CARDIAC REHABILITATION AND RISK MANAGEMENT OF COMPLICATIONS IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

Tanya Popova
Medical University-Sofia, Bulgaria, Faculty of Public Health, Department of Health Care, Sofia, Bulgaria, t.popova@foz.mu-sofia.bg
Dimitrina Blagoeva
Medical University-Sofia, Bulgaria, Faculty of Public Health, Department of Health Care, Sofia, Bulgaria, d.jordanova@foz.mu-sofia.bg

Abstract: The World Health Organization qualifies Bulgaria as a country with a very high risk of mortality due to cardiovascular diseases. To overcome this negative statistic, effective primary prevention and motivation to change the behavior and lifestyle of the population is needed. Effective coordination and collaboration between primary care facilities, Emergency Medical Centers and 24/7 interventional facilities is important. After that, in order to reduce future complications and an unfavorable outcome of the disease, it is necessary to carry out effective cardiac rehabilitation. Cardiac rehabilitation is defined as a multidisciplinary approach, including effective management and control of risk factors, health education, counseling and providing psychological support to cardiac patients. The aim of the study is to analyze the existing clinical guidelines for cardiac rehabilitation and, based on the scientific data, to summarize the need to develop a Model for the management of the risk of complications in patients with acute myocardial infarction, intended for health care professionals. Materials and methods: For this purpose, a documentary method was used and the specialized medical literature concerning the studied problem was studied. Based on keywords (cardiorehabilitation, secondary prevention of cardiovascular diseases, risk prevention after experienced myocardial infarction, a model for prevention and risk management in acute myocardial infarction, Guidelines for the management of acute myocardial infarction) we performed a systematic search in electronic databases and systematized the materials found. Findings and conclusion: There is convincing evidence in the scientific literature for the importance of conducting cardiac rehabilitation in order to prevent future complications, and the involvement of nurses and their benefit has been proven positive. There is a need to develop a risk management model that combines the separate elements of conducting cardiac rehabilitation in patients with acute myocardial infarction and is in line with the modern recommendations of the European Society of Cardiology for conducting cardioprophylaxis.
Keywords: cardiac rehabilitation, acute myocardial infarction, risk, management

1. INTRODUCTION

The recommendations of the European Society of Cardiology for the prevention of cardiovascular diseases for 2019 and 2021 report the qualification of the World Health Organization in four main groups of countries depending on the mortality rates from diseases of the cardiovascular system. Bulgaria is far from low, moderate and high risk countries and falls into the black statistics by being defined as a very high risk country or one with ≥300 cardiovascular deaths per 100,000 people, along with countries such as Romania, Serbia , Syria, Macedonia, Montenegro, Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Kyrgyzstan, Latvia, Lithuania, etc. (Visseren, Mach, Smulders, Carballo, Koskinas, Bäck, Benetos, Biffi, Boavida, Capodanno, Cosyns, Crawford, Davos, Desormais, Di Angelantonio, Franco, Halvorsen, Hobbs, Hollander, Jankowska, … ESC Scientific Document Group, 2021, 3227–3337; Младенова, Господинов, Попов, Тишева, 2022, 22-29).

To overcome this negative statistic, effective primary prevention and motivation to change the behavior and lifestyle of the population is needed. (Попова, Димитрова, Благоева, 2023, 33-39; Todorova, Petrova, 2016, p.147; Todorova, Petrova, 2018, p.463; Ninova, 2020, 743-748). Effective coordination and collaboration between primary care facilities, Emergency Medical Centers and 24/7 interventional facilities is important. It is recommended that the transfer of the patient skips the emergency department and that he be immediately introduced to a catheterization laboratory in order to perform percutaneous coronary intervention, and if this is not possible, to perform fibrinolysis, within less than 12 hours from the onset of symptoms. (Ibanez, James, Agewall, Antunes, Bucciarelli-Ducci, Bueno, Caforio, Crea, Goudevenos, Halvorsen, Hindricks, Kastrati, Lenzen, Prescott, Roffi, Valgimigli, Varenhorst, Vranckx, Widimský, ESC Scientific Document Group, 2018, 119–177; Нинова, 2008, 35-37).

