

Pulmonary hypertension and cardiopulmonary rehabilitation: a systematic review for further clinical research

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Introduction: Pulmonary hypertension (PH) characterized by elevated mean arterial pressure in pulmonary artery more than 25 mmHg¹. Pulmonary hypertension increase pulmonary vascular resistance and increase pulmonary arterial pressure cause symptoms such as dyspnea, lack of effort, weakness, pre syncope and syncope and clinical signs of right heart failure². European PH guidelines recommend supervised cardiopulmonary rehabilitation as an addition to drug therapy. Activities which increase symptoms should be avoided according to the recommendations of the European Society of Cardiology³. Evaluation effectiveness of therapy and monitoring of PH is performed with Echocardiography, Six-minute walk test (6MWT) and plasma N-terminal pro-brain natriuretic peptide (NT-proBNP)⁴. Moderate physical activity increases cardiopulmonary capacity without of clinical worsening in stable patients⁵. Respiratory muscle training, resistance training and aerobic activity shows improvement; 6MWT, quality of life, maximal inspiratory pressure (PImax) and endurance of inspiratory muscles⁶.

Patients and Methods: Medline and Hrčak were searched. In search were used keywords: *pulmonary hypertension and cardiopulmonary rehabilitation*. The analysis included: systematic literature reviews, meta-analyses, research paper, clinical guidelines, and feasibility study protocol. From 14, 10 papers were selected for the final analysis. Problems that occurred when searching the mentioned databases. The research was conducted with a small number of subjects, there are few randomized controlled studies, the cardiorespiratory rehabilitation procedures are uneven, and the results obtained after the research are usually not confirmed by hemodynamic diagnostics.

Results: 1499 patients were included in all papers. First step in treatment is early detection of this fatal disease. Different drugs are used in the treatment, calcium channel antagonists, prostaglandins, endothelial antagonists, and phosphodiesterase inhibitors. When the conservative method of treatment is ineffective, the final step is a lung transplantation⁴. Evaluated selective phosphodiesterase type 5 inhibitor, sildenafil is also the drug to be used in the treatment of PH. Taken orally in 12 months, there was a significant improvement in 6MWT and, the diameter of the right ventricle decreased significantly⁷. Hospital treatment patients with PH is focused on acute conditions and is therefore not aligned with clinical guidelines and evidence-based research. Patients will be directed to other available services (home care...) that do not have enough knowledge to work with PH patients at the end of their lives. Rehabilitation and exercise interventions should be promoted for better outcomes in accordance with patient needs. Procedures should be part of the healthcare system with physiotherapists developing health improvement strategies⁶. Exercise has a positive impact on physical activity capacity, quality of life (QoL), hemodynamics and possible disease progression and survival. An ideal module includes exercise frequency, intensity, duration and setting that still need to be explored. Due to the risks that could arise during rehabilitation in patients with PH, rehabilitation must be supervised and closely monitored by a multidisciplinary team³. Carefully supervised rehabilitation is recommended as an adjunct in patients with PH. In a review of seventeen studies with a total of four hundred and seventy patients, they concluded that after cardiopulmonary rehabilitation there was a significant improvement in physical effort capacity, cardiorespiratory function and QoL compared to untrained control groups. The shortcoming of all studies is the small sample uncontrolled design without assessment of hemodynamics, clinical deterioration, and survival. What is the best method and the duration of the program, the nature of supervision and the increase in functional capacity are also unclear⁸. Published guidelines to provide evidence-based recommendations for cardiorespiratory rehabilitation, specific to the Australian and New Zealand healthcare system presented an evidence assessment with nine PICO (Problem/Population, Intervention, Comparison, Outcome) questions with recommendations for clinicians and health insurers⁹. After aerobic training and resistance exercises, patients with different causes of PH improved 6MWT, aerobic exercise, resistance exercise, and inspiratory muscle training

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(IMT) alone or together significantly improve physical function and psychology in PH patients⁵. Further multicenter research are needed to confirm the efficiency and safety of cardiorespiratory rehabilitation¹⁰. Inadequacy of institutional rehabilitation programs hospital rehabilitation of PH patients is often insufficient, and it is an appropriate time to evaluate the effectiveness of safety and the effect of the program in one's own home, as an alternative method for PH patients. This way eliminates transport problems, distance from centers, long waiting lists. Telemetry provides significant potential as additional support at a distance and is essential for the long-term implementation of rehabilitation¹¹.

Conclusion: Carefully supervised rehabilitation is recommended in addition to drug treatment in patients with PH. Further multicenter research is needed to confirm the efficiency and safety of cardiorespiratory rehabilitation and demonstrated improvement in hemodynamics. Exercise protocols should be standardized.

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