

Peter Takáč

Biobehavioural approach in cardiac rehabilitation – Key factor for success

From the Department of Physical Medicine and Rehabilitation,
University in Košice Faculty of Medicine

Despite of important advances cardiovascular diseases remain the number-one cause of mortality in the most of countries. There is therefore an urgent need to pursue other ways of preventing and treating heart disease. In population of Europe the lack of a decline of modifiable cardiovascular risk factors has been confirmed despite the substantial increase of cardiovascular drug prescription. Experts therefore urge the need for the implementation of a comprehensive cardiovascular rehabilitation in national programmes. Generally, in countries where there are low levels of cardiovascular rehabilitation, there exists high mortality and morbidity due to cardiovascular diseases. Its key components are to be: a change of lifestyle, education, management of risk factors, psychosocial interventions, adequate cardioprotective medication therapy, long-term therapeutic strategies. In this paper we review the role of behavioural and lifestyle approaches to these goals.

Key words: comprehensive cardiac rehabilitation, psychosocial risk factors, behavioural cardiology, stress management

THE CURRENT STATUS

Recently, we have seen dramatic technological and genetic advances in the diagnosis and treatment of cardiovascular diseases (CVD), as exemplified by the increasing use of stents and statins and research breakthroughs in gene therapy. These efforts have focused on the heart and blood vessels, with increasing emphasis on molecular processes that lead to the formation of atherosclerotic plaque and its subsequent rupture.

Despite of important advances cardiovascular diseases remain the number-one cause of mortality in the most of countries.

There is therefore an urgent need to pursue other ways of preventing and treating heart disease.

In contrast to the gratifying decrease mortality due to acute myocardial infarction, the ten-year development in the estimate of incidence has rather a character of stagnation than that of decrease, which is a highly unsatisfactory trend. In the development of incidence this is a reflection of the overall situation in the health of population in most European countries, particularly due to the

long-term persistence of the high incidence of the most serious risk factors of CVD, such as inadequately treated arterial hypertension, dyslipidaemia, smoking, increase of the incidence of obesity associated with the reduction of physical activity in the whole population, as well as the continued increase in diabetes [1].

Generally, in countries where there are low levels of cardiovascular rehabilitation (CVR), there exists high mortality and morbidity due to CVD. Prevention of CVD, despite the knowledge of effective means, is lagging behind both in clinical practice and in public health. The results are little better in secondary than in primary prevention. Fewer than half of eligible cardiovascular patients benefit from CVR in most European countries [2].

We now know that almost 80% of all premature deaths in the cardiovascular disease are related to unhealthy lifestyles.

Based on extensive studies of modifiable cardiovascular risk factors EUROASPIRE I, II, III surveys their lack of a decline in population has been confirmed over the past 10 years. Despite a

substantial increase in antihypertensive and lipid-lowering drugs, blood pressure management remained unchanged, and almost half of all patients remain above the recommended lipid targets. Experts from international companies (including the European Society of Cardiology) therefore urge the need for the implementation of a comprehensive cardiovascular rehabilitation in national programmes. Its key components are to be: a change of lifestyle, education, management of risk factors, psychosocial interventions, adequate cardioprotective medication therapy, long-term therapeutic strategies [3].

Cardiac rehabilitation/secondary prevention programs are recognized as integral to the comprehensive care of patients with cardiovascular disease.

EFFECTIVENESS OF CARDIOVASCULAR REHABILITATION

Metaanalysis of 37 studies involving 8 988 patients has found out that after cardio-rehabilitation programmes, in which educational and psychosocial interventions were included, have witnessed 34% decline in cardiovascular mortality and 29% decrease in the recurrence of myocardial infarction within the 10-year period of monitoring [4].

On the other hand, the above analysis highlights the shortcomings of the rehabilitation based solely on the exercise programmes. Rehabilitation based on actual activity and movement, according to three metaanalyses, reduces the CV mortality, but the benefit has not been proven pertaining to the reduction of risk factors and improving the quality of life [5, 6, 7].

The benefits of CVD risk reduction are only realized through long-term lifestyle, and risk-factor management. CVR drop-outs and adherence continue to pose a challenge to the success of

CVR. In many of the studies described, drop-outs were directly related to the intervention. These drop-out rates tend to be higher than those reported in controlled pharmacological intervention trials [8].