After that, in order to reduce future complications and an unfavorable outcome of the disease, it is necessary to carry out effective cardiac rehabilitation. Cardiac rehabilitation is defined as a multidisciplinary approach, including effective management and control of risk factors, health education, counseling and providing psychological support

to cardiac patients (Ambrosetti, Abreu, Corrà, Davos, Hansen, Frederix, Iliou, Pedretti, Schmid, Vigorito, Voller, Wilhelm, Piepoli, Bjarnason-Wehrens, Berger, Cohen-Solal, Cornelissen, Dendale, Doehner, Gaita, Zwisler, 2021, 460–495).

2. AIM

The aim of the study is to analyze the existing clinical guidelines for cardiac rehabilitation and, based on the scientific data, to justify the need to develop a Model for the management of the risk of complications in patients with acute myocardial infarction, intended for health care professionals.

3. MATERIALS AND METHODS

For this purpose, a documentary method was used and the specialized medical literature concerning the studied problem was studied. Based on keywords (cardiorehabilitation, secondary prevention of cardiovascular diseases, risk prevention after experienced myocardial infarction, a model for prevention and risk management in acute myocardial infarction, Guidelines for the management of acute myocardial infarction) we performed a systematic search in electronic databases and systematized the materials found. The most relevant are the 2017 European Society of Cardiology – ESC Guidelines for the management of acute ST-segment elevation myocardial infarction, the 2019 ESC/EAS Guidelines for the management of dyslipidemias: lipid modification with aim to reduce cardiovascular risk, ESC 2020 Recommendations on Sports Cardiology and Exercise in Patients with Cardiovascular Disease, ESC 2020 Recommendations on Behavior in Acute Coronary Syndromes in Patients Presenting Without Persistent ST-Elevation, Secondary Prevention by comprehensive cardiovascular rehabilitation – European Society of Preventive Cardiology document (2020), ESC Recommendations for the prevention of cardiovascular disease in clinical practice (2021).

4. RESULTS AND DISCUSSION

Acute myocardial infarction (AMI) survivors are at very high risk of recurrent ischemic cardiovascular events, especially in the first year after AMI. This risk requires active monitoring, control, lifestyle changes and adequate treatment and correction of risk factors (Krychtiuk, Ahrens, Drexel, Halvorsen, Hassager, Huber, Kurpas, Niessner, Schiele, Semb, Sionis, Claeys, Barrabes, Montero, Sinnaeve, Pedretti, Catapano, 2022, 939–949).

Smoking is an indisputable risk factor for AMI. It is a harbinger of a poor prognosis in patients, especially those who continue to smoke after the cardiovascular event. It has a strong prothrombotic effect and its discontinuation is the cheapest and most effective method of prevention. The first step to quit smoking is already done when the patient is admitted for AMI, because he does not have the opportunity and/or is not able to smoke. After discharge from the hospital, the patient must be strongly motivated to continue the process of quitting smoking (Ibanez, James, Agewall, Antunes, Bucciarelli-Ducci, Bueno, Caforio, Crea, Goudevenos, Halvorsen, Hindricks, Kastrati, Lenzen, Prescott, Roffi, Valgimigli, Varenhorst, Vranckx, Widimský, ESC Scientific Document Group, 2018, 119–177). Medical professionals can use pre-prepared statistics and visualization of the risks of smoking after a coronary event to motivate and long-term smoking cessation. A good example of this is the data published in the 2017 ESC Guidelines for Management of Acute ST-Elevation Myocardial Infarction, which reported a 36% reduction in mortality among those who quit smoking. Prescription pharmacotherapy and use of electronic cigarettes during the period of dependence are also recommended (Ibanez, James, Agewall, Antunes, Bucciarelli-Ducci, Bueno, Caforio, Crea, Goudevenos, Halvorsen, Hindricks, Kastrati, Lenzen, Prescott, Roffi, Valgimigli, Varenhorst, Vranckx, Widimský, ESC Scientific Document Group, 2018, 119–177).

