Proceedings of the 2nd International
Scientific and Practical Conference
«Modern Directions and Movements
in Science»
(April 16-18, 2023).
Luxembourg, Grand Duchy of Luxembourg

No
150

MEDICINE AND PHARMACY

A personalized approach to the prevention of cardiovascular diseases: moving to clinical practice

Korzh Oleksii Mykolayovych[1]

[1] Doctor of Medical Sciences, Professor,
Head of Department of General Practice - Family Medicine;
Kharkiv National Medical University; Ukraine

Abstract. The article presents a number of major updates on the assessment of the risk of cardiovascular complications and the principles of preventive intervention based on the materials of the analyzed clinical recommendations. Previous European guidelines focused on risk stratification and prevention of risk factors, whereas the updated European Society of Cardiology document places great emphasis on personalization and stepwise intervention in clinical practice. When developing a prevention strategy, it is recommended to pay attention not only to gender and age indicators, but also to geographic and ethnic factors. A personalized approach to prevention using a cardiovascular risk score and stepwise selection of treatment are more complex than a general prevention strategy, but they reflect the diversity of patients and their characteristics in clinical practice.
Keywords: *prevention, cardiovascular diseases, personalized approach, risk factors.*

One of the most important achievements of the epidemiology of cardiovascular diseases (CVD) is the discovery of their multifactorial nature and the development of a multifactorial model of total or general risk [1]. In general, coronary heart disease (CHD) and cerebral stroke together rank first in the development of fatal complications [1]. According to the World Health Organization (WHO), the countries of Western Europe belong to the zone of low and medium cardiovascular risk (CVR), while the countries of Eastern Europe remain in the zone of high and very high risk, which requires active interventions, primarily comprehensive measures of primary prevention [2].

Prevention of cardiovascular disasters by reducing the risk of developing CVD is the highest priority in primary prevention [3]. Previous European guidelines focused on risk stratification and prevention of risk factors (RFs), whereas

the updated 2021 document of the European Society of Cardiology places great emphasis on personalization and stepwise intervention in clinical practice [4].

Assessment of cardiovascular risk

According to the new recommendations, it is necessary to assess the risk of CVD not only in practically healthy people, but also in elderly people with diagnosed diseases of the cardiovascular system. In addition, the risk of CVD may also occur in individuals with diabetes mellitus (DM), which allows personalized preventive measures. A similar approach should be taken, in particular, in patients with other diseases, especially in the presence of diabetes, chronic kidney disease (CKD), chronic obstructive pulmonary disease (COPD).

In conditionally healthy people, CVR is perceived as the result of multiple interactions of RFs, and this "multifactoriality" is the basis of CVD prevention. The evaluation of total risk occupies a key place in European recommendations, starting from 2003, when the prognostic model SCORE (Systematic COronary Risk Evaluation) [5] was first presented, developed for European countries of different risk levels and built on the basis of endpoints — fatal cardiovascular events that included all known CVDs of atherosclerotic origin, including aneurysm of the abdominal aorta.

The SCORE scale is a flexible general risk assessment system that has become familiar to every doctor. It is convenient in that if it is impossible to achieve the normalization of the risk indicator by correcting any one factor, you can try to influence other factors, which can lead to a decrease in the total risk. For example, it should not be forgotten that quitting smoking reduces the risk by 50%.

In the updated scale, both fatal and non-fatal events are predicted, which led to an increase in the numerical values of CVR. For the first time, total cholesterol is not used to calculate CVR, but high-density lipoprotein cholesterol, which requires a comprehensive lipidogram.

To assess the 10-year risk of CVD in persons aged 40-69 years, the SCORE2 scale is used, and in the elderly (≥70 years), the SCORE2-OP scale is used. Moreover, the threshold of SSR values in three age categories (<50, 50-69, ≥70 years) has different values [5, 6]. Four risk scales of different gradations are proposed for countries depending on which group they are in: low, medium, high and very high.

MEDICINE AND PHARMACY

It has been established that psychosomatic stress is associated with the risk of CVD caused by atherosclerosis [6]. Social factors also play an important role in the prognosis and development of CVD [7].

During screening, finding out the family anamnesis should be a mandatory point, and the presence of a family burden of premature CVD should be taken into account in the CVD risk assessment [8]. Current data do not support the use of a genomic risk scale to assess CVR in primary prevention. Gradation of CVR in different age groups is different. For example, a low risk at the age of less than 50 years has a value of 2.5%, at the age of 50-69 years - 5%, and at the age of 70 years - 7.5%. According to the new recommendations, correction of risk factors is not required for patients with a low risk of CVR, correction is required for persons with a high CVR, and correction is mandatory for persons with a very high CVR [4].

When developing a prevention strategy, it is recommended to pay attention not only to gender and age indicators, but also to geographic and ethnic factors.

