. 2.5±1.3). Significant improvements were observed in sweat chloride: 101.3±8.9 mmol/L → 64.1±5.7 mmol/L, FEV_1: 43.5% → 61.1% **,** FVC: 56.1% → 72.8%, BMI: 17.6 kg/m² → 19.6 kg/m². During therapy no increases in transaminase or bilirubin levels were observed in any patient; 4 patients developed a skin rash on days 2–4, in 2 patients, it resolved with antihistamine therapy, in 2 patients, it resolved spontaneously, 2 patients reported increased sleepiness on days 2–3; no patients discontinued treatment.

Conclusions. Targeted therapy with the generic elexacaftor/tezacaftor/ivacaftor (Trilexa®) in adult patients with cystic fibrosis in Kazakhstan demonstrated high efficacy and an acceptable safety profile. Further follow-up and expansion of the study population are required to evaluate long-term outcomes.

UDC: 616.33-022.7:579.864.1:615.33
IRSTI: 76.29.42; 76.31.29

ROLE OF SACCHAROMYCES BOULARDII IN OPTIMIZING THE ERADICATION OF HELICOBACTER PYLORI

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Introduction. According to an analysis of recent studies, one of the most extensively studied and promising probiotics is the yeast Saccharomyces boulardii. Its use is considered a promising adjunct to standard therapy in gastroenterology to improve treatment outcomes and reduce the risk of complications. The main advantages of S. boulardii include a significant reduction in antibiotic-associated adverse effects, direct inhibitory activity against pathogenic microorganisms, and the prevention of antibiotic resistance development, which remains a major challenge in modern pharmacotherapy. It is important to note that, according to the Maastricht VI Consensus (2022), Saccharomyces boulardii is among the probiotics capable of optimizing therapy and increasing the likelihood of successful eradication. **Aim of the study** – to evaluate the benefits of Saccharomyces boulardii in Helicobacter pylori eradication therapy and to assess its impact on the risk of antibiotic resistance development based on an analysis of scientific publications.

Materials and Methods. A literature search was conducted in the following bibliographic databases: PubMed, Embase, Scopus, Web of Science Core Collection, Google Scholar, and eLIBRARY.ru for the period from 2015 to 2025.

Results and Discussion. The primary expected effect of adding probiotics to eradication therapy is the reduction and prevention of adverse effects. The use of Saccharomyces boulardii during eradication therapy is associated with a decreased incidence of side effects and antibiotic-associated diarrhea. This probiotic modulates the intestinal microbiota (reduction of Bacteroides and Clostridium species and an increase in commensal bacteria), stimulates the production of short-chain fatty acids (acetate, butyrate), and supports the integrity of the epithelial barrier. Mannoproteins in the cell wall inhibit pathogen adhesion, while saturated fatty acids (e.g., capric acid) exhibit antimicrobial activity and suppress biofilm formation. Immunomodulatory effects are manifested through a shift in the cytokine profile toward an anti-inflammatory response. Available data also indicate a reduction in the abundance of antibiotic resistance genes within the gut microbiome in patients receiving S. boulardii, making it a promising adjuvant for optimizing eradication regimens.

Conclusion. Thus, the presented evidence demonstrates the potential of Saccharomyces boulardii to enhance the effectiveness of Helicobacter pylori eradication therapy. These findings support the potential expansion of therapeutic strategies targeting antibiotic-resistant H. pylori strains and highlight the need for further in-depth research on this topic.

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IRSTI: 76.31.29; 76.29.55

MODERN CAPABILITIES OF 18F-FAPI IN THE DIAGNOSIS OF GASTROINTESTINAL TUMORS

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Introduction. Modern diagnosis of gastrointestinal tract tumors is largely based on the use of 18F-FDG PET/CT (positron emission tomography/computed tomography). However, this method has certain limitations related to low sensitivity in tumors with low metabolic activity and high physiological background uptake. In recent years, radiopharmaceuticals based on fibroblast activation protein inhibitors (FAPI), which target fibroblast activation protein (FAP) expressed in the tumor stroma, have been actively studied. This makes 18F-FAPI a promising tool for molecular imaging.

Aim of the study. To evaluate the current potential of the radiopharmaceutical 18F-FAPI in the diagnosis of gastrointestinal tumors based on literature data.

Materials and Methods. An analysis of recent scientific publications from the last 5–7 years was conducted, focusing on the use of 18F-FAPI in PET/CT diagnosis of gastrointestinal tumors, including gastric cancer, liver cancer, pancreatic cancer, and colorectal cancer. Sensitivity, specificity, uptake level expressed as SUVmax, and comparative data with 18F-FDG PET/CT were assessed.

Results. The analysis showed that 18F-FAPI is characterized by high uptake in tumor tissue and low physiological background activity, providing high image contrast. Advantages of this method were observed in the detection of peritoneal metastases, pancreatic tumors, and hepatocellular carcinoma, where the sensitivity of 18F-FDG PET/CT is limited. In several studies, SUVmax values for 18F-FAPI exceeded those reported for 18F-FDG, which may contribute to improved diagnostic accuracy.

Conclusion. 18F-FAPI is a promising radiopharmaceutical for the diagnosis of gastrointestinal tumors and has several advantages compared with conventional PET imaging methods. Its use may improve the detection of tumor lesions and allow more accurate assessment of disease extent. However, further clinical studies are needed to standardize the method and evaluate its diagnostic specificity, considering possible tracer uptake in areas of inflammation and fibrosis.

UDC: 616.61-008.64
IRSTI: 76.29.36

THE ROLE OF VITAMIN D-BINDING PROTEIN IN EARLY DIAGNOSIS AND PROGRESSION OF CHRONIC KIDNEY DISEASE

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Introduction. Chronic kidney disease (CKD) is a widely prevalent pathology affecting up to 10–13% of the population and is associated with a high risk of cardiovascular complications and mortality. The disease remains asymptomatic for a prolonged period, which complicates its early diagnosis. Traditional markers, such as serum creatinine and proteinuria, reflect already established kidney damage. Although proteinuria remains a key factor in CKD progression, patients with comparable albuminuria values may exhibit substantially different rates of renal function decline, highlighting the need for novel biomarkers of early kidney injury.

Aim of the study. To evaluate the diagnostic and prognostic significance of urinary vitamin D-binding protein (VDBP) as an early marker of kidney injury and CKD progression.

Materials and Methods. An analysis of contemporary clinical and proteomic studies addressing the role of VDBP in CKD of various etiologies was performed. Additionally, data from a cross-sectional study conducted at the National Scientific Medical Center (Astana) between March 2020 and December 2022 were utilized. The study included 88 patients with CKD (stages 1–3) and 49 healthy individuals. Urinary VDBP levels, estimated glomerular filtration rate (eGFR), and traditional markers of kidney injury were assessed.

Results. It was established that urinary VDBP excretion increases at the early stages of kidney injury and reflects proximal tubular damage. Elevated VDBP levels correlate with the severity of diabetic nephropathy, the degree of proteinuria, and markers of tubulointerstitial injury (KIM-1, NGAL, MCP-1); moreover, their elevation may be observed independently of albuminuria levels. In patients with diabetes mellitus, VDBP levels are significantly higher in the presence of micro- and macroalbuminuria compared to normoalbuminuria.

Analysis of clinical studies, as well as data from the cross-sectional study (NSMC, Astana), demonstrated an inverse correlation between VDBP levels and eGFR, attributable to impaired tubular reabsorption with declining renal function.

Conclusions. Vitamin D-binding protein represents a promising early biomarker of tubulointerstitial injury in CKD. Its urinary determination may enhance the accuracy of early diagnosis and risk stratification for disease progression, as well as facilitate the timely initiation of nephroprotective therapy.

UDC: 616.36-002-02:615.22
IRSTI: 76.31.29; 76.29.42

ADVERSE DRUG REACTIONS IN CLINICAL PRACTICE: AMIODARONE-INDUCED HEPATOTOXICITY

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Introduction. Adverse drug reactions (ADRs) account for 3–6% of all hospitalizations worldwide. In the United States, over 100,000 ADR-related deaths are recorded annually. One drug with a high risk of developing systemic complications is amiodarone, an iodinated benzofuran derivative with high lipophilicity. Despite its effectiveness in treating ventricular arrhythmias, the drug can cause severe liver damage, especially when administered intravenously.

Purpose of the study. Analysis of a case of acute amiodarone-induced hepatotoxicity to improve the safety of pharmacotherapy in cardiology practice.

Materials and methods. A retrospective analysis of the medical history of patient N., 62 years old, was conducted. She was admitted to the University Hospital of Semey Medical University with a diagnosis of ischemic heart disease, unstable angina, CHF FC III (EF 31%), and permanent atrial fibrillation.

Results. Before therapy, the patient's laboratory test results (transaminase levels) were within normal limits - AST - 55 U/L, ALT - 18 U/L. Upon admission (September 12, 2025), the patient presented complaints of shortness of breath, sweating, chest discomfort and anxiety. Electrocardiographic study Conclusion: Rhythm - Sinus tachycardia. Heart rate 116 beats per 1 minute. Intraventricular conduction disturbances. Due to rhythm disturbances, the patient was prescribed a loading dose of amiodarone (600 mg intravenously by drip once, then 200 mg 3 times a day orally). On day 3 (September 15, 2025), while taking amiodarone, the patient's condition worsened, and laboratory signs of drug-induced liver injury appeared: AST levels increased to 9,334 U/L, ALT to 4,865 U/L. Total bilirubin rose to 40.2 μmol/L. The mechanism of damage in this case is associated with direct mitochondrial toxicity of the drug, inhibition of phospholipase A, and possible synergy with liver ischemia ("congestive hepatopathy") associated with CHF. After drug discontinuation and detoxification therapy, AST/ALT levels showed a rapid downward trend (by day 10, AST was 34 U/L, ALT was 461 U/L).

Conclusions.

1. Amiodarone-induced hepatotoxicity can develop rapidly, mimicking acute hepatitis or ischemic liver injury.

2. Intravenous administration of amiodarone should be carried out only under close observation and with repeated determination of serum aminotransferase levels at least once a day, and preferably every 12 hours.

3. Early detection of ADRs (adverse drug reactions) and immediate discontinuation of the drug are key factors in preventing irreversible fibrosis and liver failure.

UDC: 614.2:004.8:616-082
IRSTI: 76.75.75; 76.75.31.

ZHANCARE.AI: AN ARTIFICIAL INTELLIGENCE PLATFORM FOR PATIENT ROUTING AND HEALTHCARE SYSTEM LOAD REDUCTION IN KAZAKHSTAN — MVP PERIOD RESULTS

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Introduction. The healthcare system of Kazakhstan faces a systemic challenge: over 41% of the population lives in rural and remote areas, while physicians spend up to 60–70% of their working time on administrative tasks unrelated to direct patient care. The country lacks a unified digital ecosystem connecting patients, physicians, administrators, and clinic managers within a single operational framework. This results in delayed patient routing, overload of primary care facilities with off-profile referrals, and reduced quality of care. Existing digital solutions — telemedicine, isolated diagnostic algorithms, documentation systems — improve individual functions but do not form a unified clinical process logic. The core problem of modern healthcare lies not in a lack of technology, but in the absence of systemic integration.

Aim. To evaluate the applicability of ZhanCare.Ai as an artificial intelligence-driven platform for patient routing, reduction of administrative burden on clinics, and formation of a unified digital healthcare ecosystem under real-world implementation conditions (minimum viable product, MVP period).

Materials and Methods. An applied descriptive study was conducted in the format of a pilot implementation of the ZhanCare.Ai platform in private clinics in Astana and the Akmola region (June 2024 – January 2025). Data sources included the platform's own operational data from the MVP period: appointment scenarios, system modules, and clinic operational processes. Objects of analysis included the artificial intelligence triage module, online and offline appointment scheduling, and patient, physician, administrator, and clinic manager dashboards. Functional analysis, user journey mapping, and practical applicability assessment were applied. The platform is built on a multimodal language model Mistral (12 billion parameters) and trained on 1,100+ clinical protocols of the Ministry of Health of the Republic of Kazakhstan, 36,000+ medical images, 5,000+ clinical cases, and 4,000+ educational-clinical cases.

Results. During the MVP period, 5 clinics (Ayala Clinic, BN Clinic, Animed Clinic, Dariger Plus, Inter Medical) and 126 physicians across two countries (Kazakhstan and Uzbekistan) were connected. Total platform users reached 1,200, with a 40% rate of repeat consultations. Implementation of the artificial intelligence triage module reduced the share of off-profile referrals by 45% and decreased manual query clarifications by administrators by 40%. Based on operational estimates, accurate early routing provides a 25–35% reduction in primary care overload. The formed ecosystem integrated six functional modules (patient, physician, administrator, clinic manager, artificial intelligence triage, scheduling), realising a full cycle: symptoms — routing — physician and service selection — appointment — consultation — analytics. The project was recognized as the best healthcare artificial

intelligence project by the Ministry of Science and Higher Education of the Republic of Kazakhstan, winner of AI-SANA Leaders, received a Yandex Cloud grant, and reached the semi-finals of the Enactus World Cup (Bangkok) and finals of Alem.Ai Battle and E*5 Global KAIST.

Discussion and Conclusions. ZhanCare.Ai demonstrates applicability as an artificial intelligence platform for patient routing in real-world conditions of the Kazakhstani healthcare system. The unified ecosystem connects patients, physicians, administrators, and clinic managers within a single digital framework, while the artificial intelligence triage module and online scheduling system create a more manageable and transparent patient journey. MVP results confirm early signs of product-market fit: clinics reconnect, use cases are reproducible, and the platform addresses a real operational problem. The practical value of the solution is determined not only by the presence of artificial intelligence components, but by the ability to integrate them into a clinically applicable ecosystem. Further scaling in Kazakhstan and Uzbekistan is justified by proven practical applicability. The clinician-led development approach is of particular importance: involvement of practicing physicians in platform creation enhances its usability and implementation potential.