The evidence regarding the need for pharmacologic treatment of blood lipids is compelling, unequivocal, and repeatedly demonstrated. High levels of low-density lipoprotein (LDL-cholesterol) reduce the risk of atherosclerosis and cardiovascular disease, and untreated AMI patients are also associated with an increased risk of future vascular complications (Ibanez, James, Agewall, Antunes, Bucciarelli-Ducci, Bueno, Caforio, Crea, Goudevenos, Halvorsen, Hindricks, Kastrati, Lenzen, Prescott, Roffi, Valgimigli, Varenhorst, Vranckx, Widimský, ESC Scientific Document Group, 2018, 119–177; Krychtiuk, Ahrens, Drexel, Halvorsen, Hassager, Huber, Kurpas, Niessner, Schiele, Semb, Sionis, Claeys, Barrabes, Montero, Sinnaeve, Pedretti, Catapano, 2022, 939–949; Гочева, Аврамов, Георгиев, Байчева, 2008, 1-6). Pharmacological treatments affect cholesterol synthesis in the liver and reduce LDL-cholesterol levels, but also have anti-inflammatory and antioxidant effects, potentially important for cardiovascular risk and complications (Mach, Baigent, Catapano, Koskinas, Casula, Badimon, De Backer, Delgado, Ference, Graham, Halliday, Landmesser, Mihaylova, Pedersen, Riccardi, Richter, Sabatine, Taskinen, Tokgozoglu, ESC Scientific Document Group 2020, 111–188).

The large National Registry of Myocardial Infarction study assessed the risk for patients with AMI when statin therapy was interrupted. In patients who received a statin before the vascular incident and it was interrupted for 24

hours at the beginning of hospitalization, an increased risk of in-hospital death, heart failure, pulmonary edema, arrhythmias, cardiogenic shock was demonstrated, compared with the continuous regimen. The study authors reported that the risk for patients with interrupted therapy was similar to those who did not receive it. In their publication, N. Gocheva and co-authors indicate some of the reasons why patients do not take or stop taking antilipemic agents. Although rare, the causes can be rooted in manifestations of adverse reactions - hepatotoxicity, muscle weakness, myalgias, myositis. The reason may be the development of rhabdomyolysis, which is a severe form of statin-induced muscle damage characterized by muscle pain, sometimes with the appearance of muscle necrosis and myoglobinuria, which can lead to kidney failure and death (Mach, Baigent, Catapano, Koskinas, Casula, Badimon, De Backer, Delgado, Ference, Graham, Halliday, Landmesser, Mihaylova, Pedersen, Riccardi, Richter, Sabatine, Taskinen, Tokgozoglu, ESC Scientific Document Group 2020, 111–188; Гочева, Аврамов, Георгиев, Байчева, 2008, 1-6). Other reasons may be the impossibility or reluctance to carry out long-term treatment, as well as the sometimes high cost of medication. Discontinuation of statins may sharply increase the risk of cardiovascular events in patients with known coronary artery disease. Reasons put forward are the rapid exhaustion of the vascular protective effect of the statin and an increase in platelet activity (Гочева, Аврамов, Георгиев, Байчева, 2008, 1-6).

K. A. Krychtiuk and co-authors point to possible inadequate control of blood lipids as reasons for minor or missing adjustments of therapy after discharge of patients, inertia of prescription, delay, gaps in care or lack of follow-up of patients at home and in the transition from the hospital to home, lack of communication with patients and uncoordinated support (Krychtiuk, Ahrens, Drexel, Halvorsen, Hassager, Huber, Kurpas, Niessner, Schiele, Semb, Sionis, Claeys, Barrabes, Montero, Sinnaeve, Pedretti, Catapano, 2022, 939–949).

These data indicate the need to inform patients of the need for continued drug therapy, control of blood cholesterol levels and change and/or discontinuation of treatment only as prescribed by a supervising cardiologist, and to give instructions and advice on non-pharmacological means of managing lipids in the blood.