Comorbidity and CVD risk

One of the issues widely discussed in the updated guidelines is the issue of comorbidity and CVD risk. This is due to the fact that the number of patients with concomitant diseases, including those not related to the cardiovascular system, is increasing. When choosing treatment priorities, it is necessary to take into account that the treatment of one disease does not have a negative effect on other concomitant conditions. Treatment of comorbid diseases should be oriented not so much to the disease, but to the patient, that is, personalization is required in each individual case. The updated document considers the principles of prevention of complications in a number of concomitant diseases.

Cancer and CVD have common risk factors. The risk of CVD in patients with oncological diseases is determined not only by the possible cardiotoxicity of chemotherapy, but also by the presence of RFs. Monitoring for signs of left ventricular dysfunction before, during, and after chemotherapy is recommended [9].

CKD is an independent risk factor for the development of CVD, and CVD is the leading cause of death in CKD [10]. All patients with CKD should be screened for CVD, including monitoring of albuminuria. Reduction of albuminuria by approximately 30% against the background of renin-

angiotensin-aldosterone system (RAAS) inhibition is associated with improved cardiovascular and renal outcomes.

COPD is a major risk factor for CVD, including stroke and heart failure (HF) [11]. Patients with COPD are prone to atrial fibrillation (AF), ventricular tachycardia, and sudden cardiac death. All patients with COPD should be screened for CVD. Medicines used to treat COPD are safe for patients with CVD.

Nonalcoholic fatty liver disease is associated with other cardiometabolic risk factors, so screening for other cardiometabolic risk factors is recommended.

Migraine, and especially migraine with aura, is an independent risk factor for stroke and CAD [12]. The risk of ischemic stroke in patients with migraine and aura increases with the use of combined hormonal contraceptives and smoking.

Sleep duration that fluctuates more or less from the optimal value (7 h) is associated with an increased risk of CVD [4].

With CVD, the risk of psychosomatic disorders increases by 2.2 times, which negatively affects the prognosis of patients [13]. On the other hand, symptoms of anxiety and depression are associated with the development of CVD and with a worse prognosis in individuals with existing CVD (coronary artery disease, arterial hypertension, atrial fibrillation, heart failure) [14].

Preeclampsia and pregnancy-related hypertension are associated with a higher risk of CVD. Polycystic ovary syndrome is considered a springboard for further development of DM [4].

Erectile dysfunction (ED) is a predictor of CVD and mortality in men of reproductive age. Men with ED should be assessed for CVD risk [4].

Personalization of treatment goals

Treatment goals also need to be personalized using a stepwise approach. For patients with established CVD, the term residual risk was introduced, which is defined as the risk assessed after initial lifestyle changes and RFs correction [4].

Lifestyle changes are an important method of preventing CVD caused by atherosclerosis. These traditionally include regular physical activity, following a diet and fighting against bad habits [14].

Regular physical activity is the basis of CVD prevention. All adults are recommended to perform aerobic exercise and

MEDICINE AND PHARMACY

reduce a sedentary lifestyle [15].

Diet reduces the risk of cardiovascular and other chronic diseases. The transition from an animal to a plant-based diet can reduce the incidence of CVD [16].

Achieving and maintaining optimal body weight through lifestyle changes has a beneficial effect on key RFs, such as blood pressure (BP), lipids, and glucose metabolism. Drug therapy and bariatric surgery are used in high-risk individuals when lifestyle changes do not provide adequate results [4].

Quitting smoking helps reduce the risk of CVD and is one of the foundations of primary and secondary prevention strategies. There is convincing evidence in favor of the use of drugs: nicotine replacement therapy, bupropion, varenicline and combinations of drugs [17].

Correction of psychosomatic disorders requires an interdisciplinary approach. Improvements in stress symptoms and quality of life have a positive effect on CVD outcomes [7].

Lowering low-density lipoprotein cholesterol (LDL-C) and maintaining target levels prevent CVD. The use of statins, ezetimibe and, if necessary, PCSK9 inhibitors reduces the risk of CVD in proportion to the achieved target level of LDL-C [18]. If the target levels of LDL-C according to the level of risk cannot be achieved, it is necessary to reduce them by ≥50%.

If arterial hypertension is suspected, the diagnosis should be confirmed by repeated office blood pressure measurement or daily blood pressure monitoring. Lifestyle modification is indicated for all patients with hypertension and may delay the need for drug therapy or supplement the effect of antihypertensive therapy.

A multifactorial approach, including lifestyle changes, is important for people with type 2 diabetes (type 2 diabetes). Treatment of hyperglycemia is known to reduce the risk of microvascular complications and, to a lesser extent, the risk of CVD. Glycemic targets should be relaxed in the elderly. New hypoglycemic drugs have shown effectiveness in patients with type 2 diabetes and CVD in combination with heart and/or kidney failure [19, 20].

