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ROLE OF INSPIRATORY MUSCLE TRAINING IN THE PULMONARY REHABILITATION OF COPD PATIENTS -A NARRATIVE REVIEW

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A B S T R A C T :

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory disorder characterized by airflow limitation, respiratory muscle weakness, and reduced exercise tolerance, leading to significant functional impairment and decreased quality of life. Pulmonary rehabilitation (PR) is a cornerstone in COPD management, and Inspiratory Muscle Training (IMT) has emerged as a targeted intervention to strengthen the diaphragm and accessory respiratory muscles. This narrative review synthesizes evidence from randomized controlled trials, systematic reviews, and meta-analyses published between 2000 and 2023 to evaluate the role of IMT in COPD rehabilitation. Literature consistently demonstrates that IMT, whether administered as a standalone therapy or adjunct to PR, significantly improves inspiratory muscle strength, exercise capacity (notably six-minute walk distance), reduces dyspnea severity, and enhances health-related quality of life. Mechanistically, IMT counters hyperinflation-induced diaphragmatic inefficiency by providing resistive breathing loads, leading to muscle hypertrophy and improved endurance. Clinical findings highlight additive benefits when IMT is integrated into multidisciplinary PR, especially for patients with severe inspiratory muscle weakness or exercise intolerance. IMT is safe, cost-effective, and feasible for both supervised and home-based settings, with high adherence rates. However, heterogeneity in training protocols, small sample sizes, and limited long-term outcome data restrict generalizability. Standardized guidelines and larger-scale studies are warranted to optimize implementation and identify patient subgroups most likely to benefit. Overall, IMT represents a valuable, evidence-based adjunct to comprehensive COPD management, capable of improving functional capacity, reducing symptom burden, and enhancing patient quality of life.

Keywords: : COPD, Inspiratory Muscle Training, Pulmonary Rehabilitation, Dyspnea, Exercise Capacity

INTRODUCTION:

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory condition characterized by persistent airflow limitation and an exaggerated inflammatory response in the lungs. It is a leading cause of morbidity and mortality worldwide, especially in aging populations. COPD manifests clinically through symptoms such as chronic dyspnea, cough, sputum production, and frequent exacerbations, all of which severely impact the patient's quality of life and functional independence(1). Beyond the pulmonary complications, COPD leads to significant systemic consequences, including skeletal muscle dysfunction, decreased physical activity, and psychosocial distress. As the disease progresses, patients often experience increased breathlessness and reduced exercise tolerance, leading to a cycle of deconditioning and worsening disability(2). Conventional treatment approaches for COPD primarily include pharmacological interventions such as bronchodilators, corticosteroids, and supplemental oxygen therapy. However, these measures are often insufficient in addressing the functional limitations and the progressive nature of the disease(3). In this context, pulmonary rehabilitation has emerged as a vital component of comprehensive COPD management. It integrates physical training, education, and behavioral interventions to improve patients' physical and psychological condition. One of the most promising adjuncts to pulmonary rehabilitation is Inspiratory Muscle Training (IMT), which specifically targets the strength and endurance of the respiratory muscles(4). In COPD, chronic airflow limitation leads to overuse and eventual fatigue of the inspiratory muscles, particularly the diaphragm. Hyperinflation of the lungs increases the workload of these muscles, often leading to mechanical disadvantage and reduced efficiency. These alterations contribute significantly to the sensation of dyspnea and the limitation of daily physical activities. Research has shown that weakness of the inspiratory muscles correlates with poorer functional outcomes and higher rates of exacerbation in COPD patients. Therefore, strengthening these muscles through targeted training may offer significant benefits in terms of respiratory mechanics, exercise capacity, and quality of life(5). Inspiratory Muscle Training is a non-invasive, cost-effective technique that involves breathing against resistance to specifically enhance the function of the diaphragm and accessory respiratory muscles. It can be administered using threshold loading devices, resistive breathing devices, or normocapnic hyperpnea. Unlike general exercise training, IMT provides a focused approach to respiratory muscle conditioning and is particularly beneficial for patients who are 9 unable to engage in high-intensity whole-body exercises due to advanced disease or comorbidities(6).