A wide variety of factors may help promote poor patient adherence to recommended lifestyle changes. These include psychological factors (e.g., depression, chronic stress), biological factors (e.g., medical illness, fatigue states, cognitive impairment, poor sleep), poor social support, low socio-economic status, lack of physician follow up, poor communication between patient and health providers, functional medical illiteracy, and false health beliefs (e.g., denial of the importance of

coronary artery disease – CAD risk factors). Each of these factors may require its own specific solution [9].

CURRENT DEFINITION AND CORE COMPONENTS OF CARDIOVASCULAR REHABILITATION

The goals of CVR are restoration of optimal physiological, psychological and vocational status, and reduction of risk of cardiac morbidity and mortality.

World Health Organization has defined CVR as: "... the sum of activity required to ensure cardiac patients the best possible physical, mental and social conditions so that they may, by their own effort, regain as normal a place in the community, and lead an active life" [10].

The current definition of rehabilitation in cardiology (AHA-2006) [11]: CVR should include comprehensive, long-term care, including medical evaluation, treatment by physical activity, cardiovascular risk factor modification, education, and behavioural intervention. Therefore, the recommended models of comprehensive cardiac rehabilitation as it follows from the above fundamental definitions.

American Heart Association (AHA) and the American College of Cardiology, American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) conclude that cardiac rehabilitation programs should offer a multifaceted and multidisciplinary approach to overall cardiovascular risk reduction and that programs that consist of exercise training alone are not considered cardiac rehabilitation. The AHA and the AACVPR recognize that all cardiac rehabilitation/secondary prevention programs should contain specific core components that aim to optimize cardiovascular risk reduction, foster healthy behaviours and compliance with these behaviours, reduce disability, and promote an active lifestyle for patients with cardiovascular disease.

Cardiac rehabilitation is an individualized comprehensive program developed by using various principles of rehabilitation medicine with the aim to maintain, restore, and increase the optimal physical, medical, psychological, social, emotional, vocational, and economic status of patients with cardiovascular disease. It requires a patient's active participation and involves medical evaluation, exercise prescription, cardiac risk reduction and modification, education and counselling [12].

Cardiac rehabilitation has to be comprehensive and, at the same time, individualized.

PSYCHOSOCIAL FACTORS IN CARDIOLOGY

A psychosocial factor may be defined as a measurement that potentially relates psychological phenomena to the social environment and to pathophysiological changes.

Evidence of mechanisms linking psychosocial factors with coronary heart disease is important in making causal inferences and therefore in designing preventive interventions. Psychosocial factors may affect health related behaviours such as smoking, diet, alcohol consumption, or physical activity, which in turn may influence the risk of coronary heart disease, may cause direct acute or chronic pathophysiological changes, access to and content of medical care may plausibly be influenced, for example, social supports [13].

INTERHEART study reported that psychosocial stress accounted for approximately 30% of the population's attributable risk of acute myocardial infarction, placing it behind only lipids and smoking in importance among the 9 major modifiable CHD risk factors [14].

We would like to highlight and briefly review some key psychosocial factors that have an impact on coronary artery disease.

In context with cardiovascular diseases the attention has been latest concentrated especially to the depression, anxiety, vital exhaustion, hostility, recently also to the adult attention deficit/hyperactivity disorder (Adult ADHD).

These psychological factors have been given into the connection with cardiovascular diseases as precursors, predictors the coronary event, mortality on myocardial infarction, factors of coronary event recurrence [15, 16].

Depression is connected with three to four fold increase in cardiac mortality [17]. According to some authors depressive symptoms and depressive disorders predict cardiac recurrence and mortality, in cardiac patients, with relative risk ranging from 2.6 – 7.8 [18,19]. Many meta-analyses and systematic reviews now indicate that depression—as either a clinical diagnosis or an elevation in self-reported symptoms—is a strong, consistent, independent predictor of coronary syndrome incidence [20].

Summarily depression : 1) is especially common in a variety of cardiac patient populations; 2) is associated with a worse prognosis independent of disease severity and other risk factors; 3) is associated with nonadherence and heightened medical expenditures; and 4) is associated with impaired quality of life [21].

