ISSN: 2577-2996

PROGRESS IN MEDICAL SCIENCES, 2022
VOL 6, NO. 1, PAGE 1 – 4
DOI: doi.org/10.47363/PMS/2022(6)E146

REVIEW ARTICLE

Open Access

Physical Therapy in Cardio-Pulmonary Rehabilitation: Evidence-Based Practices for Functional Recovery and Health Optimization

Laljibhai Makwana

USA

ABSTRACT

These cardiopulmonary disorders like COPD, heart failure and post-cardiac surgery often influence functional capability, physical stamen and lifestyle. These chronic diseases are frequent causes of disability and mortality around the globe and, therefore, require inclusive and efficient approaches to rehabilitation. Cardio-pulmonary rehabilitation involves using physical PT exercise routines, breathing techniques and lifestyle modification to enhance the clients' physical fitness and ultimately enhance the clinical results. PT evidence-based writings centred on the improvement of aerobic fitness, respiratory muscles, symptoms decrease, and increased functional mobility. These include diaphragmatic breathing, inspiratory muscle training (IMT), as well as progressive respiratory muscle strength training with due consideration to the strengths and realities of every patient. Using HIIT, telerehabilitation and VR-based therapies is changing the conventional methods of PT and is making rehabilitation more interactive, feasible and efficient. These methods use contemporary technology to enhance medicines compliance, counselling and feedback, and quality greatly in extent fewer served. Besides exercise interventions, other approaches in different professional disciplines, such as dietetics, counselling, and informative support for the patient, all augment results. These general intervention models include: These approaches consider much more than simply the physiological disabilities of cardio-pulmonary diseases, but also the psychological and social aspects involved. Papers show that PT is an important factor that helps prevent readmissions, mortalities and better long-term outcomes.

Consequently, PT applied to patients, implementing both conventional and emerging techniques, is aimed at achieving patients' independence, proper symptom control, and promotion of their improved quality of life. The present paper aims to understand the aspects of PT in cardiopulmonary rehabilitation and discuss scientific achievements, novel trends, and their effects on patients in detail. This is why it becomes relevant to incorporate PT into an extensive rehabilitation plan in patients with cardiopulmonary diseases to guarantee long-lasting positive changes in health and quality of life.

ARTICLE HISTORY

Received January 01, 2022
Accepted January 08, 2022
Published January 15, 2022

KEYWORDS

Cardio-pulmonary Rehabilitation, Physical Therapy, Aerobic Capacity, Inspiratory Muscle Training, High-intensity Interval Training, Telerehabilitation, Functional Recovery, COPD, Heart Failure, Quality of Life

Introduction

Cardio-pulmonary rehabilitation is an inside-out process that focuses on heart and lung disorders to enhance the physio-social well-being of the clients. These diseases like COPD, coronary artery disease, and heart failure often lower exercise tolerance levels, compromise the respiratory system and ultimately reduce the precious quality of life. Cardio-pulmonary diseases account for the highest disability and death rates worldwide, highlighting the importance of rehabilitation interventions on the systemic as well as functional effects.

Cardio-pulmonary rehabilitation really cannot be complete without PT, which deals with physical activities that aim at improving cardiovascular endurance, respiratory efficiency and functional independence of the patient. A variety of modern approaches is incorporated into PT practice: traditional PT including aerobic exercise, breathing retraining, and strength conditioning; new evidenced-based approaches. HIIT, IMT and resistance training not only increase the functional capacity but also decrease the psychosocial impact of these diseases. Moreover, the recent evolution of "telerehabilitation" enables caretakers at a distance, providing important care to populations not reached.

Try and incorporation of physical therapy into cardiopulmonary rehab programs have been evidenced to minimize readmission of patients into hospital, and increased survival and quality of life. Stating the evidence-based practices related to the cardio-pulmonary PT speciality, this paper discusses PT's contributions to functional rehabilitation and life span readiness. In addition, it examines technologies and techniques that are revolutionizing cardiopulmonary rehabilitation, making the treatment patient-focused and economical.

Contact: Laljibhai Makwana, USA.

Role of Physical Therapy in Cardio-Pulmonary Rehabilitation

Cardiopulmonary rehabilitation and its component, PT, are critical for addressing physical deconditioning and optimizing respiratory mechanics and overall functional ability. The treatment employed in PT aims to create a sense of body and mind integration among people with heart and lung diseases. Besides implementing exercise protocols, relaxation exercises, and teaching, PT interventions additionally enhance not only the persons' quality of physical well-being but also decrease the emotional and psychological impact of chronic cardiopulmonary illnesses.