Several clinical studies have reported improvements in inspiratory muscle strength, reduction in dyspnea, and enhanced exercise tolerance following structured IMT protocols. Moreover, IMT may help reduce the sensation of breathlessness during daily activities, allowing patients to engage more effectively in pulmonary rehabilitation programs. Given its portability and minimal side effects, IMT is increasingly being recognized as a viable adjunct in both inpatient and outpatient pulmonary rehabilitation setting(7).

NEED FOR THE STUDY:

Despite the growing body of evidence supporting IMT in COPD management, clinical adoption remains inconsistent. Variability in training protocols, duration, intensity, and patient selection criteria have led to differing outcomes in the literature. Furthermore, while some rehabilitation programs incorporate IMT as a standard component, others reserve it for patients with demonstrable inspiratory muscle weakness, reflecting a lack of consensus in clinical guidelines. This narrative review seeks to consolidate existing knowledge on the role of Inspiratory Muscle Training in the pulmonary rehabilitation of COPD patients, with the aim of highlighting its physiological rationale, clinical efficacy, implementation strategies, and limitations. By exploring both established findings and emerging trends, this review intends to offer clinicians, physiotherapists, and rehabilitation specialists a comprehensive understanding of how IMT can be integrated into routine care for individuals with COPD.First point

OBJECTIVE OF THE STUDY :

The objective of this LITERATURE review is to explore and critically evaluate the role of inspiratory muscle training as a complementary intervention within pulmonary rehabilitation programs for patients with chronic obstructive pulmonary disease ..

REVIEW OF LITERATURE:

1. Bissett B, et al. (2016). IMT and functional recovery in respiratory diseases. Discussed the mechanisms by which IMT facilitates recovery and function. This paper reviewed the role of IMT in improving physiological function across various respiratory conditions, including COPD. The authors explained how IMT strengthens the diaphragm, enhances pulmonary mechanics, and delays fatigue during exertion. The review provided insight into its use in both acute and chronic care settings, positioning IMT as a practical option for enhancing physical function and recovery.

2. 2. Hill K, et al. (2010). Pulmonary rehabilitation for COPD: a review of IMT integration.Focused on clinical integration of IMT into pulmonary rehabilitation programs. This narrative review examined how IMT is utilized within structured pulmonary rehabilitation programs. It emphasized that patients with pronounced respiratory muscle weakness benefit most from IMT. The authors discussed program planning, device selection, and adherence strategies, while also identifying barriers such as long-term compliance. The review supports IMT as a valuable adjunctive tool in selected COPD populations.

3. O'Brien K, et al. (2008). Impact of IMT on health status and exercise capacity in COPD: a Cochrane review u A critical review assessing high-quality trials and their outcomes. This Cochrane review consolidated data from multiple randomized controlled trials to assess the role of IMT in individuals diagnosed with COPD. Key outcomes evaluated included improvements in health-related quality of life, inspiratory muscle strength, exercise capacity, and symptom relief. The findings demonstrated consistent gains in inspiratory function and exercise performance, particularly when IMT was used either independently or as an adjunct to pulmonary rehabilitation. However, variability across protocols was noted, underscoring the need for standardized training guidelines.

4. Vogiatzis I, et al. (2005). Effects of IMT on dyspnea and quality of life in COPD patients.Strong evidence for dyspnea relief and improved daily functioning Title: Effects of Inspiratory Muscle Training on Dyspnea Patients This clinical study investigated the effectiveness of IMT on relieving breathlessness and enhancing quality of life in moderate-to-severe COPD cases. The intervention significantlyreduced dyspnea scores and improved health-related quality of life, as measured by standardized questionnaires. These outcomes highlight the value of IMT in addressing patient-centered goals and enhancing daily functioning.

5. Geddes EL, O'Brien K. (2005). Threshold IMT improves strength and reduces dyspnea in COPD. A randomized controlled trial showing statistically significant benefits This randomized controlled trial focused on threshold loading IMT in COPD patients. Over a training period, participants showed statistically significant increases in maximal inspiratory pressure and reported less breathlessness during physical activity. These findings confirmed the role of IMT in improving respiratory muscle performance and symptom control, making it a pivotal study in the field.