There have been relatively few investigations of the relationship between anxiety and cardiac disease and recurrence. Cardiac Arrhythmia Suppression Trial showed increased mortality associated with higher state anxiety (i.e. anxiety at that point in time, rather than an enduring personality characteristic of anxiety [22]. The authors hypothesize that anxiety disorders and the associated symptoms may cause an alteration in cardiac autonomic tone through impaired vagal control or reduced heart rate variability, or both, thereby causing increased risk of sudden cardiac death for cardiac patients. Anxiety is associated with elevated serotonin-mediated platelet reactivity in stable coronary artery disease patients and symptoms of anxiety show strong, independent correlations with platelet function [23].

Friedman and Rosenman [24] first proposed, in 1959, that a constellation of competitive, hostile, time-pressured behaviours comprise a personality trait (“Type A”) that predisposes patients to cardiovascular disease. Although early studies found this to be the case, several more recent studies did not [25].

Many theorists have suggested that hostility, or the tendency to view others with suspicion and scepticism, may be the toxic component of the Type A behavioural pattern, and that this component should be evaluated independently for its predictive value for cardiac patients. Some small studies of cardiovascular disease patients have found that a high level of hostility is associated with more rapid progression of atherosclerosis, more ischemia, a faster rate of restenosis after angioplasty, and a higher probability of recurrent myocardial infarction [26].

A Type D personality disposition can be found in about a quarter of the general population, which is comparable to the prevalence of classical cardiovascular risk factors. In both sexes, an independent association to Type D appeared mainly in psychopathological symptoms. Type D constitutes a relevant and independent risk marker in the community and should receive attention in clinical practice [27].

Low education and income seem to be strongly associated with higher vital exhaustion among patients; a significant factor contributing to worse prognosis and lower quality of life among patients with coronary heart disease [28].

According to self-report and unsystematic observational data adult patients with attention-deficit/hyperactivity disorder suffer from increased vulnerability to daily life stressors [29].

Because the perception of social support seems important for CHD prognosis, monitoring of functional social support is indicated in patients with CHD, and interventions to increase the perception of positive social resources are warranted [30].

We consider to be as especially important the latest data, that the presence of psychosocial risk factors can have an adverse effect on remainder classic risk factors of cardiovascular diseases [31].

CLUSTER OF RISK FACTORS

Psychological factors might cluster together within individuals to substantially increase the risk of clinical events [32]. Williams [33] describes, that in the persons with high score of hostility, also in depressive persons, appear the behavioural characteristics, that especially in interrelationship constitute the higher health risk. The cluster of these characteristics for heuristic purposes defined as the "hostility syndrome", that includes the following manifestation: impulsivity, aggressive attitude, anxiety, depressive mood, higher cardiovascular reactivity to mental stress, higher activity of hypothalamo-pituitary-adrenal axis, altered function of some immune cells (especially monocyte and macrophage components) higher reactivity of the sympathetic nervous system, lower reactivity of the parasympathetic nervous system, dysbalance of the autonomic nervous system with the consequence of higher sensitivity to stress, inability to suppress the compulsive behaviour, so appears the higher appetite, smoking, higher alcohol consumption, eventually of psychotropic drugs. In these persons is changed the lipid and sugar metabolism, appears the overweight, diabetes mellitus and hypertension.

In our previous research we have found significant changes in reactions of autonomic nervous system on experimental physical and psychical load in the group of patients suffering from coronary heart disease in comparison with healthy subjects[34].

BEHAVIOURAL CARDIOLOGY

The work of Friedman and Rosenman led to the development of a field, now called behavioural cardiology, which applies the theories and principles of the behavioural sciences to the practice of medicine with cardiac patients.

According to Thomas Pickering et. al [35] behavioural cardiology represents an alternative, and often overlooked, medical view that coronary heart disease is not inevitable, but can be prevented. Pickering emphasize, that the causes of

heart disease lie not so much in the heart itself, but in the brain, or more specifically, the mind. There are two general ways that the mind affects the heart. The first is via our lifestyles, and the second is via the effects of psychosocial stresses and how we cope with them.

The concept of behavioural cardiology links these two processes, not only in how they interact to cause heart disease, but also in terms of how they can be altered to modify heart disease once it is present. Behavioral cardiology is an outgrowth of behavioural medicine, which was first defined at a conference held at Yale in 1977 [36]: „Behavioral medicine is the field concerned with the development of behavioural-science knowledge and techniques relevant to the understanding of physical health and illness and the application of this knowledge and these techniques to prevention, diagnosis, treatment and rehabilitation". Behavioral cardiology differs from the better-known discipline of preventive cardiology in that it takes a wider and more integrative approach. Preventive cardiology focuses on traditional lifestyle risk factors such as smoking and cholesterol, and pays little attention to psychological risk factors (such as anger) or techniques for treating the disease (such as stress management). Another related area, psychosomatic medicine, covers the role of psychological factors in the development of physical disease, but pays little attention to lifestyles or treatment. Thus, behavioural cardiology includes the areas covered by both preventive cardiology and psychosomatic medicine.