All patients with established CVD, depending on the clinical condition, require mono or dual antithrombotic therapy. The updated guidelines present new data on antithrombotic therapy regimens for the prevention of CVD

caused by atherosclerosis. In general, the management of CVD risks associated with a specific disease (coronary artery disease, heart failure, cerebrovascular diseases, diseases of the arteries of the lower extremities) requires a multifactorial approach [21, 22].

Application of population approach to CVD prevention

An important section in the prevention of CVD is the population approach. The effectiveness of multifactorial prevention at the level of the state and individual regions has been proven during prospective studies [23]. A population-based approach to the prevention of CVD involves increasing regular physical training among different strata of the adult population, maintaining a diet, combating tobacco smoking, and combating alcohol abuse. These skills should be developed from school age. Schools should practice regular physical training for at least 3 hours a week.

Environmental problems, air pollution and climate change play a special role in the prevention of CVD and other chronic diseases. The impact on the environment has become relevant, since air pollution, in addition to its health consequences, is also considered one of the main factors of climate change.

Conclusions

Thus, a personalized approach to prevention using a CVD risk score and stepwise selection of treatment is more complex than a general prevention strategy, but it reflects the diversity of patients and their characteristics in clinical practice.

During the development of an individual prevention and rehabilitation plan, it is necessary to comprehensively take into account the principles of lifestyle change, psychosocial factors, behavioral and biological indicators, as well as the patient's social status.

References:

[1] Halle M, Davos CH, Dendale P, Papadakis M, Pfaff C, Kra¨nkel N. Future of preventive cardiology: EAPC vision 2020-22. Eur J Prev Cardiol 2021;28:356-358.
[2] Gielen S. The new EAPC core curriculum for preventive cardiology: the keystone of the EAPC transformation. Eur J Prev Cardiol 2022;29:246-250.
[3] Haniffa M, Taylor D, Linnarsson S, Aronow BJ, Bader GD, Barker RA, Camara PG, Camp JG, Che´dotal A, Copp A, Etchevers HC, Giacobini P, Gottgens B, Guo G, Hupalowska A, James KR, Kirby E, Kriegstein A, Lundeberg J, Marioni JC, Meyer KB, Niakan KK, Nilsson M, Olabi B, Pe'er D, Regev A, Rood J, Rozenblatt-Rosen O, Satija R, Teichmann SA, Treutlein B, Vento-Tormo R, Webb S. Human cell atlas

MEDICINE AND PHARMACY

developmental biological network. Nature 2021;597: 196-20.
[4] Visseren FLJ, Mach F, Smulders YM, et al. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J. 2021;42(34):3227-337. doi:10.1093/eurheartj/ehab484.5.
[5] Conroy RM, Pyorala K, Fitzgerald AP, et al. Estimation of tenyear risk of fatal cardiovascular disease in Europe: the SCORE project. Eur H J. 2003;24:987-1003. doi:10.1016/S0195-668X(03)00114-3.
[6] Zeng L, Talukdar HA, Koplev S, Giannarelli C, Ivert T, Gan LM, Ruusalepp A, Schadt EE, Kovacic JC, Lusis AJ, Michoel T, Schunkert H, Bjo¨rkegren JLM. Contribution of gene regulatory networks to heritability of coronary artery disease. J Am Coll Cardiol 2019;73:2946-2957.
[7] Mu¨nzel T, Sørensen M, Lelieveld J, Hahad O, Al-Kindi S, Nieuwenhuijsen M, Giles-Corti B, Daiber A, Rajagopalan S. Heart healthy cities: genetics loads the gun but the environment pulls the trigger. Eur Heart J 2021;42:2422-2438.
[8] Musunuru K., Kathiresan S. Genetics of Common, Complex Coronary Artery Disease. Cell. 2019;177:132-145. Doi: 10.1016/j.cell. 2019.02.015
[9] Armenian S. H., Xu L., Ky B., Sun C., Farol L. T., Pal S. K., Douglas P. S., Bhatia S., Chao C. Cardiovascular Disease Among Survivors of Adult-Onset Cancer: A Community-Based Retrospective Cohort Study. J Clin Oncol. 2016;34:1122-1130. Doi: 10.1200/ JCO.2015.64.0409
[10] GBD Chronic Kidney Disease Collaboration. Global, regional and national burden of chronic kidney disease, 1990-2017: a systematic analysis for the Global Burden of Disease Study.
[11] 2017. Lancet. 2020;395:709-733. Doi: 10.1016/S0140-6736 (20) 30045-3.
[12] Chen W., Thomas J., Sadatsafavi M., FitzGerald J. M. Risk of cardiovascular comorbidity in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. Lancet Respir Med. 2015;3:631-639. Doi: 10.1016/S2213-2600 (15) 00241-6.
[13] Kurth T., Winter A. C., Eliassen A. H., Dushkes R., Mukamal K. J., Rimm E. B., Willett W. C., Manson J. E., Rexrode K. M. Migraine and risk of cardiovascular disease in women: prospective cohort study. BMJ. 2016;353:i2610. Doi: 10.1136/bmj.i2610.
[14] Jha M. K., Qamar A., Vaduganathan M., Charney D. S., Murrough J. W. Screening and Management of Depression in Patients With Cardiovascular Disease: JACC State-of-the-Art Review. J Am Coll Cardiol. 2019;73:1827-1845. Doi: 10.1016/j.jacc.2019.01.041.
[15] Rozanski A. Behavioral cardiology: current advances and future directions. J Am Coll Cardiol. 2014;64:100-110. Doi: 10.1016/j.jacc.2014.03.047
[16] Jakicic J. M., Kraus W. E., Powell K. E., Campbell W. W., Janz K. F., Troiano R. P., Sprow K., Torres A., Piercy K. L., 2018 Physical Activity Guidelines Advisory Committee. Association between Bout Duration of Physical Activity and Health: Systematic Review. Med Sci Sports Exerc. 2019;51:1213-1219. Doi: 10.1249/ MSS.0000000000001933.
[17] Guasch-Ferre M., Satija A., Blondin S. A., Janiszewski M., Emlen E., O'Connor L. E., Campbell W. W., Hu F. B., Willett W. C., Stampfer M. J. Meta-Analysis of Randomized Controlled Trials of Red

