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ASPECTS REGARDING THE CARDIAC REHABILITATION OF PATIENTS WITH SURGICALLY CORRECTED VALVULOPATHIES

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Abstract

Problem statement. The international literature includes several studies on valvular heart diseases, but most of them debate aspects related to epidemiology, physiopathology, systematization of the types and subtypes of these conditions, as well as regarding drug treatment; there are few studies addressing the medical rehabilitation of patients with surgically corrected valvulopathies, and randomized trials are even very rare. Cardiovascular disease is a group of diseases of the heart and blood vessels and includes coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions. According to the World Health Organization they are the leading cause of death globally, claiming approximately 17.9 million lives each year. Valvulopathy represents an isolated pathological valvular condition or within other diseases, which leads to changes in the structure and dysfunction of the valvular apparatus. Medical rehabilitation is defined as a complex process aimed at regaining a greater percentage of a person's suppressed or diminished functions, resulting from a congenital or acquired pathology throughout life. Medical rehabilitation helps a person to be as independent as possible in everyday activities, thereby enabling participation in education, work, recreation and family integration.

Aim. The main objective of this study is to have a correct picture and to present aspects regarding the current cardiac rehabilitation programs resulting from the review of bibliometric studies related to cardiac rehabilitation.

Conclusions. Although there are few studies that address the cardiac rehabilitation of patients with surgically corrected valvulopathies, the current study highlights that following the application of cardiac rehabilitation programs, it was observed that by re-educating motor skills, the patients' quality of life improved. The study highlights the role of the physiotherapist is highlighted, as a member of the interdisciplinary team, who creates and applies individualized cardiac rehabilitation programs throughout the medical recovery period.

Keywords: valvulopathies, cardiac rehabilitation, physiotherapist, quality of life

Introduction

Cardiovascular disease is a group of diseases of the heart and blood vessels and includes coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions. According to the World Health Organization (2021), they are the leading cause of death worldwide, claiming approximately 17.9 million lives each year. At the same time, according to the World Health Organization, more than four out of five deaths caused by vascular diseases are due to heart attacks and strokes, and a third of these deaths occur prematurely in people under 70 years old (World Health Organization, 2021).

Cardiovascular diseases cause more than 4 million deaths each year in Europe, accounting for 45% of all deaths. Coronary heart disease and cerebrovascular disease were the most common causes of death from cardiovascular disease, accounting for 1.8 million and 1.0 million deaths, respectively (Townsend et al. 2016).

Cardiovascular disease accounted for 31.5% of all deaths and 45% of all deaths from non-communicable diseases in the 2013 report, more than twice that from cancer, as well as more than all communicable disorders, maternal, neonatal and nutrition combined (Townsend et al. 2016).

Ischemic heart disease was the main cause of mortality in Romania in 2018, representing over 19% of all deaths according to the country profile developed by the Observatory on Health Systems and Policies (2022). In Romania, the mortality rate caused by ischemic heart disease was more than twice the EU average, and the mortality caused by cerebrovascular accidents - the second leading cause of death - represented 16% of all deaths, despite significant improvements registered after 2000 (OECD/European Observatory on Health Systems and Policies, 2022).

Valvulopathy represents an isolated pathological valvular condition or within other diseases, which leads to changes in the structure and dysfunction of the valvular apparatus.

Within cardiovascular diseases, valvular heart disease (valvulopathy) is a congenital defect or damage to one or more heart valves: mitral, aortic, tricuspid and pulmonary. Heart valves have only one function: to allow blood to flow unobstructed forward through the heart, and they work on the principle of mechanical valves: they open to allow blood to flow in one direction and close to prevent backflow.

