# DESCRIPTION OF COURSE UNIT FOR DOCTORAL STUDIES
## AT VILNIUS UNIVERSITY

| Scientific Area/eas, Field/ds of Science | Medical and Health Sciences (M 000): Medicine (M 001) | | | |
|---|---|---|---|---|
| **Faculty, Institute, Department/Clinic** | Medical faculty<br>Institute of Clinical Medicine<br>Clinic of Cardiovascular Diseases | | | |
| **Course unit title** (ECTS credits, hours) | **Diagnostic Methods for Early Manifestations of Atherosclerosis**<br>8 credits (212 hours) | | | |
| **Study method** | Lectures | Seminars | Consultations | Self-study |
| Number of ECTS credits | - | - | 2 | 6 |
| **Method of the assessment** (in 10 point system) | Oral exam, 3 questions | | | |

## PURPOSE OF THE COURSE UNIT

To familiarize with the mechanisms of atherosclerosis development, complications of atherosclerosis, to provide profound insight about non-invasive diagnostic methods of early forms of atherosclerosis, cardiovascular risk factors. Provide information about prevention of the cardiovascular system diseases, its benefits, analyze the epidemiological situation of cardiovascular diseases and also about specialized program "Financing of measures for the selection and prevention of persons belonging to the high-risk group of cardiovascular diseases". To get acquainted with dyslipidemias, to learn the interpretation of lipid changes and the goals of treatment of dyslipidemias.

## THE MAIN TOPICS OF COURSE UNIT

- **Normal arterial wall -** layers, endothelial cells, smooth muscle cells, extracellular matrix. Endothelium and its function (structural and functional heterogeneity, endothelium-derived vasoactive substances). Causes and mechanisms of endothelial dysfunction. The role of nitric oxide in the pathogenesis of endothelial dysfunction (production of nitric oxide in the endothelium, targets and mechanisms of its action, its degradation in the endothelium, influence of risk factors on nitric oxide metabolism).
- **Arterial wall affected by atherosclerosis** – fatty streaks, endothelial dysfunction, impaired lipoprotein transport, leukocyte involvement, formation of mast cells.
- **Atherosclerotic plaque progression pathways** – plaque progression (growth), rupture of atherosclerotic plaque. Atherosclerotic plaque lipid pool, target organ damage.
- **Prevention of cardiovascular disease.** Epidemiological situation of cardiovascular diseases in Lithuania, Europe and the world. "Financing of measures for the selection and prevention of persons belonging to the high-risk group of cardiovascular diseases"in Lithuania.
- **Risk factors for atherosclerosis, biomarkers of cardiovascular risk.** Modified traditional risk factors include dyslipidemia (various types), smoking, hypertension, diabetes and metabolic syndrome, and physical immobility. Unmodified risk factors - old age, male gender, congenital - genetic factors. *FRAMINGHAM, SCORE2, PROCAM* scale for risk assessment. Biomarkers of cardiovascular risk include lipoprotein (a), C-reactive protein, and other inflammatory markers.

- **Review of dyslipidemias, principles of treatment**. Brief history of dyslipidemias, pathophysiological mechanisms, epidemiological data. Etiology and classification of dyslipidemias. Diagnosis of dyslipidemias - interpretation and efficiency of standard lipidogram in clinical practice. Importance and significance of other lipid parameters in clinical practice. Interpretation of dyslipidemia in clinical practice. Explanation of severe familial dyslipidemias - familial mixed dyslipidemia, heterozygous and homozygous forms of familial dyslipidemia. Treatment of dyslipidemia - non-pharmacological, treatment with statins, PCSK inhibitors, fibrates, omega fatty acid preparations. The problem of dyslipidemia in Lithuania. Objectives for the treatment of dyslipidemias.

- **Mechanisms of arterial hypertension, diagnosis, prevention and principles of treatment.** Definition of arterial hypertension, pathophysiological mechanisms. Classifications of arterial hypertension. Classification of arterial blood pressure. Principles of measuring arterial blood pressure in a doctor's office and at home. 24 hours blood pressure monitoring. Early and late damage of target organs. Co-morbidities complicating the course and prognosis of hypertensive patients. Cardiovascular risk categories in arterial hypertension. Aims to reduce arterial blood pressure. Non-pharmacological treatment of arterial hypertension. The main and additional groups of antihypertensive drugs. Administration of multiple (multi-drug) preparations in one tablet. Trends in the control of arterial hypertension in Lithuania, Europe and the world.