Physical exercise, as part of cardiac rehabilitation, leads to a reduction in cardiovascular mortality and the number of rehospitalizations. They positively affect total cholesterol and triglycerides in the blood, systolic blood pressure values, reduce the number of cigarettes smoked in smokers and significantly improve the quality of life. They also have a beneficial effect on patients' anxiety, which is a common phenomenon after a vascular accident. As part of cardiac rehabilitation, physical activity is carried out through the Physical Exercise Program, which is prepared by specific specialists. The program requires consideration of age, capabilities, limitations, and activity level prior to the heart attack (Anderson, Oldridge, Thompson, Zwisler, Rees, Martin, Taylor, 2016, 1–12; Ibanez, James, Agewall, Antunes, Bucciarelli-Ducci, Bueno, Caforio, Crea, Goudevenos, Halvorsen, Hindricks, Kastrati, Lenzen, Prescott, Roffi, Valgimigli, Varenhorst, Vranckx, Widimský, ESC Scientific Document Group, 2018, 119–177; Pelliccia, Sharma, Gati, Bäck, Börjesson, Caselli, Collet, Corrado, Drezner, Halle, Hansen, Heidbuchel, Myers, Niebauer, Papadakis, Piepoli, Prescott, Roos-Hesselink, Graham Stuart, Taylor, ESC Scientific Document Group, 2021, p.42; Taylor, Brown, Ebrahim, Jolliffe, Noorani, Rees, Skidmore, Stone, Thompson, Oldridge, 2004, 682–692). Exercise-based cardiac rehabilitation in post-AMI patients should begin 8-12 weeks after dehospitalization (Pelliccia, Sharma, Gati, Bäck, Börjesson, Caselli, Collet, Corrado, Drezner, Halle, Hansen, Heidbuchel, Myers, Niebauer, Papadakis, Piepoli, Prescott, Roos-Hesselink, Graham Stuart, Taylor, ESC Scientific Document Group, 2021, p.42).

In order for cardiac rehabilitation to be successful, it is important for patients and their families to build trust in medical professionals. For a favorable outcome of the disease, they need to be motivated to cooperate and actively participate in the process of prevention and lifestyle change in order to limit the risk of complications (Тодорова, 2018, 1171-1176). Lifestyle change is central to cardioprevention. More than half of the mortality from cardiovascular diseases is due to the correctable risk factors - high values of serum lipids, high blood pressure and smoking (Mach, Baigent, Catapano, Koskinas, Casula, Badimon, De Backer, Delgado, Ference, Graham, Halliday, Landmesser, Mihaylova, Pedersen, Riccardi, Richter, Sabatine, Taskinen, Tokgozoglu, ESC Scientific Document Group, 2020, 111–188). The European Society of Cardiology recommends building a multidisciplinary preventive program and maintaining close collaboration between a cardiologist, general practitioner, nurses, nutritionists, psychologists, pharmacists in order to reduce complications and improve the quality of life of patients (Collet, Thiele, Barbato, Barthélémy, Bauersachs, Bhatt, Dendale, Dorobantu, Edvardsen, Folliguet, Gale, Gilard, Jobs, Jüni, Lambrinou, Lewis, Mehilli, Meliga, Merkely, Mueller, ESC Scientific Document Group, 2021, 1289–1367; Ibanez, James, Agewall, Antunes, Bucciarelli-Ducci, Bueno, Caforio, Crea, Goudevenos, Halvorsen, Hindricks, Kastrati, Lenzen, Prescott, Roffi, Valgimigli, Varenhorst, Vranckx, Widimský, ESC Scientific Document Group, 2018, 119–177; Visseren, Mach, Smulders, Carballo, Koskinas, Bäck, Benetos, Biffi, Boavida, Capodanno, Cosyns, Crawford, Davos, Desormais, Di Angelantonio, Franco, Halvorsen, Hobbs, Hollander, Jankowska, ESC Scientific Document Group, 2021, 3227–3337). The multidisciplinary preventive program is a quality indicator of health care for patients