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According to Iung et al. (2019) the EURObservational Research Program Valvular Heart Disease II Survey reinforces the findings of the 2001 Euro Heart Survey on valvulopathies, demonstrating the predominance of aortic stenosis and degenerative mitral stenosis, the high frequency of elderly patients with valvulopathies, and the inherent burden of comorbidities. Medical rehabilitation is defined as a complex process aimed at regaining a greater percentage of a person's suppressed or diminished functions, resulting from a congenital pathology or acquired throughout life. Medical rehabilitation helps a person to be as independent as possible in everyday activities, thus allowing participation in education, work, recreation and meaningful participation in the family. Over the years, cardiac rehabilitation programs have become an important component in a broad multidisciplinary and multi-layered framework, offering a holistic and integrative approach to the patient with cardiovascular conditions. According to the World Health Organization (2023), medical rehabilitation is defined as a set of interventions aimed at optimizing functioning and reducing disability in people with health conditions in interaction with their environment. Worldwide, it is estimated that one in three people lives today with a condition that requires medical rehabilitation; this need for medical rehabilitation is expected to increase in the coming years due to changes in health status and population characteristics worldwide (World Health Organization, 2023).

In 2019, the Global Study of Diseases, Injuries and Risk Factors appeared, which contains data collected over the years (1980-2019) by over 3,600 researchers from over 145 countries who participated in data collection to quantify levels and trends in the field of health. This is the first study to produce global, regional and national estimates of the need for medical rehabilitation services (Cieza et al., 2021). Not surprisingly, medical rehabilitation has often been incorrectly perceived as an expensive specialized clinical service provided mainly at secondary and tertiary care levels (Stucki, Bickenbach, Gutenbrunner and Melvin, 2018).

According to the World Health Organization (2012), quality of life is defined as the individual's perception of his position in life in the context of the culture and value systems in which he lives and in relation to his goals, expectations, standards and concerns; this definition reflects the view that quality of life refers to a subjective assessment that is embedded in a cultural, social and environmental context. According to Irtelli and Durbano (2020), this type of definition shifts the focus from objectively definable functionality to the dimension of subjectivity; detection of both these aspects can be a reliable measure of quality of life. The development of research on the concept of quality of life is related to the changes of the last decades in the definition of the concept of health, the structure of which has moved from a biomedical model to a "biopsychosocial model". In the biopsychosocial model devised by Engel (1977) he states that in order to understand a person's medical condition, not only biological factors but also psychological and social factors must be taken into account. This biopsychosocial model consists of: biological factors (physiological pathology), psychological factors (thoughts, emotions, behaviors) and social factors (socio-economic, familial, cultural) and is commonly used in chronic pain. Following its publication, the biopsychosocial model was adopted by the World Health Organization (2002) as the basis for the International Classification of Functioning of Disability and Health.

The biopsychosocial model of the World Health Organization, adopted in 2002, after the original model of Engel (1977) offers the possibility of identifying health indicators that provide the necessary and appropriate data for the evaluation of clinical outcomes in terms of quality of life and can improve the process of taking decisions regarding a global and comprehensive perspective of the clinical outcomes of different cardiac rehabilitation programs. Although significant progress has been made in prevention, diagnosis, and overall management, cardiovascular disease is still an important public health liability and issue. In this context, optimized preventive measures and cardiac rehabilitation programs play a central role in contemporary cardiovascular medicine. The studies related to cardiac rehabilitation were grouped by geographical areas, each with their own approaches and specifics, the purpose of this bibliographic study is not to determine the best cardiac rehabilitation method presented, but to highlight and their existence.

Methods

In recent months, I have studied and selected various bibliographic sources, on electronic or physical support, regarding the history and the present in the field of cardiac recovery, at national and international level. These bibliographic materials were systematized and analyzed at the national level, in figure 1, and at the international level in figure 2.

Reflection of the theme in the national specialized literature

The concept of cardiac recovery appeared in Romania around the 1970s when the Ministry of Health approved the establishment of recovery centers with as large a profile of conditions as possible. At present, in Romania there is no national guideline regarding the cardiac recovery of patients with surgically corrected valvulopathies. Due to Romania's membership in the European Union in 2017, the specialized guide "ESC/EACTS Guidelines for the management of valvular heart" for the evaluation and treatment of valvulopathies was translated into Romanian, a guide developed by Baumgartner el al. (2017) representing the working group on management of valvulopathies within the European Society of Cardiology. Accessing the available literature and information, I found that in Romania there are cardiac recovery centers in the state public system, the most important are:

- Târgu Mureș County Emergency Clinical Hospital - cardiovascular recovery clinical section;
- Iasi Clinical Recovery Hospital - cardiovascular recovery clinic;
- Cluj-Napoca Clinical Recovery Hospital - cardiovascular recovery clinical section;

- Dr. Benedek Geza Covasna Cardiovascular Recovery Hospital - cardiovascular recovery hospital.