Recently has been shown, that the most comprehensive view of the investigation of these issue is the biobehavioral approach, which estimates the contribution of the biological psychological, social and environmental factors and mechanisms in pathogenesis of the diseases. The experiments of separate influence of risk factors have been shown as ineffective.

CONCLUSIONS AND FUTURE IMPLICATIONS

The ideal approach to lowering psychosocial stress and improving stress related adverse prognoses is unclear, but the comprehensive cardiac rehabilitation offers several opportunities to tailor interventions to the individual patient.

A thorough examination of the expansive literature relating to psychosocial and behavioural factors in cardiac rehabilitation shows the integration of psychologists into cardiac care settings may prove beneficial to treatment outcomes due to

the high involvement of emotions in the progression of heart disease.

Pharmacologic therapy is the standard approach to stress reduction; although antidepressants improve symptoms of depression in patients with CHD, they have not been shown to favourably alter the prognosis of patients with CV disease. In contrast, exercise training has been associated with reductions in psychosocial stress and its related mortality [37].

The development of clinical health psychology as a specialization may confer significant benefits to the healthcare system in the area of chronic or lifestyle diseases.

As heart patients often have multiple comorbidities such as diabetes and chronic pain, these skills may be applied to a variety of conditions by health psychologists in the care cardiac patients.

Several psychological models have been shown to be effective in developing strategies for behavioural change: cognitive behavioural therapy (CBT), health belief and illness representation models, motivational interviewing. The above approaches are qualitatively different from education, which alone may not be sufficient to produce behavioural change. The use of these principles is equally important in exercise programmes.

One analysis of current literature related to interprofessional practice in cardiac rehabilitation was performed. Analysis revealed the lack of clarity regarding interprofessional practices and approaches. Further research is required to increase an understanding of these issues [38].

In 2009 was in Košice established the Centre of Complex Rehabilitation of Heart and Coronary Diseases by Pavol Jozef Šafárik University in Košice. and Spa Vyšné Ružbachy (East Slovakia)

The Centre will participate in research in the field of cardiovascular rehabilitation and its benefits for patients after cardiac surgery. It will also serve as a training and educational centre in the field of cardiovascular rehabilitation for middle and senior medical staff as well as for students of medicine, physiotherapy, nursing, and public health.

The basic aim of research and educational activities at the Centre of Cooperation will demonstrate the benefits of comprehensive multidisciplinary team approach in cardiovascular rehabilitation in the following parameters:

- the number of recurrences of coronary events,
- reducing the number re-hospitalisations for those patients,
- increased cost– benefit,

– impact on the consumption of drugs and the subsequent costs of health insurance for those patients,

– not least to highlight the quality of life of patients in improving their functional parameters and subsequent inclusion in their employment or daily life.

The Centre should serve as an open research project in the field of cardiovascular

rehabilitation in Slovakia, with the possibility of integration and other bodies dealing with that topic. Upon completion and evaluation of the project, the project should be applied to other spa facilities and interested entities.

„The Centre was supported by the Slovak Research and Development Agency under the contract No. SUSPP-0011-09”.