with coronary disease. One of the quality indicators is their satisfaction, which is measured on the basis of patient feedback and the systematic collection of data on vascular disease (medical follow-up, benefits and risks of treatment, providing information about the patient's behavior in case of recurrence of symptoms) (Collet, Thiele, Barbato, Barthélémy, Bauersachs, Bhatt, Dendale, Dorobantu, Edvardsen, Folliguet, Gale, Gilard, Jobs, Jüni, Lambrinou, Lewis, Mehilli, Meliga, Merkely, Mueller, ESC Scientific Document Group, 2021, 1289–1367). The role of nurses in cardioprevention and cardiorehabilitation is described in the European recommendations for prevention and behavior in patients with cardiovascular diseases (Ambrosetti, Abreu, Corrà, Davos, Hansen, Frederix, Iliou, Pedretti, Schmid, Vigorito, Voller, Wilhelm, Piepoli, Bjarnason-Wehrens, Berger, Cohen-Solal, Cornelissen, Dendale, Doehner, Gaita, Zwisler, 2021, 460–495; Collet, Thiele, Barbato, Barthélémy, Bauersachs, Bhatt, Dendale, Dorobantu, Edvardsen, Folliguet, Gale, Gilard, Jobs, Jüni, Lambrinou, Lewis, Mehilli, Meliga, Merkely, Mueller, ESC Scientific Document Group, 2021, 1289–1367; Ibanez, James, Agewall, Antunes, Bucciarelli-Ducci, Bueno, Caforio, Crea, Goudevenos, Halvorsen, Hindricks, Kastrati, Lenzen, Prescott, Roffi, Valgimigli, Varenhorst, Vranckx, Widimský, ESC Scientific Document Group, 2018, 119–177; Krychtiuk, Ahrens, Drexel, Halvorsen, Hassager, Huber, Kurpas, Niessner, Schiele, Semb, Sionis, Claeys, Barrabes, Montero, Sinnaeve, Pedretti, Catapano, 2022, 939–949; Visseren, Mach, Smulders, Carballo, Koskinas, Bäck, Benetos, Biffi, Boavida, Capodanno, Cosyns, Crawford, Davos, Desormais, Di Angelantonio, Franco, Halvorsen, Hobbs, Hollander, Jankowska, ESC Scientific Document Group, 2021, 3227–3337; Препоръки на ESC 2017). The important functions of nurses in the prevention of diseases are reported in a number of Bulgarian and foreign publications (Popova Stambolova, 2019, 1117-1124; Богданова, Благоева, Георгиева, Чанева, 2015, 209-213; Димитрова, Чанева, 2020, 32-36; Иванова, 2014; Иванова, Чанева, 2016, 38-41; Петрова, 2020, 76-98; Попова, Василева, Терзиева, 2021, 169-173; Стамболова, 2019, 34-38; Тодорова, 2018, 1171-1176).

In one of the series of scientific works in the field of health care for patients with cardiovascular diseases, D. Ivanova proposes an organizational model for nursing care for patients with AMI. The model emphasizes the organization of care for patients with AMI during the hospital stay (admission of the patient, completion of hospital documentation, co-morbidities, transport to the intensive care unit and invasive unit, monitoring of indicators, necessary nursing care and research, emotional support, as well as pain assessment in AMI patients). The author also points out the need for health education, communication with the patient and prevention of future complications (Иванова, 2014). In a study by D. Ivanova and G. Chaneva, it is said that almost half of heart patients have no information and cannot deal with possible future complications (Иванова, Чанева, 2016, 38-41). M. Trešlová and co-authors highlight the leading role of medical professionals in preventive cardiology and conducting health education, education and motivation of patients to lead a healthy lifestyle (Trešlová, Šedová, Bártlová, Tóthová, Chloubová, 2017, e86-92). M. Todorova defines motivation and adherence to the prescribed treatment as the main factors in achieving positive results in cardioprophylaxis. The author proposes approaches to optimize prevention consisting of sending telephone messages to patients and using an automated system of mobile operators to remind them of an upcoming element of prevention in order to achieve good control of risk factors in patients with ischemic heart disease (IHD) and AMI (Тодорова, 2018, 1171-1176).

5. FINDINGS AND CONCLUSION

In the scientific literature, there are convincing data on the benefit of conducting cardiac rehabilitation in order to prevent future complications in patients with IHD and experienced AMI. A number of prominent health care and public health scholars have identified the essential role of the nurse in health promotion and disease prevention. There is a need to develop a risk management model that combines the separate elements of conducting cardiac rehabilitation in patients with AMI and is in line with the modern recommendations of the European Society of Cardiology for conducting cardioprophylaxis.

ACKNOWLEDGEMENTS

This research was supported by the Bulgarian Ministry of Education and Science under the National Program "Young scientists and Postdoctoral Students – 2"

REFERENCES

Ambrosetti, M., Abreu, A., Corrà, U., Davos, C. H., Hansen, D., Frederix, I., Iliou, M. C., Pedretti, R. F. E., Schmid, J. P., Vigorito, C., Voller, H., Wilhelm, M., Piepoli, M. F., Bjarnason-Wehrens, B., Berger, T., Cohen-Solal, A., Cornelissen, V., Dendale, P., Doehner, W., Gaita, D., & Zwisler, A. O. (2021). Secondary prevention through comprehensive cardiovascular rehabilitation: From knowledge to implementation. 2020 update. A position paper from the Secondary Prevention and Rehabilitation Section of the European Association of