In the private sector, Monza Bucharest Hospital specializes in performing complex surgical interventions and providing high-performance integrated medical services.

1. Târgu Mureș County Emergency Clinical Hospital

   According to the website of the Târgu Mureș County Emergency Clinical Hospital (2023), it was established in 1975, and at the beginning of the 90s, the cardiovascular recovery clinical section was established, being the first and only specialized section, in Mureș County, in the recovery of patients with cardiovascular diseases.

   Within the recovery clinic is the Prevention and Recovery Center where specialist consultations, investigations and physiotherapy programs are provided. The cardiovascular recovery clinic is equipped with 25 beds and a physiotherapy room, where patients follow individualized medical gymnastics programs under the guidance of a physiotherapist. Within the recovery clinic is the Prevention and Recovery Center where specialist consultations, investigations and physiotherapy programs are provided. The cardiovascular recovery clinic is equipped with 25 beds and a physiotherapy room, where patients follow individualized medical gymnastics programs under the guidance of a physiotherapist. According to the hospital's website, Dr. Theodora Benedek, head of the Cardiology Clinic at the Târgu Mureș County Emergency Clinical Hospital, in the Report of the European Public Health Policy Platform "The Health Policy Partnership" it is mentioned that in Romania: cardiovascular recovery units are very few and they do not have the necessary facilities. Their staff consists of general recovery specialists who are reluctant to engage in the treatment of the cardiac patient. Most patients in Romania are treated in general recovery centers, which most of the time do not benefit from adequate facilities and do not have personnel specialized in cardiac recovery (Budig & Harding, 2021).

   In the history and presentation of the recovery clinic in Târgu Mureș, we did not find studies on medical rehabilitation in valvulopathies operated by invasive or minimally invasive techniques.

2. Iași Clinical Recovery Hospital

   According to the website of the Iași Clinical Recovery Hospital (2023), professor Dr. Rugină addressed at the level of the Ministry of Health the issue of setting up recovery hospitals in university education centers, which would more fully meet the health requirements of modern medicine. In the Cardiovascular Recovery Clinical Hospital, specialist consultations, investigations and physiotherapy programs are provided, the hospital being equipped with 45 beds, laboratory equipment and a physiotherapy room equipped with multifunctional devices. patients follow individualized medical gymnastics programs under the guidance of a physiotherapist. In 2002, Dr. Mitu Florin published the book "Recovery of patients with ischemic heart disease" where he developed the subject of recovery of patients with ischemic heart disease (Mitu. 2002).

   According to Mitu, Suceveanu and Mitu (2020) in Romania, cardiovascular recovery is performed exclusively in the hospital, for patients in the second phase of recovery, in five specialized centers, which have the necessary equipment and multidisciplinary team, but an insufficient number of beds compared to the large number of patients with an indication for recovery. Issues related to addressability, adherence, legislative gaps regarding ambulatory recovery, as well as non-recognition of cardiovascular recovery as part of cardiology or internal medicine still remain unresolved.

3. Clinical Recovery Hospital Cluj-Napoca

   According to the website of the Cluj-Napoca Clinical Recovery Hospital (2023) in 1979 the Cluj Clinical Recovery Hospital was inaugurated and within the hospital recovery medical services are provided with the objective of preventing and reducing the physical, functional and psychological consequences resulting from the Occurrence of a cardiovascular disease, the recovery process being supported in its own treatment base. In the history and in the presentation of the Cluj clinical recovery hospital, we did not find any studies on medical recovery in valvulopathies operated by invasive or minimally invasive techniques.

4. Dr. Benedek Geza Covasna Cardiovascular Recovery Hospital

   According to the website of the Dr. Benedek Geza Covasna Cardiovascular Rehabilitation Hospital (2023), this is one of the most important and well-known centers for the treatment of cardiovascular diseases in Romania, being equipped with state-of-the-art equipment and ultra-qualified staff in this field . The Covasna medical recovery model includes the integration of natural factors such as: climate therapy, skunks and aerotherapy in classic cardiac recovery programs.