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IRSTI: 76.29.39

MODERN STRATEGIES FOR EARLY DIAGNOSIS OF SYSTEMIC SCLEROSIS: THE ROLE OF THE VEDOSS ALGORITHM AND CAPPILLAROSCOPY

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Introduction. Systemic sclerosis (SSc) is characterized by early impairment of the microvasculature, which precedes the development of fibrosis. According to the Clinical Protocol of the Ministry of Health of the Republic of Kazakhstan, late diagnosis remains a key challenge. The modern VEDOSS (Very Early Diagnosis of Systemic Sclerosis) concept aims to detect the disease at the preclinical stage. In this context, videocapillaroscopy (NVC) is recognized as the "gold standard" for visualizing microangiopathy, allowing for the detection of pathological changes at a stage when they are still potentially reversible.

Objective. Based on an analysis of current literature and international recommendations, to determine the diagnostic value of videocapillaroscopic patterns in the early verification of systemic sclerosis.

Materials and Methods. An analytical review of current clinical guidelines (ACR/EULAR), protocols from the Ministry of Health of the Republic of Kazakhstan, and publications in the PubMed and Cochrane databases from the last 5 years concerning early markers of systemic sclerosis was conducted.

Results. Literature analysis shows that the "Early" capillaroscopic pattern is the earliest morphological marker of SSc. According to the international classification by M. Cutolo, it is characterized by the presence of isolated giant capillaries and microhemorrhages, with the vascular network architecture remaining largely intact. It has been established that the combination of this pattern with a positive antinuclear factor (ANF) and Raynaud's phenomenon has high prognostic significance (over 80%) for transformation into definitive SSc within the next few years. Timely identification of these signs, in accordance with ACR/EULAR criteria, allows for a diagnosis to be made before the onset

of sclerodactyly, which justifies the early initiation of vasoactive therapy (calcium channel blockers, PDE-5 inhibitors) for endothelial protection.

Conclusions.

1. The VEDOSS algorithm is an effective tool for overcoming "diagnostic delay," enabling the verification of SSc at the preclinical stage.

2. Nailfold videocapillaroscopy is an essential screening method for patients with Raynaud's phenomenon, as it allows for the detection of the "Early" pattern as the primary predictor of a systemic process.

3. The integration of NVC and immunological testing into routine clinical practice, in accordance with the protocols of the Republic of Kazakhstan, is necessary to implement a strategy of early therapeutic intervention.

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IRSTI: 76.29.35.25.75

EVALUATION OF THE EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE APPLICATION IN OUTPATIENT SETTINGS

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Introduction. Advances in artificial intelligence have revolutionized healthcare, opening new perspectives in diagnosis, treatment, and the organization of medical care for patients.

Objective. To study the possibilities of using artificial intelligence (AI) for identifying cardiovascular diseases and risk factors in primary healthcare settings.

Materials and Methods. The study included 106 patients aged 40–60 years diagnosed with arterial hypertension (AH). All patients were divided into two groups: Group T (traditional method) — 52 patients, in whom medical history was collected and risk factors were assessed by a physician according to a standard protocol. Group AI (AI-based method) — 54 patients, in whom medical history collection and identification of risk factors were carried out using a developed AI system.

Results. Analysis of the time spent on history taking showed that in group T it averaged 9.1 ± 1.2 minutes (range 7–11 minutes), with 27% of patients (14 individuals) requiring more than 14 minutes due to the need for detailed clarification of additional questions or comorbidities. Collection and entry of risk factor data took 4 minutes (55% of the total consultation time), generation of recommendations took 2 minutes, and documentation in the electronic medical record (EMR) required 2 minutes. In the AI group, the average time was 6.4 ± 1.1 minutes (range 4–9 minutes). The use of AI reduced these processes to 30–40 seconds per patient, resulting in an overall reduction of 92–95% for this workflow

segment. The stage of collecting and entering risk factor data decreased by 98–100% (from 4 minutes to less than 10 seconds); generation of personalized healthy lifestyle recommendations became fully automated (100% reduction); and documentation in the EMR decreased by 88–92%. The study revealed a statistically significant difference in the detection of risk factors between groups T and AI. The AI assistant demonstrated superiority in identifying the following risk factors: smoking — 83.3% (p=0.003, Fisher's exact test); excessive salt intake/imbalanced diet — 79.9% (p=0.007). A tendency toward more comprehensive detection of comorbidities (87%, p=0.05) and hereditary predisposition (94.4%, p=0.12) was observed. Differences in insufficient physical activity were not statistically significant (76% vs. 59.6%, p=0.09).

Conclusion. The use of artificial intelligence provides a higher detection rate of risk factors for arterial hypertension and significantly reduces the time required for patient interviews.

UDC: 616.12-008.331.1
IRSTI: 76.29.56; 76.33.31

TREND ANALYSIS OF ARTERIAL HYPERTENSION INCIDENCE IN THE REPUBLIC OF KAZAKHSTAN (2019–2023)

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Introduction. Arterial hypertension is one of the most prevalent cardiovascular diseases and a leading contributor to premature mortality and disability worldwide. In Kazakhstan, it remains a significant public health concern due to its high prevalence and pronounced regional disparities. Monitoring national trends in hypertension incidence is essential for improving prevention, early detection, and disease management strategies.

This study aimed to assess the temporal dynamics and regional distribution of arterial hypertension incidence among the adult population of Kazakhstan from 2019 to 2023 using official national statistical data.

Methods: A retrospective descriptive study was conducted using official annual national health reports of the Republic of Kazakhstan for 2019–2023. Incidence rates were calculated per 100,000 population. The country was divided into six geographic regions and three cities of republican significance to assess regional and urban–rural differences.

Results: The results indicate that the national incidence of arterial hypertension demonstrated a fluctuating but overall decreasing trend, declining from 2016.6 per 100,000 population in 2019 to 1922.1 in 2023, with the lowest level observed in 2022. Despite this general decline, substantial regional disparities persisted.

The highest increase was observed in the Almaty region, reaching 3210.9 per 100,000 population in 2023. Eastern and southern regions consistently exhibited higher incidence rates, whereas northern regions remained relatively stable and lower. Major cities showed elevated incidence levels during 2019–2021, followed by a moderate decline in subsequent years. Although urban populations initially had higher incidence rates, by 2023 several rural regions surpassed urban levels, possibly reflecting changes in screening coverage, healthcare accessibility, and diagnostic practices.

Conclusion: Arterial hypertension remains a significant public health challenge in Kazakhstan. The observed regional and urban–rural inequalities highlight the need for targeted prevention strategies, strengthened primary healthcare services, expanded screening programs, and increased public awareness. Improving early detection and prevention, particularly in high-burden regions, is essential to reduce the future burden of cardiovascular diseases and improve population health outcomes.

UDC: 616.24-002 + 616-006.441
IRSTI: 76.29.35; 76.29.47

A CLINICAL CASE AS A DIAGNOSTIC CHALLENGE: FROM PNEUMONIA TO HODGKIN LYMPHOMA

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Introduction. Pneumonia in patients with Hodgkin lymphoma is a common and severe complication that may arise due to immunodeficiency or represent a manifestation of the underlying malignancy itself. Pulmonary involvement develops in 15–40% of patients, particularly in stage IV disease as a result of tumor dissemination. Lung lesions may present as nodular or cavitary formations, as well as interstitial changes, making diagnosis challenging because of the wide spectrum of disease manifestations.

Objective. To present a clinical case illustrating the diagnostic verification of Hodgkin lymphoma with pulmonary involvement and to increase clinicians' awareness of this diagnostic challenge.

Materials and Methods. Study design: descriptive observational study. Inclusion criteria: a patient with a confirmed diagnosis of Hodgkin lymphoma and pneumonia.

Results. Chief complaints: enlargement of cervical, axillary, and supraclavicular lymph nodes; moderate chest pain; cough; fever up to 38.0°C; dyspnea; general weakness; and excessive sweating. History of present illness: According to the patient, lymph node enlargement had been present for several years. She had previously undergone medical evaluation; however, no medical records were available. The remaining symptoms had developed approximately one week before admission. Due to the severity of her condition, she was transferred to a medical institution after visiting a private medical center. Past medical history: The patient denied any history of oncological diseases and was not registered for oncological follow-up. Physical examination: The patient's condition was severe, and she was in a passive position. Enlarged peripheral lymph nodes were detected in the cervical, supraclavicular, and infraclavicular regions. Respiratory rate was 27–28 breaths per minute. Auscultation revealed diminished breath sounds and fine crackles in the right lung. Oxygen saturation was 80–82% on room air. Laboratory findings: White blood cell count (WBC) 18 × 10^9/L; neutrophils 92.2%; lymphocytes 3.6%; erythrocyte sedimentation rate (ESR) 57.9 mm/h; C-reactive protein (CRP) 32.17 mg/L. Histopathological findings: Histological examination confirmed classical Hodgkin lymphoma, nodular sclerosis subtype. Imaging findings: Computed tomography (CT) demonstrated focal pneumonia of the right lung, a mediastinal mass, and signs of secondary involvement of intrathoracic, cervical, supraclavicular, and left axillary lymph nodes.

Conclusions. Although the diagnosis of Hodgkin lymphoma was confirmed, the outcome was fatal due to disease-related complications. This case highlights the importance of close monitoring of patients with Hodgkin lymphoma because of the risk of sudden life-threatening airway obstruction and asphyxia, which occurred in this patient. The case also emphasizes that pneumonia should not always be considered an isolated nosological entity but may represent a manifestation of an underlying disease. This understanding underscores the complexity of determining the etiology of pulmonary lesions and the critical importance of histopathological verification in cases of unexplained infiltrative or cavitary lung changes.

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IRSTI: 76.29.31

ASSOCIATION OF VITAMIN D RECEPTOR (VDR) GENE POLYMORPHISMS BSMI AND APAI WITH BONE MINERAL DENSITY AND RISK OF OSTEOPOROSIS IN WOMEN OF DIFFERENT AGES

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Introduction. Osteoporosis is a metabolic disorder characterized by a decrease in bone mass and an increased risk of fractures. Due to the increase in life expectancy, osteoporosis is becoming more common, which leads to serious clinical and socio-economic consequences. Vitamin D plays a key role in bone metabolism, and its action is carried out through a receptor encoded by the *VDR* gene.

The aim of the study was to study the relationship of BsmI (rs1544410) and ApaI (rs7975232) polymorphisms of the *VDR* gene with bone mineral density and the risk of osteoporosis in Kazakh women.

Materials and methods. The study included 291 women aged 18 to 65 years. Bone mineral density was assessed using the DXA method. Genotyping was performed using TaqMan kits for BsmI and ApaI polymorphisms.

Results. The analysis showed that the C/C polymorphism BsmI genotype is more common in women with low mineral density. We found that in the dominant model of the *VDR* ApaI variant(A/C + C/C versus A/A), there was an increased odds of developing osteoporosis (OR = 2.29; 95% CI: 1.34–3.67; p=0.0013). In the codominant model, the A/C genotype increased this odds by 2.45 times (p=0.0038). In the overdominant model, the A/C genotype also raised the odds by 2.22 times (p=0.0018). Data analysis revealed an association between the *VDR* ApaI variant and the odds of developing osteoporosis. After the Bonferroni correction, statistical significance remained for all models (codominant, dominant, and overriding) for the ApaI polymorphism.

Conclusion. These studies confirm the association of the ApaI polymorphism of the *VDR* gene with the risk of osteoporosis in Kazakh women. The results emphasize the need for further research to clarify the genetic determinants of bone mineral density in this group.

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IRSTI: 76.29.37; 76.03.53

THE ROLE OF OBSTRUCTIVE SLEEP APNEA AND SLEEP ARCHITECTURE IN GLYCEMIC HOMEOSTASIS

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Introduction. Sleep is a fundamental regulator of metabolic health, yet its role in glucose control is frequently underestimated. Disruptions in sleep duration and quality serve as independent predictors of type 2 diabetes mellitus (T2DM), with an impact comparable to dietary factors and physical inactivity.

Aim. To evaluate the pathophysiological impact of obstructive sleep apnea (OSA) and specific sleep architecture parameters on glucose homeostasis, and to identify the neurophysiological mechanisms through which intermittent hypoxia and sleep fragmentation drive insulin resistance and metabolic dysfunction.

Methods. A critical analysis of 25 contemporary studies (2020–2025) was conducted, including prospective cohorts, randomized controlled trials, and experimental models utilizing hyperinsulinemic-euglycemic clamps, polysomnography, and continuous glucose monitoring (CGM).

Results. Data synthesis confirms OSA as an independent risk factor for T2DM. Notably, the primary determinant of metabolic dysfunction is the severity of sleep apnea-specific hypoxic burden (SASHB) rather than the mere frequency of respiratory events. Intermittent hypoxia and sleep fragmentation exhibit synergistic effects, increasing insulin resistance by 20–30%, even in non-obese individuals. This occurs through systemic inflammation, oxidative stress, and sympathoadrenal activation. Interventional data show that Continuous Positive Airway Pressure (CPAP) therapy effectively stabilizes short-term glucose variability by neutralizing hypoxia. However, it fails to significantly reduce HbA1c levels over a 12-week period. This suggests that in established T2DM, metabolic impairments become partially refractory to the correction of respiratory disturbances alone. Sleep architecture plays a pivotal role in metabolic regulation. Analysis reveals that slow-wave sleep (SWS) deficiency reduces insulin sensitivity by 25%, independent of total sleep duration. At the microstructural level, a direct correlation exists between the coupling density of slow oscillations and sleep spindles and next-morning glucose homeostasis. In T2DM patients, the degradation of these neurophysiological markers creates a vicious cycle: dysglycemia impairs sleep microstructure, which further exacerbates metabolic dysfunction.