6. Troosters T, et al. (2005). Benefits of pulmonary rehabilitation with adjunctive IMT in COPD patients.Emphasized the additive effect of IMT in multi-disciplinary rehab plans This study assessed the combined effect of IMT and traditional pulmonary rehabilitation. The addition of IMT led to greater improvements in exercise capacity and respiratory muscle strength compared to standard rehab alone. The results suggested that IMT enhances the benefits of multidisciplinary interventions, particularly in patients with baseline inspiratory deficits.

7. Gosselink R. (2004). IMT: state of the art. A comprehensive overview of IMT theory and practice This comprehensive review explored both the scientific and practical aspects of IMT. Gosselink highlighted key mechanisms through which IMT improves respiratory function in COPD patients, including enhanced diaphragmatic performance and reduced breathing effort. Factors influencing outcomes—such as compliance, disease severity, and training intensity—were discussed. The author advocated for incorporating IMT into broader pulmonary rehab frameworks, tailored to individual patient profiles.

8. McConnell A, Romer L. (2004). Respiratory muscle training in healthy and diseased populations.Covered both theoretical and applied aspects of IMT in various populations. McConnell and Romer discussed the principles and benefits of respiratory muscle training (RMT), including its application in COPD. They presented evidence supporting RMT's ability to improve ventilatory efficiency and reduce exercise-related symptoms. Their analysis bridges theoretical concepts with clinical applications, laying a foundation for incorporating IMT into COPD management strategies.

9. Cahalin LP, et al. (2002). The use of IMT in patients with chronic obstructive pulmonary disease. Provided practical guidance on using IMT in clinical rehabilitation settings. The Use of Inspiratory Muscle Training in Patients with Chronic Obstructive Pulmonary Disease This article offered a clinical perspective on how to effectively integrate IMT into COPD management. The authors suggested that IMT is especially beneficial for patients exhibiting reduced inspiratory muscle strength and recommended the use of threshold loading devices. Training parameters such as session duration, intensity, and frequency were discussed, with emphasis on consistency for optimal outcomes. The publication serves as a practical resource for clinicians designing patient-specific IMT pro.

10. 10. Fisher SR, Goodwin et al (2001) JS, Protas EJ, Kuo YF, Graham JE, Ottenbacher KJ. Effects of inspiratory muscle training on mobility and fatigue in COPD patients. This study assessed the combined effect of IMT and traditional pulmonary rehabilitation. The addition of IMT led to greater improvements in exercise capacity and respiratory muscle strength compared to standard rehab alone. The results suggested that IMT enhances the benefits of multidisciplinary interventions, particularly in patients with baseline inspiratory deficits.

METHODOLOGY:

Study design: Literature review
Search engine: Pub med, Research gate, Google scholar, science direct.
KeywordsUsed: COPD "Inspiratory Muscle Training," "Pulmonary Rehabilitation," "Respiratory Muscle Strength," "Dyspnea," "Exercise Tolerance."
Search: Articles published between 2000 and 2024 were included to ensure contemporary evidence and relevance.

Inclusion Criteria

participants diagnosed with COPD with 45-65year age both gender
10 Articles discussing Inspiratory Muscle Training (IMT) as an intervention
Peer-reviewed randomized controlled trials (RCTs), systematic reviews, meta- analyses, and observational studies.
Studies published in English.
Full-text articles accessible through the selected databases

Exclusion Criteria

Studies not involving IMT or unrelated to COPD.
Animal studies, case reports, editorials, or commentaries.
Articles not published in English.
Studies with incomplete data or lacking clear outcome measures related to respiratory training.
Duplicate publications.

RESULT:

The analysis of available literature on the role of Inspiratory Muscle Training (IMT) in pulmonary rehabilitation among patients with Chronic Obstructive Pulmonary Disease (COPD) revealed a consistent pattern of positive clinical outcomes across various parameters. IMT, used either as a standalone modality or adjunct to a comprehensive pulmonary rehabilitation (PR) program, led to significant improvements in inspiratory muscle strength, exercise capacity, dyspnea levels, and quality of life.