   The hospital has a total of 695 beds for cardiovascular patients, being the only hospital located in a balneo-climatic resort and the only one with a cardiovascular recovery pediatric section in Romania.

   In the history and in the presentation of the Covasna recovery hospital, we did not find any studies on medical recovery in valvulopathies operated by invasive or minimally invasive techniques.

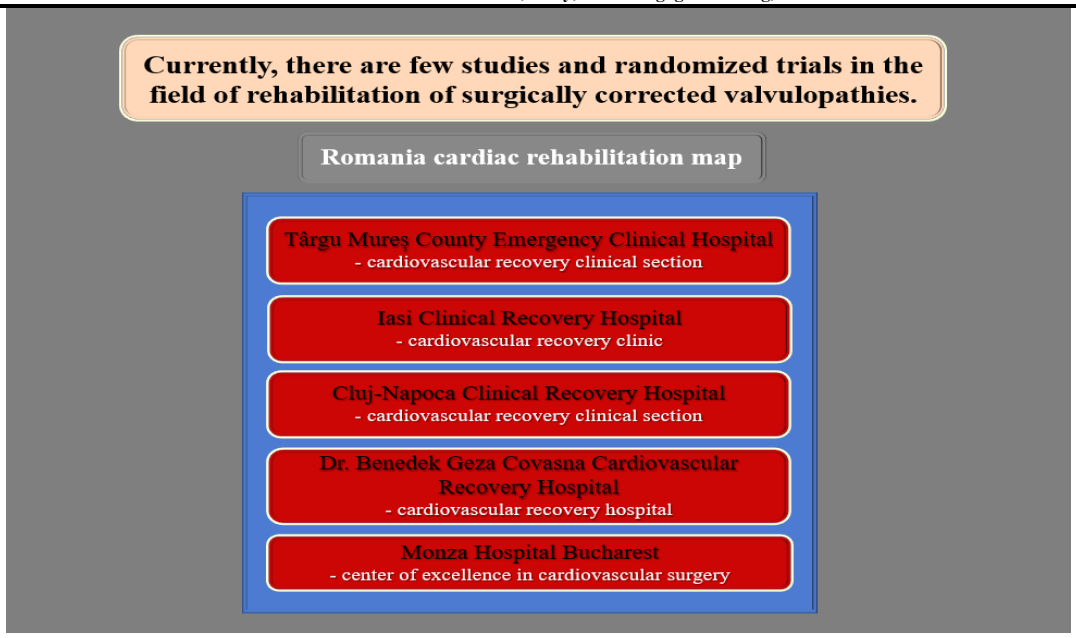

Figure 1. Reflection of the theme in the national literature

1. Monza Hospital Bucharest

According to the Monza Hospital Bucharest website (2023), the cardiovascular recovery section offers cardiac recovery services for the following types of patients:

- patients after cardiac surgery;
- outpatients with chronic heart failure who may benefit from a period of cardiac recovery to improve their exercise tolerance.

From the specialized literature available at the national level, we noticed that in these centers there are their own cardiac recovery programs, but there is no information about them, and even less about the specialized recovery programs for patients with valvulopathies operated by invasive or minimally invasive techniques , these being centralized in figure 1.

Reflection of the theme in the international specialized literature

The international literature includes several studies on valvular heart diseases, but most of them debate aspects related to epidemiology, physiopathology, systematization of the types and subtypes of these conditions, as well as regarding drug treatment.

Currently, compared to other cardiovascular diseases, there are few studies that address valvulopathies and randomized trials are even very rare. The same is true for specialized guidelines, so there is only one guideline for valvulopathies in the United States of America, one in Europe, and four other national guidelines in Europe.

Moreover, published guidelines are not always consistent, due to the lack of randomized clinical trials and constant progress in clinical practice.

After collecting, organizing and analyzing the international specialized literature, I was able to obtain an overview of the role and importance of cardiac rehabilitation, resulting in an international map of the researched literature in the field of cardiac rehabilitation, and in particular for surgically corrected valvulopathies, according to the figure 2.