Improving Cardiovascular Endurance

In cardiopulmonary diseases, the patients have a great deal of reduced cardiovascular endurance because of low oxygen-carrying capacity and oxygen consumption pathways during exercise. PT interventions, including aerobic exercise, entail helping clients gain better mobility, increased oxygen delivery and better heart functioning. Research also demonstrates that MICT increases VO2 max, which is an important factor in cardiovascular endurance [1]. Cardiac exercises like walking, cycling, or treadmill training are the commonly recommended exercises in PT programs and have been reported to cause a substantial improvement in exercise capacity in patients with chronic obstructive pulmonary disease (COPD) and heart failure.

Figure 1: Systemic Benefits of Exercise

Enhancing Respiratory Function

Abnormalities of respiratory muscles are characteristic features of many pulmonary disorders, including COPD. Some of the breathing exercises that physical therapist employs include diaphragm breathing, the pursed lip kind of breathing, and inspiratory muscle training or IMT with regard to the strength of the respiratory muscles and the lung volume. According to the numerous studies presented here, it can be stated that the type of training, such as inspiratory muscle training, increases inspiratory muscle strength and decreases dyspnea in COPD patients under treatment [2]. Such therapies help a patient handle the signs with the purpose of enhancing the proficiency level in undertaking functions.

Promoting Functional Independence

In cardio-pulmonary rehabilitation, many of the goals are aPT tend toward achieving functional independence. Patients who have undergone heart surgery, respiratory failure and other surgeries that warrant for the building of up muscle strength or mobilization of joints should also practice progressive resistive exercises. Similarly, the functional training to address tasks, such as climbing stairs or holding groceries, also increases the QoL and the clients' autonomy.

Evidence-Based Practices in Cardio-Pulmonary Rehabilitation

High-Intensity Interval Training (HIIT)

Cardio-pulmonary rehabilitation is also becoming increasingly successful with whole-body HIIT. HIIT involves a short duration of vigorous exercise followed by short periods of the recovery period. It has been revealed that this approach raises the aerobic capacity, peripheral muscle strength and cardiac output more effectively than the MICT strategy [3]. HIIT also enhances the peak oxygen uptake that is considerably vital in heart failure patients' functional recovery.

Inspiratory Muscle Training (IMT)

The study of Inspiratory muscle training aims to increase the strength of the diaphragm and all the respiratory muscles so as to enhance ventilation and minimize dyspnea. Equipment such as inspiratory threshold trainers is utilized to provide resistance comparable to that of airways during inhaling and progressively augment inspiratory muscle power. Randomized controlled trials show that IMT enhances dyspnoea and lessens the rate of hospitalization for COPD patients [2]. IMT is particularly beneficial for patients with advanced pulmonary disease, as it directly addresses one of the most disabling symptoms: breathlessness.

Resistance Training

Strength training has thus come to be considered an important part of cardio-pulmonary rehabilitation activities. Cardiopulmonary patients suffer from muscle atrophy and generalized weakness and, therefore, have poor exercise tolerance as well as physical functional status. All the resistance exercises are designed to stimulate major muscle groups and to increase the strength and functional capacity of the body. These findings are supported by a meta-analysis that indicated that resistance training increases lower limb strength and functional exercise capacity in patients with heart failure [4]. Stacking resistance exercises with aerobic exercises produce better functional gains, according to the study.

Tele-Rehabilitation

Tele-rehabilitation makes use of a remote delivery system of PT services due to challenges like geographical restrictions and access to specialist services. Virtual platforms give the therapist an opportunity to oversee the exercise regime of their patients and give immediate feedback or endorsement. Research has suggested that telerehabilitation is at least as productive as traditional face-to-face therapy in enhancing exercise capacity as

well as reducing rates of readmission to hospitals for patients with cardio-pulmonary disorders [5]. Tele-rehabilitation has become especially relevant after the COVID-19 outbreak due to continuity of care deliveries to high-risk patients.

Emerging Technologies in Cardio-Pulmonary Rehabilitation

Wearable Devices

Portable gadgets, including heart rate monitors, accelerometers and spirometers patients allow effective and convenient tracking of their physiological signs. These devices enable the therapist to monitor progress and exercise stress levels from the data obtained. A randomized controlled trial that was conducted affirmed that patients who wore wearable technology during their rehab programs were more compliant with their programs than the rest of the patients who only received conventional treatment [6].

Virtual Reality (VR)

Virtual reality (VR), therefore, presents an effective technique for motivating and engaging patients in rehabilitation. VR systems can provide patient-specific exercise therapies, including simulated gait training within virtual terrains or climbing virtual stairs. This work proves that VR-supported rehabilitation increases the number of exercise repetitions and decreases the level of anxiety in patients with cardio-pulmonary disorders [7].

