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Pulmonary Rehabilitation in Primary Care: The Use of Oxygen and Nebulization Therapy for Chronic Respiratory Diseases

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ABSTRACT

Introduction: Pulmonary rehabilitation (PR) has become a core intervention with several objectives, including besides reducing the symptoms and physical limitations, physical and social disability, and improving quality of life of patients with chronic lung diseases. PR is often executed within highly specific environment based, however it is incorporated into primary care to provide new and effective means for increasing accessibility of those principles to the population.

Aim of work: To explore the role of oxygen therapy and nebulization as key components of pulmonary rehabilitation in primary care

Methods: We conducted a comprehensive search in the MEDLINE database's electronic literature using the following search terms: Pulmonary Rehabilitation, Primary Care, Oxygen, Nebulization Therapy, Chronic Respiratory Diseases. The search was restricted to publications from 2016 to 2024 in order to locate relevant content. We performed a search on Google Scholar to locate and examine academic papers that pertain to my subject matter. The selection of articles was impacted by certain criteria for inclusion.

Results: The publications analyzed in this study encompassed from 2016 to 2024. The study was structured into various sections with specific headings in the discussion section.

Conclusion: Oxygen and nebulization therapy which are part of pulmonary rehabilitation play a central role in the treatment of Chronic Respiratory Diseases. Its incorporation in the primary care context offers a rational strategy to enhance its access and hopefully the outcomes of patients with CRDs. However, to implement this vision, there is need to pursue efforts towards fetching the key hurdles such as resource constraints, inadequate provider training as well as patient for enhanced implementation. It is possible for primary care to lead the noble cause of advancing PR and affording the millions of people who require long-term management of various forms of lung diseases the optimal care that they deserve based on technology-supported collaborative integrated care models that ensure equitable access to care for all. As the proportion of patient with CRDs increases in the communities, there is a growing need to develop, implement and sustain more patient-centered primary care models.

Keywords: Pulmonary Rehabilitation, Primary Care, Oxygen, Nebulization Therapy, Chronic Respiratory Diseases

INTRODUCTION

Chronic respiratory diseases (CRDs) that include chronic obstructive pulmonary diseases (COPD), asthma, and interstitial lung diseases impact millions of people globally (Salvi et al., 2018). They are associated with significant morbidity, mortality and overall health costs especially in LMICs. Management of CRDs can only be tackled through pharmacotherapy intervention, patient counseling, and altering of patients' behavior (To, 2017). PR has been identified to be a critical intervention that is targeted at enhancing lung function, decreasing the symptoms as well as improving the quality of life for eligible patients suffering from chronic lung diseases. Although PR is philosophically implemented in tertiary care settings, its inclusion in primary care is a breakthrough strategy that can widen the reach of PR intervention to the general population (Wounters et al., 2020).

PR in primary care supports a teamwork and patient-centered approach, which is equally important for its implementation. It includes aerobic and resistance exercise training, clinical and lifestyle psychology, and medical nutritional therapy and education. Oxygen therapy and nebulization are two important aspects of PR that assists in symptom control as well as improving functional capacity of patients with end stage respiratory diseases. These therapies should be used judiciously since they can reduce breathlessness, improve exercise tolerance, and help avoid episodes of worsening of the disease; all of which affects individuals with chronic respiratory diseases. Despite the evidence in favour of oxygen and nebulization therapy, there are gaps in their accessibility and effective use in primary care, which create significant barriers for organiated equitable and effective care (Bourbeau et al., 2020).

Oxygen therapy especially the LTOT is an effective resource which saves lives of patients with severe hypoxemia due to COPD or other respiratory diseases (Branson, 2018). It leads to increased survival, reductions in hospitalization and overall improvement in quality of life. Nonetheless, it is not always easy to facilitate adequate access and compliance with LTOT in the primary care setting. Lack of awareness among practitioners, inadequate or costly solutions, and insufficient training among healthcare professionals sometimes hinder its use. Also, it is essential to understand when and for how long oxygen should be administered as its overuse or improper utilization can cause harm to the patient and lead to complications like hypercapnia. It is critical that primary care practices have strong guidelines for prescribing and overseeing oxygen therapy to enhance the benefits whilst reducing the risks where possible (Cousins, 2023).