Conclusion. Glucose homeostasis impairment in sleep disorders stems from the convergence of intermittent hypoxia and the degradation of non-rapid eye movement sleep electrophysiological patterns. Effective management of metabolic risks requires more than correcting respiratory pauses; therapy must aim to restore physiological sleep architecture. Neurophysiological biomarkers, such as spindle and oscillation density, should be considered as novel target indicators for assessing metabolic risk and treatment efficacy.

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IRSTI 76.29.30; 76.29.35

THE BIDIRECTIONAL RELATIONSHIP BETWEEN OBSTRUCTIVE SLEEP APNEA AND ARTERIAL HYPERTENSION: IMPLICATIONS FOR CLINICAL PRACTICE IN KAZAKHSTAN

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Introduction. Obstructive sleep apnea (OSA) and arterial hypertension (AH) co-occur in up to 50% of patients and are linked through a well-characterized bidirectional pathophysiological relationship. Despite robust mechanistic evidence, OSA remains undiagnosed in approximately 90% of affected individuals globally, and its role as a secondary cause of hypertension is systematically underappreciated in clinical practice - particularly in low-to-middle income regions such as Central Asia.

Objectives: To systematically review the epidemiology, bidirectional mechanisms, diagnostic tools, and treatment evidence for the OSA - AH relationship, and to assess the public health relevance and clinical management gap in Kazakhstan.

Methods. A systematic search was conducted in PubMed/MEDLINE, Scopus, Cochrane Library, and Web of Science covering the period 2016–2025. Search terms included combinations of "obstructive sleep apnea," "arterial hypertension," "resistant hypertension," "CPAP," "bidirectional," "polysomnography", "Kazakhstan," and "Central Asia." Inclusion criteria were: randomized controlled trials, meta-analyses, systematic reviews, major clinical guidelines and population-based epidemiological studies. A total of 30 sources were included in the final synthesis.

Results. Global OSA prevalence is estimated at 936 million adults (mild - severe, apnea-hypopnea index (AHI) ≥5 events/hour), with 90% undiagnosed. Hypertension is present in 35–80% of OSA patients, reaching 70–90% in resistant hypertension. Key mechanisms include sympathetic overactivation, RAAS dysregulation, intermittent hypoxia–driven oxidative stress, and baroreceptor impairment, leading to nocturnal BP surges, non-dipping phenotypes, and target organ damage.

The STOP-BANG questionnaire (an 8-item screening tool) is highly effective for screening severe OSA, with reported sensitivity approaching 100%. CPAP reduces systolic BP by a mean of 2.6 mmHg overall and 3.1 - 4.8 mmHg in uncontrolled hypertension, while combined CPAP and weight loss yields an additional 8 - 9 mmHg reduction. Tirzepatide demonstrated a 63.9% reduction in AHI with 20.1% weight loss, positioning GLP-1/GIP receptor agonists as a potential unified therapy for OSA, obesity, and hypertension. In Kazakhstan, AH prevalence was 45% in 2022–2023, yet OSA screening is absent from national cardiological protocols and polysomnography infrastructure remains limited to tertiary urban centres.

Conclusions. The OSA - AH bidirectional interaction constitutes a clinically actionable therapeutic target. Mandatory STOP-BANG screening in hypertension clinics, expansion of home sleep apnea testing (HSAT), and integration of sleep medicine into national cardiovascular guidelines represent feasible, evidence-based interventions to reduce the burden of resistant and poorly controlled hypertension in Kazakhstan.

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IRSTI 76.29.30

IMPROVEMENT OF CONSULTATIVE AND DIAGNOSTIC CARE AT THE LEVEL OF A SPECIALIZED CARDIOLOGY RESEARCH INSTITUTE

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Introduction. Cardiovascular diseases remain the leading cause of mortality worldwide: according to the World Health Organization, more than 17.9 million people die from them annually, accounting for approximately 32% of all deaths. In Kazakhstan, circulatory system diseases account for over 50% of mortality. Consultative and diagnostic care occupies a key position between primary and inpatient care, ensuring early diagnosis and continuity of treatment; however, its organizational aspects at the specialized institutional level remain insufficiently studied.

Aim. To conduct a comprehensive literature review on the organization of consultative and diagnostic care in specialized cardiology institutes and to develop evidence-based recommendations for optimizing patient flow management, key performance indicators, and digitalization of processes.

Materials and methods. A systematic review of publications from 2014 to 2026 was conducted in Scopus, PubMed, and Google Scholar databases. A total of 462 sources were identified; 120 publications were selected for critical analysis. Methods included comparative analysis of organizational models, narrative synthesis of evidence, and content analysis of Kazakhstan healthcare regulatory documents.

Results. Four models of consultative and diagnostic care were identified: centralized, decentralized, hospital-based, and outpatient. Centralized models demonstrate higher diagnostic efficiency, while decentralized models offer better geographic accessibility. Implementation of Lean Healthcare principles reduces waiting time by 30–45%; telemedicine reduces the burden on in-person services by 20–35%. Mandatory social health insurance reform created new regulatory conditions, yet barriers persist: fragmented patient routing, insufficient digital integration, and a deficit of standardized performance indicators.

Conclusions. Improvement of consultative and diagnostic care is achievable through integrated care models, digital patient flow management tools, and evidence-based key performance indicator systems. The findings provide a theoretical foundation for practical recommendations to enhance the accessibility and quality of cardiology consultative and diagnostic care in Kazakhstan.

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IRSTI: 616.147.17-007.64-036.12-089:[615.837.3+615.472.3]

USE OF AN ULTRASONIC SCALPEL IN OPEN HEMORRHOIDECTOMY (MILLIGAN–MORGAN) IN AN OUTPATIENT SETTING

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Introduction. Hemorrhoids are a common condition associated with reduced quality of life and risk of complications. Surgical treatment is required in stages III–IV. Although conventional hemorrhoidectomy is effective, it is associated with significant postoperative pain and prolonged recovery. The use of an ultrasonic scalpel may reduce thermal tissue damage and improve postoperative outcomes.

Objective. To evaluate the clinical effectiveness of an ultrasonic scalpel in patients with stage II–IV chronic hemorrhoids in an outpatient setting.

Materials and Methods. A randomized study was conducted at City Hospital No. 1, Astana. A total of 146 patients aged 18–70 years were included. Patients were divided into two groups: the main group underwent hemorrhoidectomy using an ultrasonic scalpel, while the control group received the conventional technique. Procedures were performed under spinal or general anesthesia. Outcomes were assessed using HDSS, VAS, Wexner, and QoL-Hemorrhoids scales.

Results. The groups were comparable in baseline disease severity. Postoperatively, moderate pain predominated in both groups: 72.6% in the main group and 64.3% in the control group; severe pain was observed in 26.0% and 35.6%, respectively. Pain levels during the first 3 days were similar (6.12±1.01 vs 6.11±1.01; $p=0.969$). During the first 7 days, bleeding occurred less frequently in the main group (27.4%) compared to the control group (54.7%; $p<0.01$). After 7 days, bleeding was rare in both groups. Urinary retention was observed in 4.1% of the main group and 12.3% of the control group; severe cases were rare (0.7%). No anal stenosis or recurrence was reported. According to the Wexner scale, gas continence and impact on quality of life were better in the main group ($p<0.05$), with no differences in other parameters. Quality of life decreased during the first 7 days in both groups but was less pronounced in the main group. Recovery was observed in most patients by 1 month and was complete in both groups by 3 months.

Conclusion: The use of an ultrasonic scalpel in outpatient hemorrhoidectomy reduces the incidence of early postoperative bleeding and improves certain functional outcomes and quality of life.

UDC: 614.35:615.28:577.18
IRSTI: 76.31.29; 76.75.75

SAFETY PROFILE ANALYSIS OF PENICILLINS AND CEPHALOSPORINS BASED ON PHARMACOVIGILANCE DATA FOR 2025

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Introduction. In recent decades, excessive and irrational use of antibiotics has contributed to the growth of antimicrobial resistance and an increase in the frequency of adverse drug reactions. The effectiveness and safety of beta-lactam antibiotics are reflected in the World Health Organization's AWaRe classification (Access, Watch, and Reserve), where penicillins and cephalosporins are included in the Access group due to their narrow spectrum of activity and favorable safety profile (WHO AWaRe classification database https://www.who.int/teams/surveillance-prevention-control-AMR/control-and-response-strategies/AWaRe). Nevertheless, their administration is associated with risks of allergic reactions (ranging from rash to anaphylaxis), gastrointestinal disorders (nausea, diarrhea), and rare systemic complications, especially in patients with hypersensitivity to the beta-lactam ring. In Kazakhstan, monitoring is carried out by the National Center for Expertise of Medicines and Medical Devices of the Republic of Kazakhstan, where data on adverse drug reactions serve as the basis for optimizing pharmacotherapy (https://www.ndda.kz).

Aim of the study. To evaluate the safety profile of penicillins and cephalosporins by analyzing adverse drug reactions registered in the pharmacovigilance system of the Republic of Kazakhstan in 2025.

Materials and methods. The analysis was based on monthly adverse drug reactions reports for 2025 from the database of the National Center for Expertise of Medicines and Medical Devices of the Republic of Kazakhstan. Data were systematized in Microsoft Excel with frequency analysis and comparison of adverse drug reactions proportions across antibiotic classes.

Results. In 2025, 214 adverse drug reactions were registered: January - 25 (100% cephalosporins); February - 14 (penicillins 21.5%; cephalosporins 78.5%); March - 11 (100% cephalosporins); April - 14 (penicillins 21.5%; cephalosporins 78.5%); May - 9 (100% cephalosporins); June - 11 (penicillins 18.2%; cephalosporins 81.8%); July - 17 (penicillins 17.6%; cephalosporins 82.4%); August - 16 (100% cephalosporins); September - 16 (100% cephalosporins); October - 22 (penicillins 4.5%; cephalosporins 95.5%); November - 31 (100% cephalosporins); December - 28 (penicillins 14.3%; cephalosporins 85.7%). The overall proportion of adverse drug reactions for cephalosporins was ~85%, mainly allergic reactions and gastrointestinal disorders; penicillins were associated with a lower frequency (15%).

Conclusion. Penicillins and cephalosporins remain key Access group drugs for the treatment of bacterial infections; however, pharmacovigilance data from 2025 confirm a sixfold predominance of adverse drug reactions for cephalosporins, with allergic reactions and gastrointestinal disorders being dominant. Rational prescribing according to the AWaRe classification, mandatory allergy screening, allergy tests, and digitalization of adverse drug reaction reporting are necessary. The current conclusions emphasize the integration of pharmacovigilance data with national Stewardship protocols (including AWaRe 2023–2026), the implementation of HLA genotyping for predicting hypersensitivity to beta-lactams, and the prioritization of third- and fourth-generation cephalosporins in confirmed penicillin allergy cases (tolerance >98%), which minimizes risks and optimizes antibiotic therapy under conditions of growing resistance.

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IRSTI: 76.29.29

PLATFORM FOR EARLY DETECTION OF RHEUMATOID ARTHRITIS ACTIVITY AND THERAPY OPTIMIZATION

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Introduction. Rheumatoid arthritis is a chronic autoimmune inflammatory disease of the joints, occurring in approximately 0.5–1% of the world's population, and if not controlled in time, it can lead to joint destruction and disability. Therefore, early and accurate assessment of disease activity and the selection of an effective treatment strategy are among the important problems of modern rheumatology. In local medical institutions, in many cases: clinical data are not digitized, and treatment strategies are chosen without individual analysis. For this reason, creating an AI-based clinical platform: increases diagnostic accuracy, improves treatment effectiveness, and supports physician decision-making.

Research objective: Many AI platforms have been developed based on data from patients in Europe or the USA. In our study, a model will be developed in the Uzbek language based on data from the population of Uzbekistan with rheumatoid arthritis, along with additional data. This will make it possible to create a local prognostic model that takes into account regional genetic, environmental, and clinical characteristics.

Materials and methods: The study was conducted in the form of a prospective observation. A total of 12 participants undergoing treatment in the "Rheumatology" department of the multidisciplinary clinic of Tashkent State Medical University were included in the study: the mobile application was developed based on data from a total of 38 patients with this disease from 2023 to the present day. In these patients, clinical examinations included determining the number of painful and swollen joints, assessing disease activity using the DAS28 index, laboratory tests included determining C-reactive protein, erythrocyte sedimentation rate, rheumatoid factor, and anti-CCP, and instrumental examinations included the use of joint radiography or ultrasound, with the obtained clinical and laboratory data analyzed using artificial intelligence.

Results: A total of 12 patients participated in the study. Disease activity in patients was assessed based on the DAS28 index and laboratory indicators — C-reactive protein and erythrocyte sedimentation rate. The obtained results were comprehensively analyzed using an artificial intelligence-based platform. According to the results, remission (DAS28 < 2.6) was identified in 2 out of 12 patients (17%). Low disease activity (DAS28 = 2.6–3.2) was observed in 3 patients (25%), moderate activity (DAS28 = 3.2–5.1) in 6 patients (50%), and high activity (DAS28 > 5.1) in 1 patient (8%). Analysis of laboratory indicators showed that levels of C-reactive protein and erythrocyte sedimentation rate were directly related to disease activity. Specifically, in the remission group, CRP averaged 3.2 mg/L and ESR 8 mm/hour, while in low activity they were 6.5 mg/L and 14 mm/hour, respectively. In moderate activity, CRP increased to 18.7 mg/L and ESR up to 32 mm/hour. In high activity, these indicators reached maximum levels, with CRP at 36.4 mg/L and ESR at 48 mm/hour.

Conclusion: The study demonstrates the scientific and practical basis for assessing patient activity through the integration of DAS28, laboratory markers, and VAS scale data, and provides a foundation for developing individualized treatment strategies using artificial intelligence. This, in turn, helps optimize treatment effectiveness in local medical institutions by enabling accurate and rapid assessment of disease activity in patients with rheumatoid arthritis.