The map of the international specialized literature, hierarchical design describes the specialized literature, organized hierarchically, that we found related to the topic of cardiac rehabilitation for the patient with surgically corrected valvulopathies and represents a means of communication that helps to present the current picture of the international specialized literature regarding the proposed topic.

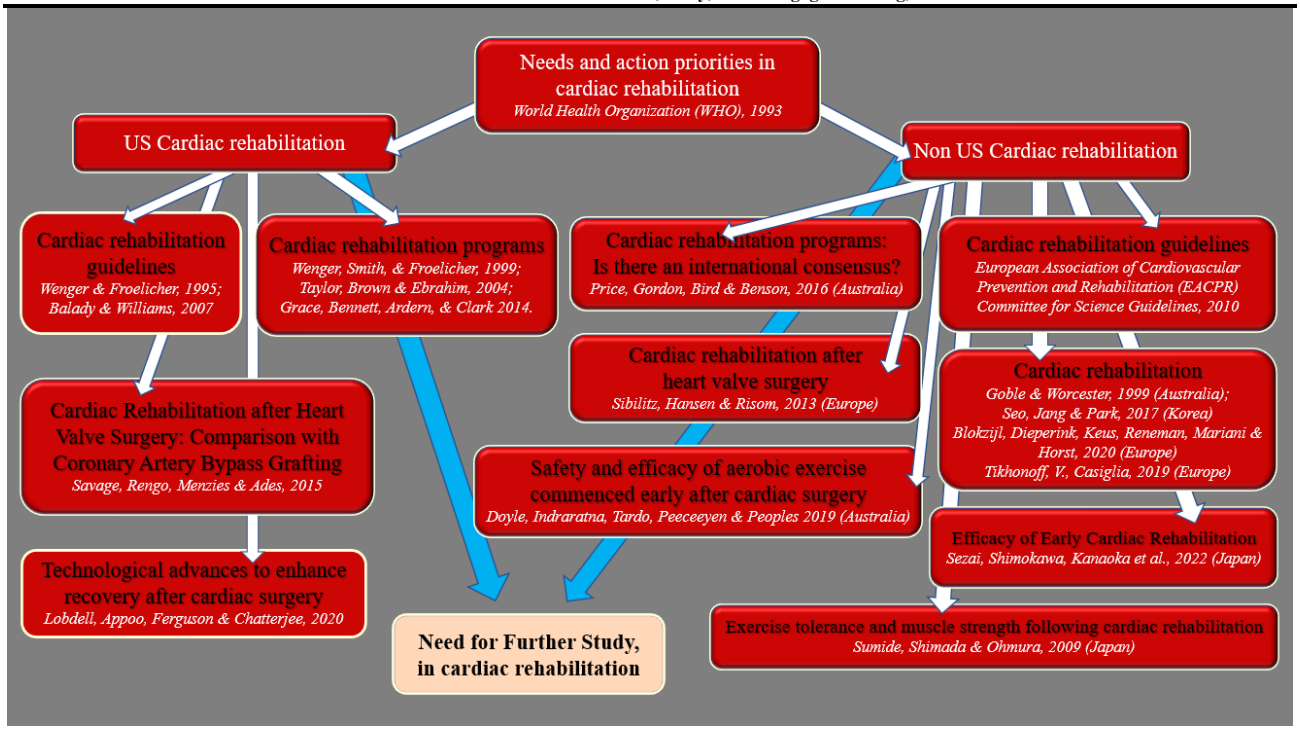

Figure 2. Reflection of the theme in international literature

In the specialized literature map, we have identified several cardiac rehabilitation directions available, US programs, European programs and Asia-Australia programs, below are presented the specific studies that address these types of cardiac rehabilitation programs.

Within cardiac rehabilitation programs in the USA, Wenger (1986) proposes the first cardiac rehabilitation program recommending early mobilization of the operated patient. The main objective of the classic cardiac rehabilitation program is to achieve the transition from the supine position to the sitting position and, last but not least, to the upward walk within 14 days. The program thus becomes what we now call the classic cardiac rehabilitation program.