Meat Consumption in Comparison With Various Comparison Diets on Cardiovascular Risk Factors. Circulation. 2019;139:1828-1845. Doi: 10.1161/CIRCULATIONAHA.118.035225.

[18] Anthonisen N. R., Skeans M. A., Wise R. A., Manfreda J., Kanner R. E., Connett J. E., Lung Health Study Research Group. The effects of a smoking cessation intervention on 14.5-year mortality: a randomized clinical trial. Ann Intern Med. 2005;142:233-239. Doi: 10.7326/0003-4819-142-4-200502150-00005.

[19] Cholesterol Treatment Trialists' (CTT) Collaboration, Fulcher J., O'Connell R., Voysey M., Emberson J., Blackwell L., Mihaylova B., Simes J., Collins R., Kirby A., Colhoun H., Braunwald E., La Rosa J., Pedersen T. R., Tonkin A., Davis B., Sleight P., Franzosi M. G., Baigent C., Keech A. Efficacy and safety of LDL-lowering therapy among men and women: meta-analysis of individual data from 174,000 participants in 27 randomised trials. Lancet. 2015;385:1397-1405. Doi: 10.1016/S0140-6736 (10) 61350-5.

[20] Ettehad D., Emdin C. A., Kiran A., Anderson S. G., Callender T., Emberson J., Chalmers J., Rodgers A., Rahimi K. Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis. Lancet.2016;387:957-967. Doi: 10.1016/S0140-6736 (15) 01225-8.

[21] Marx N., Davies M. J., Grant P. J., Mathieu C., Petrie J. R., Cosentino F., Buse J. B. Guideline recommendations and the positioning of newer drugs in type 2 diabetes care. Lancet Diabetes Endocrinol. 2021;9:46-52. Doi: 10.1016/S2213-8587 (20) 30343-0.

[22] Knuuti J., Wijns W., Saraste A., Capodanno D., Barbato E., Funck-Brentano C., Prescott E., Storey R. F., Deaton C., Cuisset T., Agewall S., Dickstein K., Edvardsen T., Escaned J., Gersh B. J., Svitil P., Gilard M., Hasdai D., Hatala R., Mahfoud F., Masip J., Muneretto C., Valgimigli M., Achenbach S., Bax J. J., ESC Scientific Document Group. 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes. Eur Heart J. 2020;41:407-477. Doi: 10.1093/eurheartj/ehz425.

[23] Chiarito M., Sanz-Sanchez J., Cannata F., Cao D., Sturla M., Panico C., Godino C., Regazzoli D., Reimers B., De Caterina R., Condorelli G., Ferrante G., Stefanini G. G. Monotherapy with a P2Y12 inhibitor or aspirin for secondary prevention in patients with established atherosclerosis: a systematic review and meta-analysis. Lancet. 2020;395:1487-1495. Doi: 10.1016/S0140-6736 (20) 30315-9.

[24] Oldridge N, Hofer S, McGee H, Saner H. Evaluation of health-related quality of life in cardiovascular research: a call for action. Eur J Prev Cardiol 2022;29:e79-e81.