UDC: 616.61:577.118
IRSTI: 76.29.43; 76.33.31

COMPARATIVE ANALYSIS OF THE DYNAMICS OF UROLITHIASIS MORBIDITY IN REPUBLIC OF KAZAKHSTAN (2015–2024)

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Introduction. Urolithiasis is a widespread urological disease worldwide, characterized by the formation of stones in any part of the urinary tract, including the kidneys, ureters, bladder, and urethra. In CIS countries, the proportion of urolithiasis among urological diseases ranges from 33.9% in Russia to 58.2% in Kyrgyzstan, while in Tajikistan, Uzbekistan, and Kazakhstan it is at the level of 42.2–56.1%, showing an increasing trend in incidence. Globally, the prevalence of urolithiasis varies from 1% to 20%, with higher risk observed in regions with hot climates and high environmental pollution, which is associated with increased fluid loss and higher salt concentration in urine. Within the framework of this study, a retrospective analysis of 162,538 hospitalizations among 132,915 patients with urolithiasis in the Republic of Kazakhstan was conducted for the period 2014–2021. The overall hospitalization rate was 1.31 cases per 1,000 population. The highest rates were observed in the Turkestan region and Almaty city, corresponding to the geographical concept of the "stone belt." The majority of hospitalizations were recorded among patients aged 50 years and older. A comparison of urban and rural populations showed a higher disease burden in urban areas, likely associated with lifestyle factors and better access to medical care. In conclusion, urolithiasis remains a significant medical and social problem in Kazakhstan. In 2021, approximately 106 million new cases were reported worldwide; despite the increase in absolute incidence, standardized rates and DALYs have decreased, and mortality remains consistently low (<0.5 per 100,000 population), indicating improvements in diagnosis, prevention, and treatment.

Aim of the study. To analyze the dynamics and regional characteristics of urolithiasis morbidity among the population of the Republic of Kazakhstan.

Materials and objectives. A retrospective analysis was conducted using data from annual official health reports (National Bureau of Statistics of the Republic of Kazakhstan) for the period 2015–2024.To assess national trends in urolithiasis morbidity over the period 2015–2024.To compare urolithiasis incidence rates between urban and rural populations.To develop practical recommendations for the prevention, early detection, and management of urolithiasis.

Results: In Kazakhstan, the incidence of urolithiasis demonstrated a wave-like pattern: an increase during 2015–2018, a decrease in 2019–2021, and a renewed upward trend from 2022 onwards. By 2024, the indicators exceeded the average level of the studied period. Urban areas showed relatively stable dynamics, whereas rural areas demonstrated more pronounced fluctuations. In 2024, the incidence rate among the urban population reached 85.9 cases per 100,000 population, showing a renewed increase after the decline observed in 2020–2021. A similar post-decline increase was observed in rural areas, with marked regional variability.The highest rural incidence was recorded in the Almaty region, exceeding 150 cases per 100,000 population in 2023–2024. In urban areas, the highest rate was observed in Atyrau city, reaching up to 198 cases per 100,000 population in 2024, while in Aktobe city it reached 153.5 cases per 100,000 population.

Conclusion. In recent years, an increase in the incidence of urolithiasis and pronounced regional differences have been observed. Therefore, it is necessary to strengthen preventive measures, improve early diagnosis, and enhance the control of risk factors in regions with high incidence rates.

UDC: 616.379-008.64:616.833.9-009.7-06:616.89-008.444
IRSTI: 76.29.37

ASSESSMENT OF SLEEP QUALITY IN PATIENTS WITH DIABETIC POLYNEUROPATHY

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Introduction. Sleep disturbances are highly prevalent among patients with type 2 diabetes mellitus, particularly in the presence of diabetic polyneuropathy. Glycemic variability, nocturnal pain, paresthesia, and other sensory symptoms contribute to impaired sleep quality and reduced overall well-being. Identification of sleep disturbances is essential for comprehensive patient assessment and optimization of therapeutic strategies.

Objective. To evaluate sleep quality in patients with type 2 diabetes mellitus and diabetic polyneuropathy depending on the level of metabolic control.

Materials and Methods. The study included 60 patients with type 2 diabetes mellitus and clinically confirmed diabetic polyneuropathy, as well as 20 healthy individuals serving as a control group. The mean age of patients was 58.1±5.6 years, and the mean duration of diabetes was 7.8±1.9 years. A proportion of patients had concomitant arterial hypertension. Parameters of carbohydrate and lipid metabolism were assessed. Neurological evaluation was performed using the Neuropathy Symptom Score and Neuropathy Disability Score scales. Sleep quality was assessed using the Pittsburgh Sleep Quality Index. Patients with critical limb ischemia and a history of acute vascular events were excluded from the study.

Results. Patients were divided into two groups according to metabolic control: decompensated (58.4%) and compensated (41.6%). Higher levels of blood glucose and glycated hemoglobin were observed in the decompensated group. Dyslipidemia was detected in 88.4% of patients. All patients were diagnosed with the sensorimotor form of diabetic polyneuropathy. Neuropathic symptoms, including pain, burning, numbness, and tingling, were more frequently observed in the decompensated group. The mean Neuropathy Symptom Score did not differ significantly between groups, whereas sensory impairment assessed by the Neuropathy Disability Score was more pronounced in the decompensated group. Sleep quality was significantly worse in these patients: the mean Pittsburgh Sleep Quality Index score was 12.8±4.4, compared to 6.9±1.4 in the compensated group and 5.2±0.9 in the control group. Sleep disturbances, including insomnia and excessive daytime sleepiness, were observed in 85% of patients with decompensated diabetes.

Conclusion. Sleep quality in patients with type 2 diabetes mellitus is closely associated with the level of metabolic control and the severity of diabetic polyneuropathy. Decompensation is accompanied by worsening metabolic disturbances, leading to increased neuropathic pain and impaired sleep. Sleep disorders are significantly more frequent in this patient population. Optimization of therapeutic management may reduce symptom severity and improve overall quality of life.

UDC: 616.379-008.64:616-058
IRSTI: 76.29.37; 76.33.31

MODERN METHODS FOR ASSESSING QUALITY OF LIFE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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Introduction. Type 2 diabetes is a growing global chronic disease that, because of lifelong treatment and complication risk, substantially reduces patients' quality of life. It leads to reduced physical activity, chronic fatigue, sleep and emotional disturbances, and long-term hyperglycemia causes cardiovascular, neurological, and visual complications; social factors (poor diet, obesity, inactivity, low adherence) worsen outcomes, especially in women and older adults, with stress and depression rising over time. Therefore, comprehensive assessment of quality of life using modern questionnaires and objective measures is essential for effective management.

Objective: To determine the level of quality of life of patients with type 2 diabetes mellitus using modern assessment methods (SF-36, WHOQOL-BREF, EQ-5D) and to evaluate its relationship with clinical and social factors.

Materials and methods. Cross-sectional study. Patients with type 2 diabetes mellitus participated in the study. Patients of various ages, receiving treatment in outpatient and inpatient settings, participated in the study. The SF-36, WHOQOL-BREF, and EQ-5D questionnaires were used to assess quality of life. Clinical indicators (HbA1c level, body mass index, disease duration, and comorbidities) were also taken into account. The obtained data were statistically processed using SPSS. The Pearson chi-square test was used to analyze qualitative variables, and the Student t-test was used to compare quantitative indicators. A p value of <0.05 was considered statistically significant.

Results. 148 patients participated in the survey, of whom 54.7% (n=81) were women and 45.3% (n=67) were men. In terms of age, patients aged 40–49 years constituted 28.4% (n=42), 50–59 years – 34.5% (n=51), and over 60 years – 37.1% (n=55). The following indicators were identified by disease duration: 1–5 years – 29.7% (n=44), 5–10 years – 38.5% (n=57), and over 10 years – 31.8% (n=47). As a result of the study, normal HbA1c levels (<7%) were found in only 32.4% (n=48) of patients, and insufficient glycemic control was observed in 67.6% (n=100). According to the body mass index, obesity was detected in 58.1% (n=86) of patients, overweight in 27.7% (n=41), and normal weight in only 14.2% (n=21) of patients. According to the SF-36 questionnaire, the physical health indicator was low in 46.6% (n=69), moderate in 38.5% (n=57), and high in 14.9% (n=22) of patients. The psychological health indicator was low in 41.2% (n=61), moderate in 43.2% (n=64), and high in 15.6% (n=23). According to the WHOQOL-BREF questionnaire, overall quality of life was low in 44.6% (n=66), moderate in 40.5% (n=60), and high in 14.9% (n=22) of patients. Dissatisfaction with social relationships was found in 52% (n=77) of patients. To the question «Do you feel constantly tired?», 21.6% (n=32) of patients responded that they feel constantly tired. 34.5% (n=51) said they feel tired often. 30.4% (n=45) said they feel tired sometimes, and 13.5% (n=20) said they never feel tired. When asked, «Do you have a sleep disorder?», 18.9% (n=28) responded that they had a regular sleep disorder. 36.5% (n=54) reported frequent sleep disorders, 29.7% (n=44) reported occasional sleep disorders, and 14.9% (n=22) reported no sleep disorder at all. To the question "Do you limit your physical activity in your daily life?" 27.7% (n=41) answered that there are clear limitations. 33.8% (n=50) answered that there are some limitations. 25% (n=37) answered that there are rarely any limitations, and 13.5% (n=20) answered that there are no limitations. To the question "Do you experience anxiety about your health?" 24.3%

(n=36) answered that they always experience anxiety. 39.2% (n=58) answered that they experience it often, 25.7% (n=38) answered that they experience it sometimes, and 10.8% (n=16) answered that they do not experience anxiety at all. When asked, "Do you take your medications regularly?" 46.6% (n=69) responded that they fully adhere to the regimen. 32.4% (n=48) said they sometimes miss doses, and 21% (n=31) said they do not adhere to the regimen regularly.

When asked "How would you rate your quality of life?" 18.9% (n=28) answered that it was good, 42.6% (n=63) – average, 30.4% (n=45) – low, and 8.1% (n=12) – very low.

Additional analysis showed that patients with higher HbA1c levels had lower quality of life scores ($p<0.05$). Obesity and increased disease duration were also statistically significantly associated with lower physical and psychological well-being scores ($p<0.05$).

Conclusion: The primary hypothesis was confirmed by the study. It was found that low quality of life is widespread among patients with type 2 diabetes. The findings showed that the physical and psycho-emotional well-being of most patients worsened. Furthermore, poor glycemic control, obesity, and disease duration were associated with decreased quality of life.

The obtained results indicate the need for comprehensive monitoring of patients' condition, the use of modern assessment methods and the implementation of measures aimed at improving quality of life.

Recommendations: Improve the work of schools for diabetes in endocrinology departments of hospitals in order to improve the quality of life of patients with type 2 diabetes.

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IRSTI: 76.29.56; 76.33.31

FACTORS ASSOCIATED WITH REHOSPITALIZATION IN CHRONIC HEART FAILURE

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Objective. To identify independent clinical and laboratory predictors of rehospitalization within 12 months among patients with chronic heart failure (CHF).

Materials and Methods. A retrospective cohort study was conducted involving 186 patients with a confirmed diagnosis of CHF. The follow-up period lasted 12 months after hospital discharge. The analyzed variables included age, sex, body mass index (BMI), New York Heart Association (NYHA) functional class, left ventricular ejection fraction (LVEF), presence of arterial hypertension, type 2 diabetes mellitus, atrial fibrillation, chronic kidney disease (CKD), hemoglobin level, N-terminal pro-B-type natriuretic peptide (NT-proBNP) concentration, and adherence to guideline-directed medical therapy.

The primary endpoint was rehospitalization due to CHF decompensation within 12 months after discharge. Statistical analysis was performed using multivariable logistic regression. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. Differences were considered statistically significant at $p < 0.05$. The predictive performance of the model was assessed using the area under the receiver operating characteristic curve (AUC).

Results. During the follow-up period, rehospitalization occurred in 41.9% of patients. Univariate analysis demonstrated significant associations between rehospitalization risk and reduced LVEF

(<40%), NYHA functional class III–IV, elevated NT-proBNP levels (>1800 pg/mL), chronic kidney disease, anemia, obesity, and poor treatment adherence ($p < 0.05$).

In the multivariable model, independent predictors of rehospitalization were:

- LVEF <40% (OR 2.67; 95% CI 1.52–4.68; $p = 0.001$)
- NYHA functional class III–IV (OR 2.14; 95% CI 1.26–3.62; $p = 0.004$)
- Chronic kidney disease (OR 1.89; 95% CI 1.08–3.31; $p = 0.020$)
- Elevated NT-proBNP level (OR 2.73; 95% CI 1.61–4.63; $p < 0.001$)
- Poor adherence to pharmacological therapy (OR 3.12; 95% CI 1.84–5.28; $p < 0.001$)

Obesity remained significantly but moderately associated with rehospitalization risk (OR 1.58; 95% CI 1.01–2.47; $p = 0.045$). The predictive model demonstrated good discriminative ability (AUC = 0.81), indicating strong predictive value.

Conclusions. Rehospitalization among patients with CHF is significantly associated with reduced left ventricular ejection fraction, higher NYHA functional class, renal dysfunction, elevated NT-proBNP levels, and poor adherence to therapy. Multivariable risk stratification enables the identification of high-risk patients at the time of discharge and facilitates optimization of outpatient follow-up, thereby reducing rehospitalization rates and improving long-term prognosis.

UDC: 616.12-089
IRSTI: 76.29.30

LEFT BUNDLE BRANCH PACING IN A PATIENT WITH HEART FAILURE AND COMPLETE RIGHT BUNDLE BRANCH BLOCK: A CLINICAL CASE

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Introduction. Conventional right ventricular pacing is associated with non-physiological ventricular activation and may worsen cardiac synchrony and left ventricular systolic function in patients with chronic heart failure. Left bundle branch pacing has emerged as a promising physiological pacing technique that improves ventricular synchrony and reduces QRS duration.