Preventive Cardiology. *European journal of preventive cardiology*, *28*(5): 460–495. https://doi.org/10.1177/2047487320913379

Anderson, L., Oldridge, N., Thompson, D. R., Zwisler, A. D., Rees, K., Martin, N., & Taylor, R. S. (2016). Exercise-Based Cardiac Rehabilitation for Coronary Heart Disease: Cochrane Systematic Review and Meta-Analysis. *Journal of the American College of Cardiology*. *67*(1): 1–12. https://doi.org/10.1016/j.jacc.2015.10.044

Collet, J. P., Thiele, H., Barbato, E., Barthélémy, O., Bauersachs, J., Bhatt, D. L., Dendale, P., Dorobantu, M., Edvardsen, T., Folliguet, T., Gale, C. P., Gilard, M., Jobs, A., Jüni, P., Lambrinou, E., Lewis, B. S., Mehilli, J., Meliga, E., Merkely, B., Mueller, C., … ESC Scientific Document Group (2021). 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *European heart journal*. 42(14): 1289–1367. https://doi.org/10.1093/eurheartj/ehaa575

Ibanez, B., James, S., Agewall, S., Antunes, M. J., Bucciarelli-Ducci, C., Bueno, H., Caforio, A. L. P., Crea, F., Goudevenos, J. A., Halvorsen, S., Hindricks, G., Kastrati, A., Lenzen, M. J., Prescott, E., Roffi, M., Valgimigli, M., Varenhorst, C., Vranckx, P., Widimský, P., & ESC Scientific Document Group (2018). 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *European heart journal*. *39*(2): 119–177. https://doi.org/10.1093/eurheartj/ehx393

Krychtiuk, K. A., Ahrens, I., Drexel, H., Halvorsen, S., Hassager, C., Huber, K., Kurpas, D., Niessner, A., Schiele, F., Semb, A. G., Sionis, A., Claeys, M. J., Barrabes, J., Montero, S., Sinnaeve, P., Pedretti, R., & Catapano, A. (2022). Acute LDL-C reduction post ACS: strike early and strike strong: from evidence to clinical practice. A clinical consensus statement of the Association for Acute CardioVascular Care (ACVC), in collaboration with the European Association of Preventive Cardiology (EAPC) and the European Society of Cardiology Working Group on Cardiovascular Pharmacotherapy. *European heart journal. Acute cardiovascular care*. *11*(12): 939–949. https://doi.org/10.1093/ehjacc/zuac123

Mach, F., Baigent, C., Catapano, A. L., Koskinas, K. C., Casula, M., Badimon, L., Chapman, M. J., De Backer, G. G., Delgado, V., Ference, B. A., Graham, I. M., Halliday, A., Landmesser, U., Mihaylova, B., Pedersen, T. R., Riccardi, G., Richter, D. J., Sabatine, M. S., Taskinen, M. R., Tokgozoglu, L., ESC Scientific Document Group (2020). 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk. *European heart journal*. *41*(1): 111–188. https://doi.org/10.1093/eurheartj/ehz455

Ninova, M. (2020). Knowledge and application of medikal devices for the prevention of hai by health care professionals. *Knowledge – International Journal.* Vol. 42.4: 743-748. ISSN 1857-923X.

Pelliccia, A., Sharma, S., Gati, S., Bäck, M., Börjesson, M., Caselli, S., Collet, J. P., Corrado, D., Drezner, J. A., Halle, M., Hansen, D., Heidbuchel, H., Myers, J., Niebauer, J., Papadakis, M., Piepoli, M. F., Prescott, E., Roos-Hesselink, J. W., Graham Stuart, A., Taylor, R. S., ESC Scientific Document Group (2021). 2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease. *European heart journal*. *42*(1): 42. https://doi.org/10.1093/eurheartj/ehaa605

Popova T., Stambolova, Iv. (2019). Prevention of cardiovascular health in adolescents – long-term investment in the protection and employability of adults. *Knowledge International Journal Vol. 35.4:* 1117-1124, ISSN 2545-4439.