- **Instrumental diagnosis of early atherosclerosis.** The concept of early vascular aging. Methods for studying vascular function and structure. Clinical evaluation of arterial stiffness. Local, regional and systemic measurement of arterial stiffness, measurement and significance of pulse wave velocity. The most important parameters of applanation tonometry, their significance. Arterial stiffness and cardiovascular risk: key clinical studies. Influence of drugs on arterial stiffness. Clinical evaluation of endothelial function. Ultrasound measurement of carotid artery intima - media thickness, detection of atherosclerotic plaques in arteries. Ankle brachial index. Computed tomography angiography of coronary arteries and determination of calcium index, evaluation of results, its significance. Magnetic resonance angiography. Intravascular ultrasound, coherent tomography, and near-infrared spectroscopy. Discussion and application of high-risk patient identification methodology in clinical practice. The role of arterial markers in the cardiovascular disease prevention program.

## RECOMMENDED LITERATURE SOURCES

1. Visseren FLJ, Mach F, Smulders YM, et al. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J. 2021; 42: 3227–337.
2. Mach F, Baigent C, Catapano AL. 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS). European Heart Journal 2020; 41:111-188.
3. Nilsson P, Olsen M, Laurent S. Early vascular aging (EVA): new directions in cardiovascular protection. 1st ed. Academic Press, 2015.
4. Gielen S, De Backer G, Piepoli M, Wood D. The ESC textbook of preventive cardiology. Oxford University Press, USA, 2015.
5. Tarkin JM., Dweck MR, Evans NR, et al. Imaging atherosclerosis. Circulation research 2016; 118: 750-769.
6. Manual of Cardiovascular Medicine. EDITOR Thomas Lüscher. Oxford University Press, Incorporated, 2021.
7. Cosentino C, Grant PJ, Aboyans V et al. 2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD. European Heart Journal (2020) 41, 2553232

8. Current Diagnosis and Treatment Cardiology. 5th ed. by M. Crawford.McGraw-Hill/Appleton & Lange, 2014.

9. David G., Lloyd-Jones D.M., Bennett G., et al. 2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk. A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014; 63(25PA).

10. Stone N.J., Robinson J.G., Lichtenstein A.H, et al. 2013 ACC/AHA Guideline onthe Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults. A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014 Jul1; 63(25_PA):2889-2934.

11. Jensen MD, Ryan DH, Apovian CM, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. J Am Coll Cardiol. 2014; 63(25 Pt B):2985–3023.

12. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine / Mann D., Zipes D., Libby P., Bonow R. – 10th ed. Elsevier Inc., 2015

13. Palombo C., Kozakova M. Arterial stiffness, atherosclerosis and cardiovascular risk: Pathophysiologic mechanisms and emerging clinical indications. Vascular Pharmacology 2016; 77:1–7.

14. Agarwala A., Virani S., Couper D. Biomarkers and degree of atherosclerosis are independently associated with incident atherosclerotic cardiovascular disease in a primary prevention cohort: The ARIC study. Atherosclerosis 2016; 253:156-163.

15. Therapeutic Lipidology Edited **by** Michael H. Davidson, Peter P. Toth, Kevin C. Maki. 2021.

16. Orringer CE, Blaha MJ, Blankstein R et al. The National Lipid Association Scientific Statement on Coronary Artery Calcium Scoring to Guide Preventive Strategies for ASCVD Risk Reduction. Journal of Clinical Lipidology, 2020; 15:33-60.

17. Hecht H, Blaha MJ, Berman DS et al. Clinical indications for coronary artery calcium scoring in asymptomatic patients: Expert consensus statement from the Society of Cardiovascular Computed Tomography. Journal of Cardiovascular Computed Tomography 11 (2017) 157e168.

18. Laucevičius A., Rinkūnienė E., Ryliškytė L., Kasiulevičius V., Jatužis D., Petrulionienė Ž., Badarienė J., Navickas R., Jucevičienė A., Kutkienė S., Solovjova S., Andrejevaitė V., Lisauskienė I., Zupkauskienė J., Puronaitė R., Gurevičius R., Mykolaitytė J. Primary prevention strategy for cardiovacular disease in Lithuania. („A Funding Programme for the Screening and Preventive Management of the High Cardiovascualar Risk Individuals"– main results: 2006-2017 years). Seminars in Cardiovascular Medicine 2019; 25: 14-39.

## CONSULTING LECTURERS

1. <u>Coordinating lecturer:</u> Aleksandras Laucevičius (Prof. Habil. Dr.).
2. Žaneta Petrulionienė (Prof. Dr. HP).
3. Ligita Ryliškytė (Dr.).
4. Jolita Badarienė (Dr.).
5. Egidija Rinkūnienė (Dr.).

**APPROVED:**

By Council of Doctoral School of Medicine and Health Sciences at Vilnius University: 29th of September 2022

Chairperson of the Board: Prof. Janina Tutkuvienė