REFERENCES

1. *Comment of the Slovak Society of Cardiology, cooperating professional societies and other experts on the Summary of the European Recommendations for the Prevention of Cardiovascular Diseases in Clinical Practice.* *Cardiol* 2008; 17 (Suppl. 3): 37S–41S.
2. Bjarnason-Wehrens B., McGee H., Zwisler A D., et al.: *On behalf of the Cardiac Rehabilitation Section European Association of Cardiovascular Prevention and Rehabilitation Cardiac rehabilitation in Europe: results from the European Cardiac Rehabilitation Inventory Survey.* *Eur J Cardiovasc Prev Rehabil.* 2010 Mar 17. [Epub ahead of print]
3. Kotseva K., Wood D., De Backer D. et al.: *Cardiovascular Prevention Guidelines in Daily Practice: a Comparison of EUROASPIRE I, II, and III Surveys in Eight European Countries.* *The Lancet*, Volume 373, March 2009, Issue 9667, pp. 929 – 940.
4. Dusseldorp E. et al.: *A Metaanalysis of Psychoeducational Programmes for Coronary Heart Disease Patients.* *Health Psych*, 1999, 18, 506–19.
5. Benzer W., Oldridge N., B.: *Current Concepts in Cardiac Rehabilitation. Medical Considerations and Outcomes Evaluations.* *J Clin Basic Cardiol*, 2001; 4: 211.
6. Mora S., et al.: *Physical Activity and Reduced Risk of Cardiovascular Events Potential Mediating Mechanisms.* *Circulation.* 2007; 116: 2110–2118.
7. Lavie C. J., Milani R. V.: *Cardiac Rehabilitation, Exercise Training, and Psychosocial Risk Factors.* *J. Am. Coll. Cardiol.* 2006; 47; 212.
8. Anonymous: *Randomised trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S).* *Lancet* 1994, 344:1383–1389.
9. Rozanski A.: *Integrating Psychologic Approaches into the Behavioral Management of Cardiac Patients.* *Psychosomatic Medicine* 67, Supplement 1: (2005), S67–S73.
10. World Health Organization: *Rehabilitation of patients with cardiovascular disease: Report of a WHO expert committee.* WHO Technical Report Series No. 270; 1964.
11. AHA/ACC: *Guidelines for Secondary Prevention for Patients With Coronary and Other Atherosclerotic Vascular Disease*, Sidney C. Smith et al.: 2006 Update: En-