Taylor, R. S., Brown, A., Ebrahim, S., Jolliffe, J., Noorani, H., Rees, K., Skidmore, B., Stone, J. A., Thompson, D. R., & Oldridge, N. (2004). Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. *The American journal of medicine*. *116*(10): 682–692. https://doi.org/10.1016/j.amjmed.2004.01.009

Todorova, M., Petrova, G. (2016). Personality characteristics and quality of life in patients with chronic coronary artery disease in the contex of patient-centered approach to health care. EuroHeartCare 2016 Dubrovnik Croatia, 14-15 June 2015. *European Journal of Cardiovascular Nursing*. Vol.15 (IS /2016): 147.

Todorova, M., Petrova, G. (2018). Influence of risk factors on the quality of life of patients with chronic ischemic heart disease. *European Journal of Public Health.* Vol.28, Supplement (4): 463. DOI: 10.1093/eurpub/cky213.158

Trešlová, M., Šedová, L., Bártlová, S., Tóthová, V., Chloubová, I. (2017). Selected aspects of education process realization in preventive cardiology. *Kontakt*. 19(2): e86-92. doi: 10.1016/j.kontakt.2017.04.002.

Visseren, F. L. J., Mach, F., Smulders, Y. M., Carballo, D., Koskinas, K. C., Bäck, M., Benetos, A., Biffi, A., Boavida, J. M., Capodanno, D., Cosyns, B., Crawford, C., Davos, C. H., Desormais, I., Di Angelantonio, E., Franco, O. H., Halvorsen, S., Hobbs, F. D. R., Hollander, M., Jankowska, E. A., ESC Scientific Document Group (2021). 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. *European heart journal. 42*(34): 3227–3337. https://doi.org/10.1093/eurheartj/ehab484

Богданова, К., Благоева, Д., Георгиева, Ст., Чанева, Г. (2015). Съвременни предизвикателства при управлението на здравните грижи. *Тридесет и шеста научно-технологична сесия Контакт, София (30.10.2015). Гражданска идея в действие. Сборник статии.* Темто: 209-213.

Гочева, Н., Аврамов, Д., Георгиев, Б., Байчева, В. (2008). Прекъсване на терапията със статини. Клинични последствия и молекулни механизми. *Мединфо*. 09: 1-6.

Димитрова, М., Чанева, Г. (2020). Професионалните компетенции като предпоставка за професионалната реализация на медицинските сестри. *Сестринско дело.* 52 (2): 32-36.

Иванова, Д. (2014). *Организационен модел за сестрински грижи при пациенти с остър миокарден инфаркт.* Автореферат за присъждане на образователна и научна степен „Доктор", София.

Иванова, Д., Чанева, Г. (2016). Адаптация и потребности от грижи за пациенти след сърдечна операция. *Управление и образование*. 12, vol.5: 38-41.

Младенова, Й., Господинов, К., Попов, Е., Тишева С. (2022). Съвременни стратегии за контрол на високорискови пациенти с ACSVD. *Мединфо*, 9, 22-29.

Нинова, М. (2008). Нормативни насоки в управлението на здравните грижи. *Здравни грижи*. 2: 35-37. ISSN 1312-2592.

Петрова, Г. (2020). *Предизвикателства пред медицинската сестра в процеса на промоция на здравето.* Пловдив, МАКРОС: 76-98.

Попова, Т., Василева, Н., Терзиева, А. (2021). Потребност от здравно обучение при ученици за ползите от здравословното хранене и превенцията на сърдечния риск. *Управление и образование*. Vol. 17, (5): 169-173. ISSN 13126121

Попова, Т., Димитрова, М., Благоева, Д. (2023). Анализ на някои рискови фактори при пациенти с преживян остър миокарден инфаркт. *Сестринско дело*. 55, № 3: 33-39.

Препоръки на ESC 2017 за поведение при остър миокарден инфаркт с елевация на ST-сегмента. *European Heart Journal* (2017) **00**: 1–66. doi:10.1093/eurheartj/ehx393

Стамболова, И. (2019). Профилактичните програми за хронични неинфекциозни заболявания – участие и роля на медицинската сестра в извънболничната помощ. *Сестринско дело.* 51 (1): 34-38.

Тодорова, М. (2018). Роля на медицинската сестра в превенцията на сърдечно-съдовата болест. *Knowledge – International Journal.* Vol. 26.4 September: 1171-1176.