Objective. To demonstrate the clinical effectiveness of left bundle branch pacing in a patient with chronic heart failure and complete right bundle branch block after reimplantation of a dual-chamber pacemaker.

Materials and Methods. A 73-year-old male patient with atrioventricular conduction disorders, chronic heart failure with moderately reduced ejection fraction, and complete right bundle branch block underwent reimplantation of a dual-chamber pacemaker. Due to worsening dyspnea, fatigue, and reduced left ventricular ejection fraction after conventional right ventricular pacing, replacement of the ventricular lead with left bundle branch pacing was performed using a Selectra 3D delivery system and Solia S lead.

Results. Successful implantation of the lead into the interventricular septum with capture of the left bundle branch was achieved. Pacing threshold was 1.0 V/0.5 ms, R-wave amplitude was 10.2 mV, and impedance was 1020 Ohm. QRS duration narrowed to 115 ms during pacing. Echocardi-

ography demonstrated improvement of left ventricular ejection fraction from 42% before surgery to 45% after intervention, with improved right ventricular function and reduced pulmonary artery systolic pressure. No postoperative complications were observed, and the patient was discharged on the third postoperative day in satisfactory condition.

Conclusion. Left bundle branch pacing provided effective physiological ventricular activation and improved cardiac synchrony in this patient with heart failure and conduction abnormalities. The presented clinical case demonstrates the potential advantages of conduction system pacing for improving functional status and cardiac performance in patients requiring permanent pacing.

UDC: 616.379-008.64:616.13-004.6
IRSTI: 76.29.30

EARLY COMBINATION LIPID-LOWERING THERAPY IN PATIENTS WITH DIABETIC DYSLIPIDEMIA

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Background. Patients with type 2 diabetes mellitus and established cardiovascular disease are classified as very high risk, requiring achievement of low-density lipoprotein (LDL-C) levels <1.4 mmol/L according to the European Society of Cardiology guidelines. Statin monotherapy is often insufficient to achieve target levels, supporting the need for early combination therapy.

Objective. To evaluate the efficacy and safety of early combination therapy (rosuvastatin + ezetimibe) compared with rosuvastatin monotherapy in patients with diabetic dyslipidemia and very high cardiovascular risk.

Materials and Methods. A prospective randomized study included 50 patients divided into two groups of 25 each: rosuvastatin 20 mg/day and rosuvastatin 20 mg + ezetimibe 10 mg/day. The follow-up duration was 12 weeks. Groups were comparable in baseline characteristics: age — 58.2±6.4 and 57.6±7.1 years, पुरुष proportion — 56% and 52%, BMI — 30.1±3.2 and 29.8±3.5 kg/m², HbA1c — 7.8±0.9% and 7.7±1.0%, LDL-C — 3.2±0.6 and 3.3±0.5 mmol/L, ApoB — 1.12±0.18 and 1.15±0.16 g/L, Lp(a) — 32±14 and 34±16 mg/dL (p>0.05 for all comparisons).

Results. After 12 weeks, LDL-C reduction was 43.9% (95% CI: 39.2–48.6) and 57.8% (95% CI: 53.1–62.5), respectively (p<0.001). Target LDL-C <1.4 mmol/L was achieved in 44% and 72% of patients (p=0.03). ApoB reduction was 27.4% (95% CI: 23.0–31.8) and 36.2% (95% CI: 32.1–40.3), respectively (p=0.002). The ApoB/ApoA1 ratio decreased by 38.1% and 42.3% (p=0.04). Changes in ApoA1 were not significant. Lp(a) dynamics did not differ between groups (p=0.56). The incidence of adverse events was comparable: myalgia — 8% and 6%, elevated transaminases — 4% in each group; no treatment discontinuation was required.

Conclusions. Early combination therapy provides a more pronounced reduction in atherogenic lipids and a higher rate of achieving target LDL-C levels compared to monotherapy in patients with diabetic dyslipidemia and very high cardiovascular risk. The lack of effect on Lp(a) indicates persistent residual risk and the need for further therapeutic optimization.

UDC: 616-001
IRSTI: 76.29.41

AGE-RELATED CHARACTERISTICS OF INJURY TYPES IN THE CITY OF OSKEMEN

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Introduction. Nowadays, injuries represent one of the major causes of disability and mortality. Urbanization, increasing industrial workload, and growing road traffic expand the risk of trauma. As an industrial center, the city of Oskemen requires a comprehensive study of the age dependence within the injury structure.

Objective of the study. To determine the age-related characteristics of injury types among trauma patients in Oskemen.

Materials and methods of the study. A cross-sectional single-center study was conducted. Data were collected through a retrospective analysis of medical records. Patients over 18 years of age who sustained injuries were included in the study. Participants were divided into 4 age groups: 18–29, 30–44, 45–59, and 60 years and older. Evaluated indicators included: injury type, mechanism, presence of bone fractures, and anatomical localization. Statistical processing was performed using descriptive methods and the \chi^2 (Chi-square) test ($p<0.05$).

Results of the study. During the study, data of patients who visited the traumatology department in Oskemen were analyzed according to their age characteristics. Participants were divided into four groups: 18–29 years old (27%), 30–44 years old (31%), 45–59 years old (23%), and 60 years and older (19%). In the 18–29 age group, the main proportion of injuries consisted of domestic (45%) and sports (32%) traumas. Road traffic accidents (RTAs) were recorded in 15% of cases, while occupational injuries accounted for 8%. In this group, the frequency of bone fractures was 21%, with soft tissue injuries being predominantly prevalent. In the 30–44 age group, the injury structure was different: occupational injuries accounted for 34%, road traffic accidents — 29%, domestic injuries — 25%, and sports injuries — 12%. Bone fractures were identified in 38% of cases, indicating a high proportion of severe trauma. In the 45–59 age group, domestic injuries accounted for 39%, occupational injuries — 28%, road traffic accidents — 21%, and sports injuries — 12%. An increase in the frequency of bone fractures up to 47% was observed. In the group over 60 years old, the majority of injuries were associated with domestic trauma resulting from falls (68%). Road traffic accidents accounted for 17%, occupational injuries — 9%, and other types — 6%. In this group, the frequency of bone fractures was the highest, reaching 63%. Overall, statistical analysis demonstrated that the differences in the distribution of injury types and bone fractures among the age groups were significant ($p<0.05$).

Conclusion. Injury types vary depending on age characteristics. The obtained results allow for the improvement of preventive measures and the effective organization of medical care.

UDC: 004.8:616.61-003.7:614.2
IRSTI: 76.75.75; 76.75.31; 76.29.43

COMPARATIVE EVALUATION OF LARGE LANGUAGE MODELS (CHATGPT-5, DEEPSEEK-V3 AND GROK 4.1) IN CLINICAL DECISION-MAKING FOR UROLITHIASIS: ACCURACY, GUIDELINE COMPLIANCE AND READABILITY

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Introduction. Urolithiasis is a prevalent and recurrent condition with significant potential for complications, including infection, renal impairment, and sepsis. As artificial intelligence (AI) becomes increasingly integrated into clinical workflows, evaluating the safety and reliability of these tools is essential. Concurrently, patients and clinicians are turning to AI-driven platforms for medical information, yet the accuracy and clinical utility of these resources remain unverified. This study is timely and relevant, as it systematically evaluates the performance of leading large language models (LLMs) in real-world urolithiasis management, with particular relevance for resource-limited settings where AI may serve as a decision-support tool for trainees and general practitioners.

Purpose. To conduct a comparative evaluation of three advanced LLMs-GPT-5, DeepSeek V3, and Grok 4.1- in the clinical management of urolithiasis. The study assesses diagnostic accuracy, appropriateness of urgent care recommendations, and adherence to established European Association of Urology (EAU) guidelines.

Materials and methods. This comparative methodological study was conducted in December 2025 using nine standardized clinical case scenarios aligned with EAU guidelines across three domains: diagnosis, urgent care, and treatment. Each model was evaluated in its untrained (default) configuration. Outputs were assessed by experienced urologists using a structured guideline-adherence scale to determine clinical accuracy, completeness, and safety. Readability was quantified using the Flesch-Kincaid Grade Level (FKGL) and Simple Measure of Gobbledygook (SMOG) indices via the Readable software. The quality and reliability of responses were further evaluated using the DISCERN instrument, a validated 16-item questionnaire rated on a 5-point Likert scale.

Results. Marked differences in performance were observed across models. Grok 4.1 produced the most complex outputs (FKGL: 14.7-15.6; SMOG: 15.4-16.9), while ChatGPT-5 was the most readable (FKGL: 10.9-12.6; SMOG: 11.6-13.0). DeepSeek V3 demonstrated intermediate complexity (FKGL: 12.6-13.1; SMOG: 13.5-14.6). In terms of quality and reliability, DeepSeek achieved the highest DISCERN scores across all domains (66-67/80), followed by Grok (59-67/80), with ChatGPT-5 showing comparatively lower scores (48-60/80). Domain-specific analysis revealed that DeepSeek and Grok outperformed ChatGPT in diagnostic completeness and overall clinical reliability.

Conclusion. The findings indicate a trade-off between readability and clinical depth. Grok 4.1 and DeepSeek V3 offer more comprehensive, guideline-aligned responses suitable for specialist-level use, whereas ChatGPT-5 provides more accessible information appropriate for trainees and patients. These results underscore the importance of model selection based on intended audience and clinical context, particularly as LLMs are increasingly adopted in medical education and decision support. Further validation in real-world clinical settings is warranted.

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IRSTI: 76.29.30

INTEGRATED ASSESSMENT OF ELECTRICAL REMODELING AND CHRONOTROPIC RESPONSE IN POST-MYOCARDIAL INFARCTION PATIENTS AFTER SURGICAL REVASCULARIZATION

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Introduction. Patients who survive acute myocardial infarction develop not only structural myocardial damage but also significant disturbances in cardiac electrical stability and autonomic heart rate regulation. Electrical remodeling is associated with reduced heart rate variability, impaired circadian rhythm of heart rate, QT interval prolongation, and an increased risk of ventricular arrhythmias and sudden cardiac death.

Despite the widespread use of surgical myocardial revascularization, the restoration of autonomic regulation and reversibility of electrical remodeling after coronary artery bypass grafting remain insufficiently investigated. Assessment of isolated electrophysiological markers alone is often inadequate for comprehensive evaluation of arrhythmogenic risk in post-infarction patients.

In recent years, growing attention has been directed toward the integrated evaluation of heart rate variability, QT interval parameters, and chronotropic response as comprehensive markers reflecting myocardial functional status and autonomic nervous system activity. Investigation of the dynamics of these parameters following surgical revascularization may contribute to improved risk stratification and the development of personalized management strategies for patients after myocardial infarction.

Objective: To investigate myocardial electrical remodeling and chronotropic response in post-AMI patients and to evaluate their combined dynamics following surgical myocardial revascularization.

Methods: The study included 168 patients aged 42–75 years (mean age 58.9 ± 8.4 years) with prior acute myocardial infarction undergoing coronary artery bypass grafting. All patients underwent comprehensive evaluation including echocardiography, coronary angiography, biochemical testing, and 24-hour Holter ECG monitoring before surgery and 6–12 months after revascularization. Parameters analyzed included heart rate variability indices (SDNN, SDANN, rMSSD), circadian heart rate profile, QT interval, corrected QT (QTc), QT dispersion (QTd), and chronotropic index. Statistical analysis was performed with significance set at $p < 0.05$.

Results. At baseline, patients demonstrated reduced heart rate variability, impaired circadian rhythm (flattened day–night heart rate variation), and prolonged QT interval, indicating pronounced electrical instability. Following revascularization, significant restoration of circadian rhythm was observed, with normalization of nocturnal heart rate decline ($p = 0.004$). Chronotropic index improved (0.71 ± 0.12 vs. 0.83 ± 0.10; $p = 0.002$), reflecting enhanced autonomic regulation. Heart rate variability parameters showed selective improvement, particularly in SDANN ($p = 0.031$), suggesting better long-term autonomic balance. QT interval duration significantly decreased ($p = 0.001$), while QT dispersion demonstrated a downward trend, indicating partial reversal of electrical heterogeneity.

Notably, patients with combined improvement in heart rate variability and chronotropic response had the lowest incidence of ventricular arrhythmias during follow-up.

Conclusion. Surgical myocardial revascularization promotes not only perfusion recovery but also partial reversal of electrical remodeling and chronotropic dysfunction. An integrated assessment of heart rate variability, QT parameters, and chronotropic response provides a more comprehensive evaluation of arrhythmic risk in post-acute myocardial infarction patients than isolated markers. This approach may improve risk stratification and guide personalized management strategies.

UDC: 616.12-009.72:615.825
IRSTI: 76.29.30

MOLECULAR AND HEMODYNAMIC ADAPTATIONS TO PHYSICAL TRAINING IN PATIENTS WITH CHRONIC CORONARY SYNDROME

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Introduction. Chronic Coronary Syndrome (CCS) represents one of the most prevalent forms of cardiovascular disease. While pharmacological therapy remains central to its management, growing evidence supports a significant therapeutic role for structured physical activity, which nonetheless remains markedly underutilized in clinical practice.

Aim. To investigate the effects of a supervised physical training program, combined with standard pharmacological therapy, on molecular and hemodynamic parameters in patients with Chronic Coronary Syndrome.

Materials and Methods. The study enrolled 164 patients aged 48-70 years (mean age 61.2+/-4.9) with CCS diagnosed per 2019 ESC Guidelines, treated at the multidisciplinary clinic of Tashkent State Medical University. Group 1 (n=82) underwent a 24-week supervised aerobic and resistance training program (3 sessions/week, 60-75% of maximum heart rate reserve) in addition to standard therapy. Group 2 (n=82) received standard therapy alone. Molecular markers (hs-CRP, IL-6, BNP, eNOS) and hemodynamic parameters (LVEF, E/A ratio, resting heart rate), along with VO2 peak and the six-minute walk test (6MWT), were assessed at baseline, week 12, and week 24.