Nebulization therapy on the other hand is a convenient and efficient way of administrating bronchodilators, corticosteroids, and other medications to the lungs. It is most useful for patients with acute on chronic conditions such as asthma or COPD flare-ups, where timely alleviation of symptoms is crucial. In chronic management, nebulization can be incorporated on the basis of the requirement of the specific patients who have time management problems or very severe diseases. However, issues that hinder the effective use of nebulizers include; Inequitable availability of the devices, lack of proper patient enlightenment on its proper use, and the irregularity in prescription Author New castle (Barjaktarevic & Milstone, 2020).

The process of incorporating oxygen and nebulization therapy into primary care-based PR programs can also be an effective way to overcome some of the voids in respiratory therapy. Thus, primary care can increase the availability of these therapies and decrease healthcare inequalities by decentralizing the techniques from hospitals to the community. The attainment of this vision calls for the creation of training programs to prepare primary care clinicians, adoption of standard guidelines on the usage of these therapies, and enhancing patient education on the efficacy and drawbacks of these therapies (Alkhathlan, 2024).

This review explores the pivotal role of oxygen and nebulization therapy in pulmonary rehabilitation within primary care. It examines their clinical applications, challenges in implementation, and strategies to optimize their integration into community-based PR programs, aiming to advance the management of chronic respiratory diseases on a global scale.

AIM OF WORK

To explore the role of oxygen therapy and nebulization as key components of pulmonary rehabilitation in primary care

METHODS

A thorough search was carried out on well-known scientific platforms like Google Scholar and Pubmed, utilizing targeted keywords such as Pulmonary Rehabilitation, Primary Care, Oxygen, Nebulization Therapy, Chronic Respiratory Diseases. The goal was to collect all pertinent research papers. Articles were chosen according to certain criteria. Upon conducting a comprehensive analysis of the abstracts and notable titles of each publication, we eliminated case reports, duplicate articles, and publications without full information. The reviews included in this research were published from 2016 to 2024.

RESULTS

The current investigation concentrated on the role of oxygen therapy and nebulization as key components of pulmonary rehabilitation in primary care between 2016 and 2024. As a result, the review was published under many headlines in the discussion area, including: Importance of Pulmonary Rehabilitation, The Role of Oxygen Therapy in Pulmonary Rehabilitation, Nebulization Therapy: A Pillar of Symptom Management, Integrating PR, Oxygen, and Nebulization into Primary Care, Addressing Barriers and Challenges

DISCUSSION

Importance of Pulmonary Rehabilitation

CRDs including COPD, asthma, bronchiectasis, and interstitial lung diseases are a major health care and socioeconomic problem worldwide. From the World Health Organization (WHO), chronic respiratory diseases are among the six leading causes of mortality and morbidity globally, and COPD is expected to move to the third place of leading cause of the death. Such conditions are not easy to manage and hence a multimodal approach of treatment that does not rely on drugs alone (Viegi et al., 2020). PR has become an essential part of CRDs as a structured, comprehensive and evidence based intervention that enables interventions concurrently targeting respiratory functions, symptoms, and life components.

It is a formal and serial, plan to include exercise training, education of the patient, psychological support and counseling, and behavior modifications aiming at optimizing functional and psychosocial health. PR is typically received in a hospital or special outpatient clinic, but its relevance for primary care is increasingly being acknowledged (Roberts et al., 2018). This shift is because the tradition of PR training is expensive and requires sophisticated tools, making it a preserve of only a select few. Since most patients with CRDs present themselves into a primary care level for healthcare, primary care setting can easily identify, manage and even follow up on the patient's conditions. In this regard, the use of oxygen therapy and nebulization as primary elements of the PR in primary care setting will be highlighted. When applied appropriately, these therapies offer symptom management, enhance disease control, and enhance patient's quality of life (Dale, 2020).