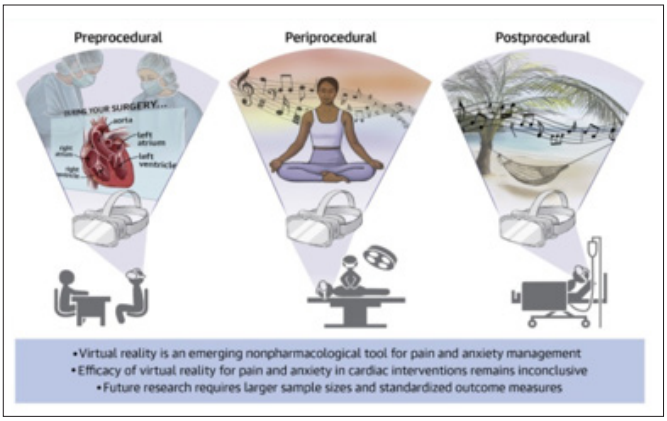

Figure 2: Virtual Reality in Cardio-Pulmonary Care

High-Fidelity Simulators

High-fidelity simulators are complex devices that allow patients to practice cardio-pulmonary recovery in life-like scenarios. These simulators mimic the actual environments: climbing stairs, walking on an uneven surface and other activities in a mock environment in order to gain confidence. Research has demonstrated that the use of high-fidelity simulators enhances balance, coordination, and functional independence in patients who have undergone cardiac surgery [8].

Holistic and Multidisciplinary Approaches

Nutritional Counseling

Cardiopulmonary rehabilitation involves nutrition since patients with cardiopulmonary disease are at high risk of being malnourished or obese, which will worsen the disease signs. As part of a team of caregivers, physical therapists collaborate with dietitians to prescribe and recommend an appropriate diet regimen regarding the restructuring of muscle mass and cardiovascular health. For instance, a Caloric Restriction with High Protein and Resistance Training Physical Therapy improves lean tissue hypertrophy as well as strength in patients with heart failure [9].

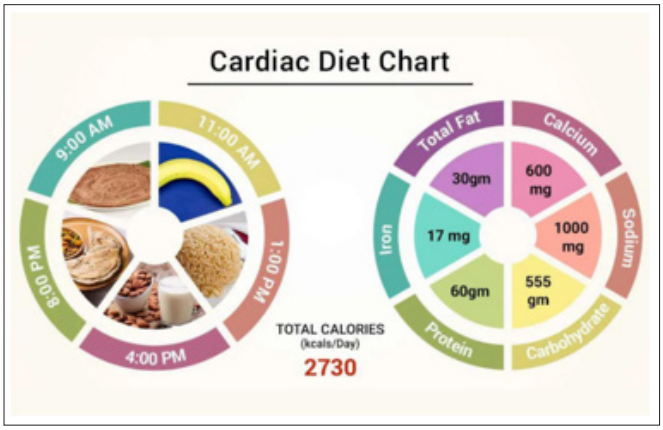

Figure 3: Cardiac Diet Chart

Psychological Support

The diagnosis of cardiopulmonary diseases presupposes certain psychological states such as anxiety, depression, and fear of physical activity. Some of these factors make it difficult for the patients to achieve the much-needed results, and integrating mental health support into the PT programs solves these challenges. Integration of CBT with PT has been recommended due to the capability that resulted in decreased depression symptoms and improved exercise compliance for patients [10].

Patient Education

Also, by informing the patient about their situation and approaching the problem through the prism of rehabilitation, such a person learns that they have the right and the capability to become an active participant in the process. Formation of cultural knowledge regarding breathing patterns, exercising safely and how to change a few personal habits is the key to long-term compliance with PT programs. Research evidence indicates that enhanced knowledge of patients has positive effects on physically active behaviour and functional status (Piepoli et al.).

Impact of Physical Therapy on Quality of Life

The objective of the present work is to evaluate the positive impact of physical therapy on the quality of life and physical functioning of individuals with cardiopulmonary disorders. Reduced symptoms, enhanced exercise tolerance, and increased functional capability allow patients to perform meaningful tasks and obtain a sense of prosthodontic treatment.

Reducing Hospital Readmissions

Early readmissions are frequent in patients with heart failure and COPD and are evidence of inadequate management. Research also indicates that broad-spectrum PT interventions reduce readmission rates because they target and correct causes of functional decline, including deconditioning and poor respiratory function [3].

Fostering Social Inclusion

Patients benefit from group-based PT sessions because people with chronic conditions are often socially isolated. The subject has an impact on social inclusion and increases the completion rates of rehabilitation [7].