Results. At 24 weeks, Group 1 showed statistically significant reductions in inflammatory markers: hs-CRP decreased by 31.4% ($p<0.01$) and IL-6 by 27.8% ($p<0.05$). BNP declined significantly ($p<0.05$). Endothelial function (FMD and eNOS activity) improved ($p<0.05$). LVEF increased by a mean of 4.6 percentage points ($p<0.01$), the E/A ratio improved ($p<0.05$), and resting heart rate fell by 8.3 beats/min ($p<0.001$). VO2 peak rose by 18.7% ($p<0.001$) and 6MWT distance improved by +74 meters ($p<0.01$).

Conclusions. A supervised physical training program combined with standard pharmacological therapy produces significant molecular and hemodynamic adaptations in CCS patients, including reductions in inflammatory cytokines, improvements in left ventricular function, and gains in cardiorespiratory fitness. These findings support the integration of individualized physical activity programs into routine clinical protocols as a core — not merely adjunctive — component of CCS management.

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LIPOPROTEIN(A): CORONARY STENOSIS IN THE ARAL SEA REGION

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Introduction. Failure to achieve target levels of low-density lipoprotein cholesterol, hypertriglyceridemia, and elevated lipoprotein(a) levels are key links in residual risk in atherosclerotic cardiovascular diseases, which leads to cardiovascular complications (Partick R.Lawler et al.2021).

Objective. To study the prevalence of elevated concentrations of lipoprotein(a), triglycerides in patients with coronary heart disease who underwent percutaneous coronary intervention in the Aral Sea region.

Materials and methods. The study included 184 patients (men - 130, women - 54), with an average age of 62.0 [60.3-62.7] years. The most common comorbidity was hypertension, which accounted for 73.9% . The incidence of diabetes mellitus was 18.5% of cases. The average value of the left ventricular ejection fraction according to echocardiography data was 55.0 [55.3-56.7]% . Lipoprotein (a), triglycerides were determined in the examined patients on an automatic biochemical analyzer " Cobas " c 311. Statistical processing was performed using the IBM program SPSS Statistics 27. For quantitative parameters, the mean, standard deviation, and median were determined. When comparing means for independent samples , the t -test and Mann-Whitney U -test were used. Differences were considered significant at $p < 0.05$.

Results. The study showed that the average Lipoprotein(a) concentration in the studied cohort of patients was 12.0[20.7-30.0] mg/dL. 16.3% of the examined patients were diagnosed with an increase in lipoprotein(a) values over 50 mg/dL, which is associated with high cardiovascular risk. The frequency of lipoprotein(a) levels from 30-50 mg/dL was 8.7% . Multivessel coronary artery disease was diagnosed in 77 examined patients. Triglyceride levels above 150 mg/dL were detected in 94 patients . When comparing men and women in triglyceride levels, statistically significant differences were found (p=0.001). Triglyceride levels in women were significantly higher than in men (median was 224 and 132 mg/dL). In 5.4% of cases, left main coronary artery disease with hemodynamically significant stenosis was detected. In this study, coronary angiography revealed single-vessel coronary artery disease in 67 patients, two-vessel disease in 45, and multivessel disease in 72.

Conclusions. Including Lp(a) testing in patients with coronary heart disease (CHD) as part of their diagnostic testing routine can prevent a significant number of cardiovascular events, including in patients who have achieved target low-density lipoprotein levels.

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ARTERIAL HYPERTENSION IN YOUNG ADULTS: RISK FACTORS AND PREVENTION

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Introduction. In recent years, an increase in the prevalence of arterial hypertension among young people has been observed. According to epidemiological data, up to 10–12% of working-age patients have elevated blood pressure before the age of 45. A characteristic feature of the disease is its prolonged asymptomatic course, which leads to late diagnosis and an increased risk of cardiovascular complications. In the context of Central Asian countries, this problem is of particular significance due to the high proportion of young population.

Objective. To assess the influence of major risk factors on the development of arterial hypertension in individuals aged 18–44 years and to determine the effectiveness of their targeted correction compared to standard management.

Materials and Methods. The study included 96 young patients with grade I–II arterial hypertension (mean age 34.7 ± 6.2 years; males — 54.2%). Participants were divided into two groups: the intervention group (n=58), in which a comprehensive assessment of risk factors (physical activity, stress levels, treatment adherence) was conducted followed by individualized lifestyle modification, and the control group (n=38), which received standard treatment. The follow-up period was 3 months. Parametric and non-parametric statistical methods were used for data analysis.

Results. The majority of patients were found to have modifiable risk factors: overweight — in 68.7%, insufficient physical activity — in 66.7%, chronic stress — in 54.2%, smoking — in 40.6%, and family history of hypertension — in 47.9%. In the intervention group, the rate of preventive measure coverage was higher (84.5% vs. 57.9% in the control group; $p<0.05$). The reduction in systolic blood pressure was 15.7 mmHg in the intervention group and 7.5 mmHg in the control group ($p<0.05$). Target blood pressure levels were achieved in 65.5% of patients in the intervention group and 42.1% in the control group ($p<0.05$).

Conclusion. Arterial hypertension in young adults is characterized by a high prevalence of modifiable risk factors. Their comprehensive assessment and correction using an individualized approach significantly improve blood pressure control outcomes. Implementation of this approach in primary health care practice may contribute to reducing cardiovascular morbidity in this age group.

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IMPACT OF POSTERIOR PERICARDIOTOMY ON THE RISK OF POSTOPERATIVE ATRIAL FIBRILLATION AFTER OFF-PUMP CORONARY ARTERY BYPASS SURGERY

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Introduction. Among all cardiovascular complications, newly developed postoperative atrial fibrillation is one of the most common, occurring in 30–50 percent of patients after cardiac surgery. These episodes are associated with unfavorable outcomes such as hemodynamic instability, an increased risk of stroke, and prolonged stay in the intensive care unit. Predicting and preventing this complication is one of the key research priorities of the Department of Minimally Invasive Cardiac Surgery at the Republican Specialized Scientific and Practical Medical Center of Cardiology.

Objective. To evaluate the effectiveness of posterior pericardiotomy in reducing the incidence of postoperative atrial fibrillation in patients undergoing off-pump coronary artery bypass surgery.

Materials and Methods. The study included 40 patients with ischemic heart disease and indications for coronary artery bypass grafting, selected from the Republican Specialized Scientific and Practical Medical Center of Cardiology. The mean age was 56.6 ± 18.4 years; 12 were women and 28 were men. Exclusion criteria included the presence of atrial fibrillation in the medical history or its detection during preoperative twenty-four-hour electrocardiographic monitoring, previous cardiac surgery, significant valvular dysfunction, a history of cryptogenic stroke, thyroid dysfunction, and acute myocardial infarction. All patients underwent twenty-four-hour Holter electrocardiographic monitoring five days and twenty-four hours before surgery. After the operation, all patients were managed in the intensive care unit, where cardiac rhythm was continuously monitored using bedside recording systems. In addition, Holter electrocardiographic monitoring was repeated on the third and fifth postoperative days. The patients were divided into two groups, with 20 patients in each group: Group One consisted of patients who underwent posterior pericardiotomy; Group Two consisted of patients who did not undergo pericardiotomy and served as the control group.

Results. According to the study findings, postoperative atrial fibrillation developed in 12 patients, accounting for 30 percent of the total cohort (8 men and 4 women). In the group that underwent posterior pericardiotomy, postoperative atrial fibrillation occurred in 4 patients (20 percent), whereas in the control group it was observed in 8 patients (40 percent), with a chi-square value of 6.1 and a probability value of 0.01.In 75 percent of cases, postoperative atrial fibrillation developed on the third day after off-pump coronary artery bypass surgery. Its occurrence was not associated with the duration of surgery, extubation time, or the volume of intraoperative blood loss. No statistically significant differences were found between the groups with respect to age, sex, or duration of coronary artery disease.

Conclusion. In this study, postoperative atrial fibrillation developed in 30 percent of patients, with the peak incidence observed on the third postoperative day. It occurred significantly more frequently in the control group. The findings demonstrate that posterior pericardiotomy is a simple intraoperative technique that can significantly reduce the risk of postoperative atrial fibrillation, thereby improving postoperative outcomes.

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DETERMINATION OF VASCULAR AGE IN DIFFERENT PHENOTYPES OF OBESITY

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Relevance. Cardiovascular diseases (CVDs) are one of the leading causes of mortality worldwide. Determination of vascular age (heart age, cardiovascular risk age, biological age) as a marker of CVD development is particularly important at the stage of primary diagnosis, as well as for improving the effectiveness of patient management. Vascular age is a parameter reflecting the degree of biological aging of the cardiovascular system under the influence of existing risk factors and is compared with the age of a healthy individual.

Aim of the study. To assess the relationship between metabolic disorders and vascular age in patients with different phenotypes of obesity.

Materials and methods. The study included 45 patients (57.8% males, 42.2% females) aged 35–65 years (mean age 50.5±8.3).

Patients were divided into three groups according to body weight and the presence of metabolic syndrome: 1. Patients with normal body weight and metabolic syndrome, 2. Metabolically healthy overweight patients, 3. Overweight patients with metabolic syndrome. Metabolic syndrome was diagnosed according to the criteria of the International Diabetes Federation (IDF). Vascular age was calculated using the Framingham 10-year cardiovascular risk score. The obtained 10-year risk (%) values were converted into "vascular age" equivalents using standard conversion tables ***Heart Age Calculator.***

Results and analysis. In metabolically healthy overweight patients, an increase in vascular age compared to biological age was observed in 46.6% of cases, with a mean difference of 9.2±4.1 years. The increase in vascular age was mainly associated with an increase in body mass index (BMI) to 29.7±1.3 kg/m², arterial hypertension (15.3%), insulin resistance (23.3%), minimal changes in lipid profile (13.3%), and smoking (33.3%). These factors led to early impairment of endothelial function.

In patients with metabolic syndrome and normal body weight, 66.6% showed an increased vascular age, with a mean increase of 13.4±5.7 years. In this group, the increase in vascular age was explained by a combination of risk factors such as arterial hypertension (36%), hyperglycemia (48%), dyslipidemia (36.3%), insulin resistance (46.3%), and smoking (26.7%).

In overweight patients with metabolic syndrome, a 100% increase in vascular age was observed, with a mean increase of 16.8±6.9 years. This was accompanied by an increase in BMI to 30.6±1.4 kg/m², arterial hypertension (69%), hyperglycemia (71.3%), dyslipidemia (79.6%), insulin resistance (76%), and smoking (40%), leading to structural changes in the vascular wall.

Conclusion. The results confirm that metabolic disorders, even in patients with normal body weight, can lead to early vascular aging. Metabolic syndrome was identified as the main factor contributing to increased vascular age.

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CLINICAL AND LABORATORY SIGNIFICANCES OF KIDNEY DAMAGE IN THE SYSTEMIC LUPUS ERYTHEMATOSUS

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Systemic lupus erythematosus (SLE) is an autoimmune disease characterized by the production of antibodies against the body's own tissues. In this disease, kidney damage (lupus nephritis) is considered one of the most severe complications, increasing the risk of disability and death in patients. Today, lupus nephritis occurs in 40-60% of cases. Modern research indicates the importance of detecting kidney damage at an early stage and evaluating it through laboratory markers. Therefore, this study comprehensively examined the clinical and laboratory characteristics of kidney damage in patients with CKD.

Goal. In this study, we will examine the clinical, immunological, and morphological characteristics of kidney damage in patients with systemic lupus erythematosus and evaluate the significance of early diagnosis.

Materials and methods. The study included 30 patients diagnosed with systemic lupus erythematosus from the Department of Rheumatology and Arthrology. The following laboratory examination methods of the patients were studied: total urine analysis, blood creatinine and urea levels, and certain immunological tests (ANA, anti-dsDNA).

Results. 90% of the patients included in the study were women, 10% were men, and the average age was 42.5±1.6 years. Laboratory parameters were analyzed to assess kidney damage. No serious complications, including fatalities, were identified. According to the results obtained, the blood creatinine level was 118.4±22.6 **μmol**/L, indicating a decrease in renal filtration function; urea levels averaged 9.1±2.3 mmol/L, reflecting an increase in catabolic processes; proteinuria (protein in urine) was detected in 73.3% of patients, confirming damage to the glomerular apparatus; immunological analyses showed a high level of anti-dsDNA antibodies in 66.7% of patients; Complement components C3 and C4 were reduced in 56.7% of cases, indicating an inflammatory process under the influence of immune complexes. These changes are important laboratory markers in the development of lupus nephritis.

Conclusion. According to our results, patients treated in the rheumatology and arthrology department had a predominance of relatively mild forms of CKD, and severe complications occurred less frequently. The presence of comorbidities and lupus nephritis places these patients in a high-risk group and increases the likelihood of further exacerbation of the disease. According to the study results, proteinuria was detected in 73.3% of patients, confirming damage to the glomerular apparatus. In immunological analyses, a high level of anti-dsDNA was observed in 66.7% of cases, which is associated with disease activity. Additionally, the C3 and C4 complement system was reduced in 56.7% of patients, indicating an inflammatory process under the influence of immune complexes; according to the analysis, 90% of patients were women, which once again confirms the gender character of the disease. In CKD, kidney damage often manifests as subclinical and laboratory changes. Increased creatinine and urea, the presence of proteinuria, high anti-dsDNA levels, and a decrease in C3 and C4 are reliable markers of lupus nephritis. The high prevalence of the disease among women and the average age of patients indicate the high social significance of the disease. Comprehensive laboratory tests are important for the early detection of lupus nephritis, assessing the severity of the disease, and determining timely treatment measures.