The Role of Oxygen Therapy in Pulmonary Rehabilitation

Oxygen therapy for mostly LTOT is recognized as one of the most essential management strategies to address chronically hypoxic patients with advanced CRDs. LTOT has been described to: increase survival; decrease the number of hospitalizations; and positively impact the overall quality of life in patients with chronic respiratory failure. In the context of PR, oxygen therapy is generally prescribed for walking training so the patients can undergo exercise with extreme fatigue or breathlessness. Regarding the physiological rationale of oxygen therapy, it is backed by the improvement of hypoxemia which in turn, relieves dyspnoea, offloads the cardiovascular systems and helps to prevent complications like pulmonary hypertension (Candia et al., 2020).

Primary care practice brings its own challenges in aspiration of oxygen therapy. In practice, there is a lot of evidence about the positive effects of LTOT, but the prescription, compliance, and monitoring in other settings may be challenging. It advances that appropriate usage of oxygen therapy is important as its deficiency or in appropriate administration could lead to severe complications (Khor et al., 2017). For instance, administering high concentration of oxygen in COPD patients results in hypercapnia and hence worsened respiratory acidosis. This emphasises the importance of adequate training of the general practitioners dealing with the O2 therapy regarding selection of candidates, necessary oxygen concentrations and, ABG or SpO2 monitoring.

However, the availability of oxygen therapy in primary care settings is confined by the availability and cost of oxygen delivery systems. The price of an oxygen concentrator or a portable oxygen cylinder and general insurance get very less covering the requirement of most patients. These problems can be solved by new approaches like the oxygen banks in communities or subsidized programs. Also, improvements in the transportability of oxygen delivery systems – such as lighter and battery operated equipment – may also improve patient mobility and compliance. Integrating oxygen therapy into primary care-based PR programs requires a coordinated effort involving healthcare providers, policymakers, and patient advocacy groups to ensure equitable access and effective utilization (Munshi & Ferguson, 2020).

Nebulization Therapy: A Pillar of Symptom Management

Another key component of PR is nebulization therapy, which is most often used for patients with moderate to severe Chronic Respiratory Diseases. Another difference between inhaling and nebulizers is that inhaling need coordination and effort to take in the air at one time like the nebulizers deliver the medications in forms easier to inhale over an extended period in the lungs. Thus nebulization is preferred in cases of severe breathlessness, restricted hand movement and or low mental competence. Bronchodilators, corticosteroids, and mucolytics are the most commonly prescribed medications delivered through a nebulizer for they act in harmony in ending airways inflammation, relieving bronchospasm, and enhancing mucus clearance (Qaiman et al. 2018).

In primary care setting nebulization therapy is very useful in an acute exacerbation of CRD where patients present with features of breathlessness, wheezing and increased sputum

production. What is important to understand that proper treatment during these episodes should be started immediately and can help avoid exacerbations and deterioration of lung function. It instantly relieves the symptoms and stabilizes the patients, so that nebulization therapy is one of few valuable procedures in primary health care. Nonetheless, it is not confined to the acuity; through chronic nebulization, patients with the progressive form of the malignancy can have ongoing nebulization to plan and organise for, enhancing their quality of life, and decreasing the incidence of flare-ups (Lane, 2020).

However, several difficulties have been observed concerning the use of nebulization therapy in primary care. One major challenge identified is access to nebulizer devices and another is cost of the devices which are still a major issue in some health facilities in developing countries. Furthermore, suboptimal nebulizer usage, for example, inadequate cleansing or sterilization, causes bacterial invasion and respiratory diseases. It is therefore mandatory that patients and caregivers be taken through an understanding of recommended nebulizers, how they are used, cleaned and stored as part of the necessary measures in developing any PR program in primary care. However, there are concerns over widespread dissimilarities in the prescription practice of nebulization therapy and therefore flexible prescribing norms are required (Tashkin, 2016).