Wenger, Smith, Froelicher, and Comoss (1999) believe that another challenge for the 21st century will be the selection, development, and delivery of appropriate recovery services to individual cardiac patients with adaptation of the cardiac recovery method.

According to Wenger et al. (1999) the particular benefit of physical training is recognized for patients with low functional capacity at baseline. This evidence-based model defines that elderly patients achieve an improvement in functional capacity from physical training comparable to their younger counterparts. Improvement in functional status occurs equally in older women and older men.

The study by Savage, Rengo, Menzies, and Ades (2015) points out that coronary artery bypass grafting patients who participate in a cardiac rehabilitation program experience improvements in aerobic capacity, but there are few outcome studies patients with surgically corrected valvulopathies.

They achieve a similar improvement in aerobic capacity by participating in the cardiac rehabilitation program as people who have had coronary artery bypass surgery. The observed improvements in cardiac rehabilitation are similar regardless of the type of valvular abnormality or whether coronary bypass surgery was performed concurrently (Savage et al., 2015).

In the study by Balady et al. (2007) The American Heart Association and the American Association for Cardiovascular and Pulmonary Rehabilitation recognize that all cardiac rehabilitation/secondary prevention programs should contain specific core components that aim to optimize cardiovascular risk reduction, promote healthy behaviors, and adhere to these behaviors, reducing disability and promoting an active lifestyle for patients with cardiovascular disease.

Health-related quality of life improved at levels similar to cardiac rehabilitation and usual care. The effect of cardiac rehabilitation on total mortality was independent of coronary heart disease diagnosis, type of cardiac rehabilitation, dose of exercise intervention, duration of follow-up, study quality, and date of study publication (Taylor et al., 2004).

According to Lobdell, Appoo, Rose, Ferguson, and Chatterjee (2021), the enhanced recovery after surgery system, originally developed for abdominal surgery, has become increasingly established in all subspecialties, including cardiac surgery. This recovery system focuses on evidence-based initiatives in the preoperative, intraoperative, and postoperative phases of care to promote patient well-being and effective cardiac recovery care.

In the study by Grace, Bennett, Ardern and Clark (2014) although the effectiveness of cardiac rehabilitation in the Canadian context is clear, only 34% of eligible patients participate and strategies to increase access for

underrepresented groups (e.g., women, ethnic minority groups) are not yet universally applied. Barriers to cardiac recovery identified include lack of physician referral and referral, travel, distance, and low perceived need.

In cardiac rehabilitation programs in Australia cardiac rehabilitation begins in hospital and consists of early mobilization and education. The content of recovery programs varies from hospital to hospital. Hospitalization makes it difficult to run formal inpatient recovery programs. Thus, hospital-based cardiac recovery programs are now much more time-limited than in the past. Furthermore, it is recognized that inpatient education may be ineffective due to their psychological state and concerns (Goble & Worcester, 1999).

In the study, Price, Gordon, Bird and Benson (2016) believe that aerobic training programs, supplemented with resistance exercises, are recommended and considered safe for patients following cardiac rehabilitation programs with specialists in the field. Based on research evidence, this may also provide superior patient outcomes and should therefore be considered when developing an international consensus for exercise prescription in cardiac rehabilitation.

According to Doyle, Indraratna, Tardo, Peeceeyen, and Peoples (2019), aerobic exercise performed in the early postoperative period significantly improves functional capacity at hospital discharge compared with usual physiotherapy care and may provide improvements in short- and medium-term aerobic capacity. Interventions involving appropriately prescribed and supervised aerobic exercise should be further investigated in larger randomized trials, with particular interest in safety outcomes and higher-risk patient groups that more accurately represent the modern cardiac surgery patient.

Data from the Sumide et al. (2009) study suggest that exercise intolerance in patients with surgically corrected valvulopathies depends on decreased muscle strength. Further studies are needed to evaluate whether the strategy of increasing lower limb muscle strength through resistance training could be effective for improving exercise capacity.