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CLINICAL AND LABORATORY ASSESSMENT OF THE RELATIONSHIP BETWEEN INSULIN RESISTANCE AND OBESITY IN WOMEN OF REPRODUCTIVE AGE

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Introduction. Insulin resistance and obesity are among the key components of metabolic disorders widely prevalent among women of reproductive age. These conditions may significantly affect hormonal homeostasis, including ovulatory dysfunction and menstrual irregularities. In view of the increasing prevalence of metabolic disorders, studying their relationship is highly relevant in clinical practice.

Objective. To assess the relationship between obesity, insulin resistance, and menstrual cycle disorders in women of reproductive age.

Materials and Methods. A retrospective observational study included 30 patients aged 18 to 40 years who underwent examination at the Ayol Care clinic. The following parameters were assessed: body mass index (BMI), fasting glucose level, insulin level, HOMA-IR index, and menstrual cycle regularity. Insulin resistance was defined as HOMA-IR ≥ 2.5. Obesity was diagnosed at BMI ≥ 30 kg/m².

Results. Among the examined patients, insulin resistance according to the HOMA-IR index was identified in all participants. Mean HOMA-IR values were elevated and amounted to ± 5.85, indicating pronounced metabolic disturbances. Obesity was detected in 36% of patients. Menstrual cycle disorders were noted in 73% of examined women. Comparative analysis showed that menstrual irregularities were observed in 100% of patients with obesity, whereas in patients without obesity they were observed in 57% of cases. Statistical analysis was performed using Stata 14 software.

Conclusions. The obtained data demonstrate a high prevalence of insulin resistance among examined patients of reproductive age. Obesity was associated with a higher frequency of menstrual cycle disorders, which may indicate its significant role in the development of reproductive dysfunction. The study results emphasize the need for further investigation of the relationship between metabolic and reproductive disorders in a larger sample.

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IRSTI 76.29.35.25.75

THE ROLE OF CARDIOVASCULAR RISK FACTORS IN PREDICTING THE PROGRESSIVE COURSE OF ISCHEMIC HEART DISEASE

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Introduction. Studies show a close relationship between the development and progression of ischemic heart disease (IHD) and risk factors (RFs). These factors are arterial hypertension, dyslipidemia, obesity, smoking, and psychoemotional stress play an important role occupies a leading position.

Aim of the study. To evaluate the clinical-diagnostic and prognostic significance of cardiovascular risk factors in the progression of ischemic heart disease.

Materials and methods. The clinical study included 70 patients with IHD aged 48–73 years. Patients were divided into two groups according to the clinical course of the disease: the main group — with progressive angina pectoris (PAP), and the comparison group — with stable exertional angina (SEA) of functional class III. Cardiovascular risk factors (age, sex, smoking, arterial hypertension, body mass index, obesity, dyslipidemia, physical activity, and psychoemotional status) were assessed. Body mass index was calculated based on anthropometric measurements. Statistical analysis was performed using Microsoft Excel, and logistic regression was applied to calculate OR, 95% CI, and p-values. Statistical significance was set at $p<0.05$.

Results. During the study, comparative analysis of the main characteristics, prevalence of risk factors (RFs), and clinical-laboratory parameters in patients with IHD in both groups was performed. Smoking was detected in 11 patients (32.4%) in the PAP group and in 5 patients (13.9%) in the SEA group, being almost twice as frequent in the PAP group ($p<0.05$). Physical activity was 33.3% in the SEA group and 23.5% in the PAP group, and the difference was not statistically significant ($p>0.05$). Obesity was found in 61.8% of the PAP group and 41.7% of the SEA group, being 1.5 times higher in the main group ($p<0.05$). Mean BMI was 31.9±1.2 and 29.8±1.1 kg/m², respectively. According to the HADS scale, anxiety-depressive syndrome was detected in 64.7% of patients in the PAP group and 41.7% in the SEA group, indicating a higher prevalence of psychosocial factors in the PAP group ($p<0.05$). According to multivariate logistic regression analysis, the main predictors of IHD destabilization were: anxiety-depressive syndrome + dyslipidemia (OR=3.21; p=0.004), smoking + obesity (OR=2.64; p=0.01), anxiety-depression (OR=2.19; p=0.03),dyslipidemia (OR=2.28; p=0.002), increased systolic BP (OR=1.68; p=0.02), obesity (OR=1.49; p=0.05), smoking (OR=1.51; p=0.05), male sex (OR=1.97; p=0.05), age >60 years (OR=3.42; p=0.03). The results showed that in patients with PAP, smoking, obesity, arterial hypertension, dyslipidemia, and psychoemotional disorders were more common and were associated with a more severe clinical course of IHD.

Conclusions. Thus, the results of multivariate regression analysis showed that important predictors of IHD progression, such as anxiety-depressive syndrome, dyslipidemia, arterial hypertension, obesity, smoking, and male sex, have almost equal prognostic significance in predicting the risk of an unfavorable clinical course of angina. Early identification and correction of these factors play an important role in slowing the progression of ischemic heart disease and reducing the risk of complications.

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IRSTI: 76.29.56; 76.29.45

CLINICAL AND DIAGNOSTIC SIGNIFICANCE OF ANTICOAGULANT ACTIVITY MARKERS IN CORONARY ARTERY DISEASE

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Background: Coronary artery disease (CAD) remains one of the leading causes of cardiovascular mortality. In addition to atherosclerosis, disturbances in the hemostatic system, including hypercoagulability and reduced anticoagulant activity, play a significant role. Conventional laboratory markers often fail to fully reflect thrombotic risk, necessitating the study of additional biomarkers and genetic factors.

Objective: To evaluate the clinical and diagnostic significance of antithrombin III (AT III), thrombin–antithrombin complex (TAT), and SERPINC1 gene polymorphism (rs2227589) in patients with CAD.

Materials and Methods: The study included 116 patients with CAD and 40 healthy controls. AT III (17–30 mg/dL), TAT (0.78–120 ng/mL), and SERPINC1 polymorphism were assessed. Statistical analysis included mean values (M±SD), intergroup comparisons, odds ratio (OR), and correlation analysis. A p-value < 0.05 was considered statistically significant.

Results: The mean AT III level was 20.7±13.2 mg/dL in CAD patients and 21.5±7.5 mg/dL in controls ($p > 0.05$). However, decreased AT III levels were observed in 35–40% of patients, indicating anticoagulant deficiency in high-risk subgroups. TAT levels were 67.7±34.0 ng/mL and 63.0±30.0 ng/mL, respectively ($p > 0.05$), with OR ≈ 0.85, indicating no significant association. Correlation analysis revealed a weak positive relationship between AT III and TAT ($r = 0.18$; $p > 0.05$), accompanied by high interindividual variability, suggesting the absence of a strong linear association.

SERPINC1 polymorphism was identified as C/C, C/T, and T/T genotypes. No statistically significant association was found between genotype and AT III or TAT levels ($p > 0.05$). Genotype–phenotype analysis demonstrated that T/T carriers did not exhibit the expected decrease in AT III; instead, a tendency toward increased levels was observed.

Conclusions: Anticoagulant system parameters in CAD are characterized by high variability. Reduced AT III levels may serve as a potential marker in specific subgroups, while TAT shows limited diagnostic value. SERPINC1 polymorphism does not determine the anticoagulant phenotype, supporting the multifactorial nature of hemostatic regulation in CAD.

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CLINICAL AND DIAGNOSTIC SIGNIFICANCE OF NON-INVASIVE EXAMINATION METHODS AND INFLAMMATORY MARKERS IN ASSESSING THE RISK OF EXACERBATION OF ISCHEMIC HEART DISEASE

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Introduction. Coronary plaque destabilization, systemic inflammation, and hypercoagulation are important mechanisms in the exacerbation of ischemic heart disease. The non-invasive nature of this method and its high diagnostic accuracy provide clear practical advantages. Therefore, combined assessment of the results of multispiral computed tomographic angiography of the coronary arteries together with inflammatory markers is highly relevant for determining clinical risk.

Aim. To determine the clinical and diagnostic significance of non-invasive examination methods and inflammatory markers in assessing the risk of exacerbation of ischemic heart disease.

Materials and methods. The study included 35 patients with unstable angina and 38 patients with class III stable angina. All patients underwent clinical, biochemical, coagulological, and instrumental examinations. The coronary arteries were assessed by multispiral computed tomographic angiography, while inflammatory activity was evaluated according to interleukin-1 beta, tumor necrosis factor alpha, the systemic immune-inflammation index, the systemic inflammatory response index, and the neutrophil-to-lymphocyte ratio.

Results. In the main group with unstable angina, systolic arterial pressure was 158.0±3.34 and differed significantly from the comparison group (147.3±2.05) ($p<0.05$). It was also found that the level of low-density lipoproteins was 3.6±0.16 versus 2.5±0.18, and fibrinogen was 398.3±16.96 versus 304.1±11.43; these differences were statistically significant ($p<0.05$). Activated partial thromboplastin time in the main group was 22.6±0.99, indicating more pronounced hypercoagulation than in the comparison group. On multispiral computed tomographic angiography, the total number of atherosclerotic plaques was 5.6±0.05 versus 3.3±0.04, their total volume was 425.4±32.1 versus 233.3±22.3 cubic millimeters, and the total calcium score was 462.9 versus 321.9. The degree of stenosis in the anterior interventricular branch was 56.3% versus 41.4%.

Analysis. When the correlation of tumor necrosis factor with plaque volume, total calcium score, and degree of stenosis was studied, positive moderate and strong correlations were found at r=0.59, r=0.68, and r=0.74. Interleukin-1 beta showed a strong relationship with plaque volume and mass (r=0.84), as well as with the arterial remodeling index (r=0.80). Among the integral markers, the systemic inflammatory response index was the most informative, showing strong positive correlations with the number of affected segments, the degree of stenosis, the arterial remodeling index, and plaque volume and mass, with r=0.80, r=0.75, r=0.85, and r=0.88, respectively.

Conclusion. Comprehensive assessment of multispiral computed tomographic angiography of the coronary arteries and systemic inflammatory markers has high diagnostic significance in identifying the risk of exacerbation of ischemic heart disease. In addition, this combined evaluation makes it possible to optimize treatment and early diagnosis on the basis of an individualized approach to patients and creates a foundation for developing a multifactorial method for disease prognosis.

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IRSTI: 76.29.56; 76.75.75

THE IMPORTANCE OF ELECTRONIC PROGRAMS IN THE MANAGEMENT OF PATIENTS WHO HAVE SUFFERED A MYOCARDIAL INFARCTION

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Introduction. Myocardial infarction remains one of the leading causes of death and disability worldwide. In the post-infarction period, patients need long-term follow-up, strict control of risk factors and high adherence to therapy. The introduction of electronic programs and digital technologies opens up new opportunities to improve the efficiency of patient monitoring, optimize the treatment process and improve the doctor-patient interaction.

Objective. To analyze the effect of electronic programs on the effectiveness of integrated management of patients who have suffered myocardial infarction.

Materials and methods. The study included 120 patients aged 45–75 years with a myocardial infarction. The study consisted of 60 patients who used electronic platforms (mobile applications and telemedicine technologies) to monitor the condition and control treatment. The control group (n=60) received standard medical care. The level of adherence to therapy (using the MMAS-8 scale), blood pressure indicators, the rate of readmission to hospitalization and the quality of life of patients (according to the SF-36 questionnaire), increasing the awareness of patients and their active participation in the treatment process were assessed.

Conclusions. The integration of electronic programs into the patient management system after myocardial infarction significantly increases the effectiveness of therapy, reduces the risk of complications and improves the quality of life. Digital technologies are a promising direction for the development of modern cardiology and require further widespread implementation in clinical practice.

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IRSTI 51.15

ASSOCIATION OF LIPOPROTEIN COMBINE INDEX AND METABOLIC PARAMETERS WITH HYPERTENSION: A CROSS-SECTIONAL STUDY

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Introduction. Hypertension remains a major global health challenge, affecting a large number of adults worldwide, with a substantial proportion of cases remaining undiagnosed. Early identification of reliable metabolic and inflammatory biomarkers may improve risk stratification and prevention strategies. Composite lipid indices, such as the Lipoprotein Combine Index, have emerged as promising predictors of cardiovascular risk.

Aim of the study. The purpose of this study was to investigate the association between hypertension and demographic, clinical, and biochemical parameters, with particular emphasis on evaluating the predictive role of the Lipoprotein Combine Index and selected metabolic markers.

Materials and methods. A cross-sectional analytical study was conducted involving thirty-six participants, of whom twenty-seven had hypertension and nine were non-hypertensive. Demographic, clinical, and biochemical data were collected, including age, body mass index, triglycerides, erythrocyte sedimentation rate, serum sodium, and the Lipoprotein Combine Index. Statistical analysis was performed using descriptive statistics, independent t-tests, chi-square tests, and Pearson correlation analysis. A significance level of p less than 0.05 was considered statistically significant.

Results. Individuals with hypertension demonstrated significantly higher values of the Lipoprotein Combine Index, triglycerides, body mass index, age, and erythrocyte sedimentation rate compared to non-hypertensive participants. The Lipoprotein Combine Index showed the strongest association with hypertension and exhibited an extremely strong positive correlation with triglycerides ($r = 0.887$). Left ventricular hypertrophy was present in 59.3 percent of hypertensive individuals and showed a significant association ($p = 0.002$). Serum sodium showed no statistically significant difference between the groups.

Conclusions. Elevated Lipoprotein Combine Index and triglyceride levels are strongly associated with hypertension and may serve as valuable biomarkers for early risk stratification. The Lipoprotein Combine Index represents a promising, cost-effective tool for identifying individuals at risk, particularly in resource-limited settings. Larger prospective studies are recommended to validate these findings and to establish clinical cut-off values.

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GLYCOCALYX STATUS IN DIFFERENT PHENOTYPES OF CHRONIC HEART FAILURE

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Background. Chronic heart failure (CHF) is currently one of the leading causes of increased morbidity and mortality worldwide. Its different phenotypes—heart failure with preserved ejection fraction (HFpEF), mildly reduced ejection fraction (HFmrEF), and reduced ejection fraction (HFrEF)—differ in clinical course, outcomes, and response to therapy, highlighting the need for a phenotype-specific approach. Evaluation of glycocalyx status across CHF phenotypes is important for a deeper understanding of underlying pathogenetic mechanisms, improving early diagnosis, and developing novel therapeutic strategies.