Integrating PR, Oxygen, and Nebulization into Primary Care

Extending PR, oxygen therapy, and nebulization in primary care also call for a shift in the approach to managing respiratory diseases. However, such interventions need to be put in place and primary care providers should possess the knowledge, skills, and tools required in order to deliver these interventions. From the above, it becomes clear that there is a need to enhance the capacity of primary care teams through training programs and continuing medical education in the implementation of evidence-based activities (Acevedo et al., 2023). Moreover, there is a need for closely-knit cooperation with related specialists, such as pulmonologists, physiotherapists, nurses, and other related health-care specialists in establishing and implementing complex PR campaigns focused on the needs of the local people.

Primary care is one area where technology can be employed to revolutionize the role of PR outreach efforts. Telemedicine further illustrates how remote monitoring of patients on oxygen therapy is possible without frequent clinic visits. Integrated mHealth solutions can include exercise regimens, informational content, and daily prompts that may help patients adhere to PR regimens better. In a similar capacity, educational activities such as support groups and patient education workshops, raise awareness of the disease status and enable those living with CRDs to actively participate in the management of the disease (Martínez-Peláez et al., 2023).

Addressing Barriers and Challenges

It is, however, crucial to understand that operationalization of PR in primary care is not without barriers. Lack of resources particularly in LMICs can limit the development of elaborate PR programs. This notion is enforced by a general ignorance regarding PR among patients and healthcare professionals alike. Lack of health insurance, cultural differences, high costs, and language barriers also limits its usage while misconceptions such as nebulizers being dangerous, that oxygen therapy is equivalent to life support, and fear of being seen as sick or weak, contribute to reluctance to adopt nebulization therapy (Rochester, 2024).

To achieve this, it is necessary to employ several strategies and overcome the barriers mentioned above. Increasing advocacy and awareness about PR could also help to debunk myths and increase appreciation for the discipline. It is, therefore, incumbent upon policymakers to ensure their jurisdictions are well equipped with respiratory healthcare resources and financial support for equipment, training, and infrastructure. Collaborations and partnership in other countries and within the global community can contribute technical and financial support to expand PR in less-endowed contexts. Implementation science and translational research are also paramount, with a strong emphasis on identifying effective and efficient methods of delivering PR that can be replicated across various PC settings (Augustine et al., 2021).

CONCLUSION

PR as an effective model for treatment of CRDs is described as a perspective that encompasses physical, psychological and social aspects of such diseases. There is a potential benefit of incorporating PR into primary care with a goal of increasing access to care and thus offering superior results to a larger population in areas that can barely access specialist care. At the core of this integration is oxygen and nebulization therapy, which offer significant patient's comfort and improved disease control. These interventions can increase exercise tolerance, decrease dyspnoea and decrease the number and severity of exacerbations thereby improving the quality of life in patient with chronic respiratory Disease.

However, the integration of such therapies into PCP has not been without some hurdles as will be discussed below. Some challenges include; Lack of adequate resources, a shortage of skilled professionals, and patient unawareness that require multiple enhanced strategies on the local, national, and international levels. New technologies like Telehealth, M-Health and community based support programs may offer a way out of these barriers. In addition, more integrated and collaborative working as well as developing consistent, evidence-based guidelines would be valuable in translating oxygen and nebulization therapies safely into primary care practice.

At the same time, equitable approach has to stay at the center of this efforts. The organisations responsible for policy making, healthcare provider alongside patient advocacy body needs to come up with measures to ensure that PR and all the related therapies aren't out of reach, especially in the low and middle income countries; the world over, which bear the brunt of CRD burden. With collective hours and strenuous efforts, primary healthcare can be the key spot for delivering integrated, individualized respiratory treatment. Introducing the principles of PR into primary care, as well as oxygen and nebulization therapies, primary care can become the force that will help millions of adults worldwide to better manage their chronic respiratory diseases.

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