Empowering Patients

When done optimally, PT optimizes the individual's functional independence, which is why it is foremost in empowering those receiving care to regain their health and ability to engage fully in all activities. Regardless of the destination, it might be the ability to walk without PT assistance or support, the ability to go back to work, and the ability to engage in recreation.

Challenges and Future Directions

However, there are challenges inherent in the PT intervention in cardio-pulmonary rehabilitation, including high financial costs, few facilities offering these specialized services and regional differences. Upgrading the tele-rehabilitation services and making financial support to programs for the underprivileged patient segments are some of the approaches towards solving these challenges [5]. Each patient is different not only by their medical history and concurrent diseases, but they also require specific functional goals. For future developments in PT, the assessment of the interventions provided should be made according to patient needs applying AI and machine learning to analyze the data [8]. Recent investigations on the potential of regenerative medicine and stem cell therapy indicate the potential to enhance the recovery status of cardio-pulmonary patients. The combination of these therapies with PT could completely change the subject, which could give new chances to those people who have multiple functional limitations [3].

Conclusion

Cardio-pulmonary rehabilitation cannot occur without physical therapy as it provides best practices that help increase functional capacity increase respiratory function as well as general health. Successfully, PT combines conventional procedures with cutting-edge tools to help patients cope with cardio-pulmonary illness and restore self-sufficiency. The fact that rehabilitation endeavours to treat the body, soul and spirit makes it broader in its handling of clients. However, as access remains a significant issue and individualized and sustainable approaches remain a requirement for fair treatment, improved approaches to addressing barriers are required. The new direction of cardio-pulmonary rehabilitation is based on the application of progressive technological tools and a research-based approach aiming to provide the best quality and accessible patient-centred care to every patient.

References

[1] Mezzani A, Hamm LF, Jones AM, McBride PE, Moholdt T, et al. (2013) Aerobic exercise intensity assessment and prescription in cardiac rehabilitation: a joint position statement of the European Association for Cardiovascular Prevention and Rehabilitation, the American Association of Cardiovascular and Pulmonary Rehabilitation and the Canadian Association of Cardiac Rehabilitation, European Journal of preventive cardiology 20: 442-467.

[2] Beaumont M, Forget P, Couturaud F, Reychler G (2018) Effects of inspiratory muscle training in COPD patients: A systematic review and meta-analysis. The Clinical Respiratory Journal 12: 2178-21884

[3] García IB, Arias JAR, Campo DJR, González-Moro IM, Poyatos MC (2019) High-intensity interval training dosage for heart failure and coronary artery disease cardiac rehabilitation. A systematic review and meta-analysis. Spanish Journal of Cardiology (English Edition) 72: 233-243.

[4] Lawler PR, Filion KB, Eisenberg MJ (2011) Efficacy of exercise-based cardiac rehabilitation post-myocardial infarction: A systematic review and meta-analysis of randomized controlled trials. American Heart Journal 162: 571-584.

[5] Balady GJ, Williams MA, Ades PA, Bittner V, Comoss P, et al. (2007) Core components of cardiac rehabilitation/secondary prevention programs: 2007 update: A scientific statement from the American heart association exercise, cardiac rehabilitation, and prevention committee, the council on clinical cardiology; the councils on cardiovascular nursing, epidemiology and prevention, and nutrition, physical activity, and metabolism; and the American association of cardiovascular and pulmonary rehabilitation. Circulation 115: 2675-2682.

[6] Lee HE, Wang WC, Lu SW, Wu BY, Ko LW (2011) Home-based mobile cardio-pulmonary rehabilitation consultant system. in 2011 Annual International Conference of the IEEE Engineering in Medicine and Biology Society 989-992.

[7] Jung T, Moorhouse N, Shi X, Amin MF (2020) A virtual reality–supported intervention for pulmonary rehabilitation of patients with chronic obstructive pulmonary disease: mixed methods study. Journal of Medical Internet Research 22: e14178.

[8] Almousa O, Prates J, Yeslam N, Mac Gregor D, Zhang J, et al. (2019) Virtual reality simulation technology for cardiopulmonary resuscitation training: An innovative hybrid system with haptic feedback," Simulation & Gaming 50: 6-22.

[9] Giuliano C, Karahalios A, Neil C, Allen J, Levinger I (2017) The effects of resistance training on muscle strength, quality of life and aerobic capacity in patients with chronic heart failure—A meta-analysis. International Journal of Cardiology 227: 413-423.

[10] Blumenthal JA, Babyak MA, Connor CO, Keteyian S, Landzberg J, et al. (2012) Effects of exercise training on depressive symptoms in patients with chronic heart failure: the HF-ACTION randomized trial. Jama 308: 465-474.