According to Seo, Jang, Park, Hong, and Sung (2017), cardiac rehabilitation for inpatients has been routinely performed after cardiac surgery in several countries, and many different outcomes have been reported. However, until now, there are inadequate data on the status of inpatient cardiac rehabilitation in Korea. In the study, Seo et al. (2017) based on the research results, recommended that recovery programs with physical exercises, for patients in the hospitalization period, be led by specialists, such as: physiotherapists.

In the prospective cohort study, Blokzijl et al. (2021) observed that many patients showed postoperative improvement in cognitive function and physical and mental quality of life. However, postoperative cognitive dysfunction was persistent in 33% of patients 6 months after surgery, and contrary to expectations, they did not find an association between postoperative cognitive dysfunction and difference in quality of life 6 months after coronary artery bypass surgery. A possible explanation could be that people with impaired cognitive function may still have a good quality of life through the perception of being glad to be alive.

The reasons for the beneficial effect of early rehabilitation are unclear, although the consequences of aerobic exercise have been extensively studied, at least from a cardiological point of view. Isotonic work, not only repeated regularly in the form of so-called "resistance exercise training", but also performed acutely, is followed in the recovery phase and in the medium and long term by a reduction in systolic blood pressure and sometimes diastolic (Tikhonoff & Casiglia, 2019).

According to Sezai et al. (2022) the current status of cardiac rehabilitation after cardiac surgery and the introduction of early cardiac rehabilitation in Japan are not fully understood. Early cardiac rehabilitation after cardiac surgery was effective in terms of prognosis, hospitalization and medical costs. This study is the first report using a large patient base in Japan. The results indicate that further introduction of early cardiac rehabilitation should be recommended in the future (Sezai et al., 2022).

This randomized clinical trial, The CopenHeartVR, will be the first study to investigate the effect of a comprehensive, individually tailored cardiac rehabilitation program comprising exercise and a psycho-educational intervention, targeting a large group of patients, after isolated surgery of heart valve in a municipal center, hospital or at home. Due to its size, it is possible that the positive, negative or neutral results of CopenHeartVR will have an impact on the organization and clinical guidelines for future rehabilitation after heart valve surgery (Sibilitz, 2013).

Future directions

The methods and clinical data that inform cardiac rehabilitation after surgery will continue to evolve. We intend to continue, update and improve the systematic review of studies related to cardiac rehabilitation, and in particular that related to patients with surgically corrected valvulopathies.

Conclusion

The main objective of this study is to have a correct picture and to present aspects regarding the current cardiac rehabilitation programs resulting from the review of bibliometric studies related to cardiac rehabilitation. Medical rehabilitation is defined as a complex process aimed at regaining a greater percentage of a person's suppressed or diminished functions, resulting from a congenital pathology or acquired throughout life. The result of the medical rehabilitation concept are the cardiac rehabilitation programs that aim to limit the psychological and physiological effects of the condition, manage the symptoms, stabilize or regress the disease, improve the vocational and psychosocial status and increase the quality of life.

Cardiac rehabilitation professional associations in North America and Europe recommend that patients progress from moderate-to-vigorous aerobic resistance exercise throughout the program, with resistance training and monitored

exercise testing. Cardiac rehabilitation professional associations in Australia and New Zealand recommend lower intensity exercise and a less technical assessment of functional capacity within cardiac rehabilitation programs.

Higher intensity aerobic training programs supplemented with resistance training have been recommended and considered safe for cardiac rehabilitation patients by many authorities. Based on research evidence, it may also provide superior patient outcomes and should therefore be considered when developing an international consensus for exercise prescription in cardiac rehabilitation (Price et al., 2016). Cardiac rehabilitation has come a long way since Wenger (1986) proposed the first cardiac rehabilitation program recommending early mobilization of the operated patient. The main objective of the classic cardiac rehabilitation program was to achieve the transition from the supine position to the sitting position and last but not least to the upward walking within 14 days, this program became the classic cardiac rehabilitation program. At the moment, although worldwide there is a huge demand for cardiac rehabilitation programs, it has not been possible to optimize and standardize the current cardiac rehabilitation programs.

Considering the current context regarding the continuous increase in the number of patients with cardiovascular diseases, cardiac rehabilitation must become a global medical priority.

Acknowledgements

All authors contributed equally to this study and should be considered as main authors.

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