- dorsed by the National Heart, Lung, and Blood Institute Circulation 113: 2006, p. 2363–2372.
12. Shah S. K.: *Cardiac Rehabilitation*. In: DeLisa J. A., et al.: *Physical Medicine and Rehabilitation*, Forth ed., Vol. 2., Lippincot Williams& Wilkins, Philadelphia, USA, 2005, p.1811– 1841.
 13. Hemingway H., Marmot M.: *Psychosocial factors in the aetiology and prognosis of coronary heart disease: systematic review of prospective cohort studies*. *BMJ* 1999;318:1460–7.
 14. Yusuf S., Hawken S., Ounpuu S., et al: *INTERHEART Study Investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study*. *Lancet*. 2004; 364(9438):937–952.
 15. O’Keefe J., H., Carter M. D., Lavie, C. J.: *Primary and Secondary Prevention of Cardiovascular Diseases: A Practical Evidence-Based Approach*. *Mayo Clin Proc.*, 2009; 84(8):741–757.
 16. Frasure-Smith N., Lespérance, F.: *Depression and Anxiety as Predictors of 2-Year Cardiac Events in Patients with Stable Coronary Artery Disease*. *Arch Gen Psychiatry*. Volume 65(1), January 2008, p 62–71.
 17. Scottish Intercollegiate Guidelines: *A cardiac rehabilitation (A national clinical guideline) Network, January 2002, supported by British Association for Cardiac Rehabilitation (BACR)*, p. 32, ISBN 1 899893 92 X.
 18. Frasure-Smith N., Lesperance F., Juneau M., et al.: *Gender, depression, and one-year prognosis after myocardial infarction*. *Psychosom Med* , 1999; 61:26 – 37.
 19. Denollet J., Brutsaert D., L.: *Personality, disease severity, and the risk of long-term cardiac events in patients with a decreased ejection fraction after myocardial infarction*. *Circulation* 1998; 97:167 – 173.
 20. Rozanski A., Blumenthal J.A., Davidson K.W., et al.: *The epidemiology, pathophysiology, and management of psychosocial risk factors in cardiac practice: the emerging field of behavioral cardiology*. *J Am Coll Cardiol* 2005; 45: 637–
 21. Blumenthal, J, A, O’Connor CH.: *No Laughing Matter*. *Letters to the Editor*. *J Am Coll Cardiol*, Vol. 55, No. 8, 2010, 836.
 22. Thomas S. A., Friedmann E., Wimbush F., Schron E.: *Psychological factors and survival in the cardiac arrhythmia suppression trial (CAST) :a re-examination*. *Am J Crit Care*, 1997, 6:116–26.
 23. Zafar M.U., Paz-Yepes M., Shimbo D. et al., *Anxiety is a better predictor of platelet reactivity in coronary artery disease patients than depression* *Eur Heart J* ehp602published ahead of print January 22, 2010, doi:10.1093/eurheartj/ehp602
 24. Friedman M., Rosenman R.H.: *Association of specific overt behavior pattern with blood and cardiovascular findings: blood cholesterol level, blood clotting time, incidence of arcus senilis, and clinical coronary artery disease*. *JAMA* 1959; 169:1286 – 1296.
 25. Miller T.Q., Turner C.W., Tindale R.S., Posavac E.J.: *Reasons for the trend toward null findings in research on Type A behavior*. *Psychol Bull*, 1991; 110:469 – 485.
 26. De Leon C.F.M., Kop W.J., de Swart H.B., et al.: *Psychosocial characteristics and recurrent events after percutaneous transluminal coronary angioplasty*. *Am J Cardiol* , 1996; 77:252 – 255.
 27. Hausteiner C., et al.: *Clustering of Negative Affectivity and Social Inhibition in the Community: Prevalence of Type D Personality as a Cardiovascular Risk Marker*. *Psychosom Med* 2010 72: 163–171.
 28. Skodova Z., et al.: *Vital exhaustion in coronary heart disease: the impact of socioeconomic status*. *European Journal of Cardiovascular Prevention & Rehabilitation*: October 2008 – Volume 15 – Issue 5 – pp. 572–576.
 29. Lackschewitz H., Huther G., Kroner-Herwig B.: *Physiological and psychological stress responses in adults with attention-deficit/hyperactivity disorder (ADHD)* *Psychoneuroendocrinology*, 33, (5), 2008, pp. 612–624.
 30. Barth J., Schneider S., von Känel R.: *Lack of Social Support in the Etiology and the Prognosis of Coronary Heart Disease: A Systematic Review and Meta-Analysis*. *Psychosom Med* , 2010 Mar 11. [Epub ahead of print]
 31. Benninghoven D., Kaduk A., Wiegand U. , et al.: *Influence of Anxiety on the Course of Heart Disease after Acute Myocardial Infarction – Risk Factor or Protective Function?* *Psychotherapy and Psychosomatics*, 75, 2006 , 56–61.
 32. Rozanski A., Blumenthal J.A., Davidson K.W., et al.: *The epidemiology, pathophysiology, and management of psychosocial risk factors in cardiac practice: the emerging field of behavioral cardiology*. *J Am Coll Cardiol* 2005;45:637–651.
 33. Williams R. B., *Somatic consequence of stress*. In: M. J., Charney, D. S., & Deutch, A. (Eds.): *Neurobiological and clinical consequences of stress: from normal adaptation to PTSD*. New York: Raven Press, 1995, 403–412.
 34. Takáč P., Skorodenský M., Pilipčincová A., Pella J.: *Evaluation of risk factors in cardiovascular diseases with examination of heart rate variability in behavioral medicine and health psychology*. *Studia Psychologica*, Roč. 49, č. 2 (2007), s. 117–126.
 35. Pickering T., et al.: *Behavioral Cardiology — Has Its Time Finally Arrived?* *The Mount Sinai Journal of Medicine* ,Vol. 70 No. 2 March 2003, p. 101– 103.
 36. Schwartz G.E., Weiss S.M.: *Proceedings of the Yale conference on behavioural medicine*. Bethesda (MD): US Department of Health, Education, and Welfare. Public Health Service (NIH); 1978. Report No. 78–1424.
 37. Milani R.V., Lavie C.J.: *Impact of cardiac rehabilitation on depression and its associated mortality*. *Am J Med*. 2007;120(9):799–806.
 38. Seneviratne C .C., Stone J. A. , King K.: *Achieving Inter-professional Practice in Cardiac Rehabilitation*. *Journal of Cardiopulmonary Rehabilitation and Prevention*. November/December 2009 – Volume 29 – Issue 6 – p 380–384.

Pavol Jozef Šafárik University in Košice
 Faculty of Medicine
 Department of Physical Medicine
 and Rehabilitation
 Rastislavova 43, 041 90 Košice
 Slovak Republic
 Phone: (+421 55) 615 20 90
 Fax: (+421 55) 615 21 09
 E mail: peter.takac@upjs.sk

Praca wpłynęła do Redakcji: 15 kwietnia 2010
 Zaakceptowano do druku: 28 maja 2010