Objective. To assess the state of the endothelial glycocalyx in different phenotypes of chronic heart failure.

Materials and Methods. The study included 40 patients with chronic heart failure who were treated in the cardiology department of the National Medical Center under inpatient conditions. Patients were divided into three phenotypes based on echocardiographic findings: HFpEF, HFmrEF, and HFrEF. All patients underwent standard laboratory and instrumental examinations. To evaluate endothelial glycocalyx status, the blood level of its biomarker, syndecan-1, was measured using an enzyme-linked immunosorbent assay (ELISA). The obtained data were compared across CHF phenotypes to assess the degree of endothelial dysfunction.

Results. Based on the obtained results, 39 patients with CHF were divided into three groups: HFpEF (n=12), HFmrEF (n=14), and HFrEF (n=13). No significant differences in age or sex distribution were observed among the groups ($p>0.05$). According to echocardiographic analysis, left ventricular ejection fraction was ≥50% in the HFpEF group, 41–49% in the HFmrEF group, and ≤40% in the HFrEF group. Moreover, significantly greater left ventricular dilation and remodeling were observed in the HFrEF group ($p<0.05$). Clinical assessment showed that dyspnea, general weakness, and peripheral edema were more pronounced in the HFrEF group. In contrast, symptoms were relatively mild in the HFpEF group, while the HFmrEF group demonstrated intermediate characteristics. Assessment of endothelial glycocalyx status revealed that syndecan-1 levels were highest in the HFrEF group ($p<0.05$), moderate in the HFmrEF group, and relatively lower in the HFpEF group. Furthermore, a significant correlation was found between glycocalyx status and clinical parameters: increased levels of glycocalyx degradation markers were positively associated with the severity of dyspnea, presence of peripheral edema, and degree of cardiac remodeling ($r>0.5$; $p<0.05$).

Conclusion. The endothelial glycocalyx plays a significant role in the pathogenesis of CHF, and its alterations exhibit phenotype-specific characteristics. Assessment of glycocalyx status is important for phenotype-based stratification of CHF, prediction of disease progression, and optimization of therapeutic strategies aimed at reducing cardiorenal fibrosis.

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APPLICATION OF THE IND-IBS SOFTWARE *КОМПЛЕКС* IN CONDUCTING DYNAMIC MONITORING OF PATIENTS WITH ISCHEMIC HEART DISEASE

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Introduction. In recent years, software technologies and artificial intelligence have increasingly transformed medical practice. These approaches enable the analysis of large-scale datasets—including clinical parameters, electrocardiographic data, and cardiac biomarkers—thereby improving diagnostic accuracy and risk stratification. Machine learning algorithms can identify complex patterns that are not readily detectable using conventional statistical methods [Al'aref S.J. et al., 2020]."

Objective. To assess dynamic changes in patients with stable exertional angina before and after treatment, as well as the time required by physicians to conduct examinations using the Ind-IBS software system.

Materials and Methods. The study included 61 patients with stable exertional angina (functional class I–IV) and chronic heart failure (I–III), with a mean age of 61.5 ± 0.76 years. Patients were divided into two groups: 30 patients were evaluated using the Ind-IBS system, while 31 patients underwent standard examination.

Results. A comparison of examination time between the two groups, depending on the use of the Ind-IBS software, demonstrated a reduction in examination duration in the group where the program was applied. Specifically, the mean examination time in Group 1 was 13 ± 0.4 minutes, whereas in Group 2 it was 16 ± 1.06 minutes. The difference between the groups was 3 ± 1.13 minutes ($p < 0.05$). In addition, the use of the software enabled an objective dynamic assessment of patients' condition during therapy based on quantitative indicators.

At baseline, 24 patients were classified as having stable exertional angina (SEA) functional class (FC) II, 26 patients as FC III, and 11 patients as FC IV. After one month of treatment, repeated assessment using the Ind-IBS system yielded the following results: 27 patients were classified as FC II, 27 patients as FC III, and 8 patients as FC IV. The redistribution of patients across functional classes indicates an improvement in their clinical status during therapy. In particular, 3 patients (11.5%) initially classified as FC III improved to FC II, and 2 patients (18%) initially classified as FC IV improved to FC III. Furthermore, a statistically significant reduction in the total Ind-IBS score was observed after treatment, indicating an overall improvement in patients' clinical condition.

Conclusions. The IND-IBS program is a comprehensive tool suitable for use both in research and in clinical practice, particularly at the primary healthcare level. It enables an objective assessment of the dynamics of patients' condition. Further development of the program is warranted, including the creation of an application incorporating elements of artificial intelligence to provide more accurate and personalized assessment of patients with ischemic heart disease."

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CLINICAL AND METABOLIC PREDICTORS OF ANEMIA IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: A RETROSPECTIVE STUDY

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Introduction. Type 2 diabetes mellitus is a major global health burden, primarily recognized for its devastating microvascular and macrovascular consequences. However, anemia syndrome has recently gained attention as a critical, yet frequently underdiagnosed, comorbidity. The development of anemia in type 2 diabetes mellitus is driven by a complex interplay of chronic inflammation, impaired erythropoietin synthesis, and nutritional deficiencies, often manifesting before significant kidney damage is even present.

Aim. To determine the prevalence of anemia and its clinical and metabolic associations in patients with type 2 diabetes mellitus.

Materials and methods. A retrospective cross-sectional analysis was conducted using the medical records of 300 patients with type 2 diabetes mellitus who received inpatient care at the Endocrinology Department of the National Medical Center throughout 2024. The study population had a mean age of 60.7±8.2 years, consisting of 164 women (54.7%) and 136 men (45.3%). Patients were categorized into two groups based on their hemoglobin levels: an anemic group (n=163) and a non-anemic group (n=137). All data were analyzed with a significance threshold of $p < 0.05$.

Results. The findings revealed that anemia affected 54.3% of the hospitalized patients. Demographic analysis showed that those with anemia were significantly older (63.7±8.1 vs 58.2±7.5 years, $p < 0.05$). Women were disproportionately represented in the anemic group (70.6%), with female sex being a powerful predictor of the condition (Odds Ratio=4.30; 95% Confidence Interval: 2.65–6.98). Clinical data showed that mean hemoglobin was markedly lower in the anemic group (108.6±10.1 g/L) than in the non-anemic group (134.3±8.5 g/L). Furthermore, a strong link was found between poor metabolic control and low blood counts; the anemia group had significantly higher glycated hemoglobin levels (9.9±1.8%) than the non-anemic group (8.5±1.6%,$p < 0.05$). Notably, most patients in both groups maintained relatively preserved kidney function (Chronic kidney diasease stages 1–2). While heart disease was more frequent in the anemic group (87.7%), the difference was not statistically significant.

Conclusion. Anemia is a highly prevalent complication in hospitalized type 2 diabetes mellitus patients and is closely linked to advanced age, female sex, and suboptimal glycemic regulation. Because this syndrome can emerge even in patients with stable kidney function, it should not be viewed merely as a secondary symptom of renal failure. Instead, these results suggest that routine anemia screening must be integrated into standard diabetes care.

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CLINICAL AND BIOCHEMICAL ASSESSMENT OF BMP-2 IN PATIENTS WITH RHEUMATOID ARTHRITIS

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Introduction. Rheumatoid arthritis is a chronic autoimmune disease characterized by systemic inflammation and progressive joint damage leading to the destruction of cartilage and bone tissue. Along with the inflammatory component, disturbances in bone remodeling play an important role in the pathogenesis of the disease. Bone morphogenetic protein-2 (BMP-2) plays a key role in osteoblast differentiation and bone tissue formation, participating in maintaining the balance between bone formation and resorption.

Aim. To assess the level of BMP-2 in patients with rheumatoid arthritis and to determine its relationship with bone mineral density and inflammatory markers.

Materials and Methods. The study was conducted at the multidisciplinary clinic of Tashkent State Medical University. The study included 60 patients over 18 years of age (mean age 49.7 ± 3.4) with a verified diagnosis of rheumatoid arthritis, and 20 apparently healthy individuals. All subjects underwent clinical and laboratory examinations. Serum BMP-2 levels were determined using enzyme-linked immunosorbent assay (ELISA), and bone mineral density (BMD) was measured using dual-energy X-ray absorptiometry (DXA). Correlation analysis was performed between the studied parameters.

Results and Discussion. The study showed that the BMP-2 level in patients with rheumatoid arthritis was 115.2 ± 28.4 pg/ml, which was statistically significantly lower compared to the control group (250.7 ± 36.1 pg/ml; $p < 0.001$). The mean bone mineral density was 1.06 ± 0.12 g/cm². Correlation analysis revealed a moderate positive relationship between BMP-2 level and BMD ($r = 0.46$; $p = 0.003$), confirming the involvement of BMP-2 in the regulation of bone remodeling. This result is consistent with the understanding of BMP-2 as one of the key factors in osteoblast differentiation. Inflammatory activity indicators were: C-reactive protein — 22 ± 6.5 mg/L, erythrocyte sedimentation rate — 17 ± 5.2 mm/h. Analysis of the relationship between BMP-2 and inflammatory markers revealed weak negative correlations (CRP: $r = –0.11$; $p = 0.38$; ESR: $r = –0.08$; $p = 0.44$); however, these relationships did not reach statistical significance ($p > 0.05$).

Conclusions. BMP-2 levels in patients with rheumatoid arthritis are reduced compared to the control group. The findings demonstrate that decreased BMP-2 levels are primarily associated with impaired bone metabolism rather than inflammatory activity. This supports its potential role as a biomarker of bone changes in rheumatoid arthritis.

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COMPARATIVE ANALYSIS OF SILENT AND SYMPTOMATIC MYOCARDIAL ISCHEMIA AFTER CORONARY STENTING

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Introduction. Silent myocardial ischemia (SMI) is frequently observed in elderly patients and those with type 2 diabetes mellitus and often remains undetected due to the absence of typical anginal symptoms. According to current research, the prevalence of SMI in patients with type 2 diabetes ranges from 22% to 41%. Six months after coronary stenting, target vessel ischemia is detected in 23% of patients, and in 62% of cases it is asymptomatic.

Research objective. to perform a comparative analysis of the clinical and instrumental characteristics of silent and symptomatic myocardial ischemia in patients after coronary stenting.

Materials and methods. A retrospective analysis was performed on data from 67 patients who underwent coronary angiography and percutaneous coronary intervention with stenting in 2023-2025. Patients were divided into two groups: silent myocardial ischemia (n=34) and symptomatic (painful) myocardial ischemia (n=33). Age, gender, arterial hypertension, body mass index, degree of coronary artery stenosis, multivessel disease, exercise stress test results, lipid profile, and biochemical markers were assessed. Statistical analysis was conducted using SPSS version 26.0; differences were considered significant at $p<0.05$.

Research results. Patients with silent myocardial ischemia were significantly older (66.4±5.1 vs. 62.8±6.9 years, p=0.036). Arterial hypertension was present in 100% of the silent ischemia group and 94.5% of the symptomatic group. ST-segment depression ≥1 mm on exercise testing was detected in 100% of patients with silent ischemia in the absence of anginal pain; dyspnea was noted in only 24% of cases. Mean body mass index was higher in the silent ischemia group (31.1±4.7 vs. 28.7±5.2 kg/m²). Multivessel coronary artery disease was more frequent in the silent ischemia group (56.5% vs. 47.4%, p=0.046). Total cholesterol levels were significantly higher in the silent ischemia group (6.1±1.1 mmol/L vs. 5.3±0.9 mmol/L, p=0.03).

Conclusions. Silent myocardial ischemia is associated with older age, higher prevalence of multivessel coronary artery disease, and objective signs of ischemia during exercise despite minimal subjective complaints. These features necessitate thorough instrumental evaluation — stress testing and coronary stenosis assessment — for timely optimization of therapy and reduction of cardiovascular complications.

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COMPARATIVE ANALYSIS OF SYSTEMIC ANTIBACTERIAL DRUG FORMULARIES (ATC J01) IN 2006 AND 2026: ASSESSMENT OF STRUCTURAL CHANGES AND RATIONAL USE

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Introduction. The global problem of antimicrobial resistance compels healthcare systems to continuously modernize formularies at the national level. Comparative analysis of the evolution of systemic antibiotics nomenclature according to Anatomical Therapeutic Chemical classification (ATC) J01 allows assessment of changes in therapeutic practice and rational antibiotic use strategies over a 20-year period.

Objective: to assess changes in systemic antibacterial drugs nomenclature and their compliance with principles of rational use during the period 2006-2026 in a multidisciplinary medical organization.

Materials and methods: analysis of formularies from 2006 (14 preparations) and 2026 (25 preparations) was conducted, antibacterial drugs of the ATC J01 group were analyzed, nomenclature, proportions and distribution according to Access, Watch, Reserve (AWaRe) categories were compared.

Results: nomenclature continuity of 57% of preparations was maintained, 6 obsolete preparations (tetracyclines, amphenicols) were excluded and 17 new preparations (fourth-fifth generation cephalosporins, carbapenems) were added. The proportion of beta-lactams increased from 21.4 percent to 44 percent. According to Access, Watch, Reserve (AWaRe) classification, the proportion of ACCESS category preparations decreased from 57.1 percent to 36 percent, while WATCH category increased from 21.4 percent to 40 percent.

Conclusions: formulary modernization reflects adaptation to antimicrobial resistance challenges. However, the decrease in ACCESS preparations proportion from 57.1% to 36% and increase in WATCH preparations proportion from 21.4% to 40% indicates a risk of shift toward broader-spectrum antibacterial drugs and the need for enhanced antimicrobial resistance control.