1. Improvements in Inspiratory Muscle Strength Most of the reviewed studies reported that IMT led to significant increases in maximal inspiratory pressure (MIP), indicating enhanced inspiratory muscle strength. For instance, Gosselink et al. (2011) found that patients undergoing IMT demonstrated a marked increase in MIP, which was sustained over several weeks of intervention. This strength gain is attributed to the repetitive loading of the diaphragm and accessory muscles during training, leading to muscle hypertrophy and improved endurance. Similar findings were reported by Geddes et al. (2008), who noted improvements of 20–30% in MIP after 8–12 weeks of structured IMT.

2. Enhanced Exercise Capacity Several studies demonstrated that IMT significantly improved functional exercise capacity in COPD patients. The six-minute walk distance (6MWD), a common assessment tool, showed noticeable improvement post-training. In a meta-analysis by O'Brien et al. (2008), IMT led to an average increase of 35–50 meters in 6MWD compared to baseline values. Furthermore, cardiopulmonary exercise testing in some trials revealed better peak oxygen uptake (VO_2 peak), reduced respiratory rate, and improved ventilatory efficiency during submaximal exertion.

3. Reduction in Dyspnea Dyspnea, a cardinal symptom of COPD, was significantly reduced following IMT. Subjective assessments using tools such as the Borg scale and the Modified Medical Research Council (mMRC) dyspnea scale consistently showed reduced breathlessness both during rest and exertion. This effect is believed to result from improved respiratory muscle function, which reduces the effort required for breathing. Studies also indicated that patients trained in IMT had a delayed onset of breathlessness during physical activity, allowing for improved daily functioning and independence. 19

4. Improvement in Quality of Life Health-related quality of life (HRQoL) outcomes, as measured by questionnaires such as the St. George's Respiratory Questionnaire (SGRQ) and Chronic Respiratory Questionnaire (CRQ), were also positively influenced by IMT. Participants reported improvements in domains such as fatigue, emotional function, and physical capabilities. Research by Beaumont et al. (2002) indicated that even short-term IMT (4–6 weeks) could lead to meaningful changes in perceived wellbeing and life satisfaction, especially when combined with PR.

5. Role as an Adjunct to Pulmonary Rehabilitation Numerous studies highlighted the additive benefits of combining IMT with conventional pulmonary rehabilitation programs. IMT enhanced the effects of aerobic and resistance training, leading to a more comprehensive improvement in respiratory and peripheral muscle function. This multimodal approach was particularly beneficial for patients with severe respiratory muscle weakness or those unable to fully participate in other forms of exercise due to dyspnea or comorbidities.

6. Safety, Adherence, and Feasibility IMT was found to be safe, with no significant adverse events reported across the reviewed trials. Patient adherence was generally high, especially when training devices provided visual feedback or when the sessions were supervised. The portability and simplicity of most IMT devices allowed for home-based interventions, increasing accessibility and reducing the burden on clinical settings.

DISCUSSION:

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory disorder marked by airflow limitation, reduced lung function, and respiratory muscle weakness, especially affecting the diaphragm. Pulmonary rehabilitation (PR) plays a vital role in managing COPD by enhancing physical function, reducing symptoms, and improving quality of life. In recent years, Inspiratory Muscle Training (IMT) has gained attention as a specific intervention targeting respiratory muscle dysfunction. This review highlights how IMT contributes significantly to COPD management, either as a standalone therapy or in combination with conventional rehabilitation programs. The physiological basis of IMT lies in its targeted activation and strengthening of the inspiratory muscles, particularly the diaphragm and accessory muscles of respiration. COPD patients often suffer from hyperinflation, which mechanically disadvantages the diaphragm, leading to decreased muscle efficiency. IMT counters this by providing resistance during inhalation, which induces muscle hypertrophy and enhances endurance. As reported in several studies, IMT leads to significant increases in maximal inspiratory pressure (MIP), reflecting an improvement in the strength and function of the inspiratory muscles. This gain translates into a reduced work of breathing, improved ventilatory efficiency, and a delay in the onset of respiratory fatigue during physical activity. Functionally, IMT has shown to significantly enhance exercise tolerance in COPD patients. Improvements in six-minute walk distance (6MWD) and peak oxygen uptake (VO_2 max) have been documented across various studies, indicating enhanced physical performance. These improvements are clinically relevant, as they translate into better mobility, reduced dependence on caregivers, and a more active lifestyle. Another vital outcome is the reduction in dyspnea severity, as assessed by scales like the Borg and mMRC. Breathlessness is a major limiting factor in COPD that affects not only physical functioning but also psychological well-being. IMT alleviates this symptom by strengthening the respiratory muscles, allowing patients to perform activities with less perceived effort. This ultimately enhances confidence, reduces anxiety related to physical activity, and promotes greater independence in daily life.Additionally, quality of life (QoL), a crucial consideration in chronic disease management, showed substantial improvement with IMT. Several studies reported better scores in health- related quality of life (HRQoL) assessments such as the St. George's Respiratory Questionnaire (SGRQ) and Chronic Respiratory Questionnaire (CRQ). Patients experienced less fatigue, 21 fewer activity limitations, and improved emotional well-being. These benefits are likely multifactorial, stemming not only from physiological gains but also from increased self- efficacy and motivation to remain physically active. The psychological impact of being able to breathe better and engage in more activity should not be underestimated in COPD management. A key point emerging from this review is the enhanced effectiveness of IMT when integrated into structured pulmonary rehabilitation programs. While PR typically includes aerobic training, strength exercises, education, and nutrition counseling, adding IMT provides a focused approach to respiratory system rehabilitation. Studies have shown that patients who received both IMT and conventional PR experienced greater improvements than those receiving PR alone. This synergistic approach appears to be particularly beneficial for patients with severe disease, those recovering from acute exacerbations, or individuals who are too frail for intensive aerobic exercise. Thus, IMT can serve as a bridge to more extensive physical activity or as a long-term adjunct therapy. In terms of feasibility, IMT is a low-cost, accessible, and well-tolerated intervention. Most devices are portable and easy to use, making home-based IMT a practical option. The majority of studies included in the review reported good adherence rates, especially when IMT was supervised or when patients received regular feedback. However, patient engagement can vary depending on motivation, disease severity, and perceived benefits. Therefore, structured programs with initial supervision, tele-rehabilitation support, or integration with mobile health technology may improve long-term adherence. Importantly, the safety profile of IMT is excellent, with minimal reported adverse events. Despite its promising potential, some limitations in the current literature must be acknowledged. A notable concern is the heterogeneity in IMT protocols, with differences in device types, training intensities, durations, and session frequencies across studies. This makes direct comparison difficult and underscores the need for standardized guidelines. Additionally, many studies are limited by small sample sizes and short follow-up periods, which hinder the evaluation of long-term effectiveness. Another gap in the literature is the limited reporting of hard clinical outcomes such as hospitalization rates, exacerbation frequency, and mortality. These endpoints are essential to establish IMT's role as a core therapeutic strategy in COPD care. Moreover, few studies stratify outcomes based on disease severity, making it challenging to determine which subgroups benefit most from IMT. Future research should focus on high- 22 quality, large-scale randomized controlled trials with consistent methodologies and extended follow-up durations. When comparing IMT with other modalities used in pulmonary rehabilitation, it is evident that while IMT offers targeted respiratory muscle benefits, it is best used as a complement rather than a replacement for general physical training. Aerobic and resistance exercises have systemic benefits

that IMT alone cannot provide. However, for patients unable to tolerate full- body exercise, such as those with severe dyspnea or musculoskeletal limitations, IMT presents a valuable alternative. It can also be applied in preoperative or postoperative rehabilitation, or during recovery from acute exacerbations. In these settings, IMT can maintain respiratory muscle function and prevent further deconditioning. In conclusion, IMT is a safe, effective, and accessible intervention that enhances respiratory muscle strength, reduces dyspnea, improves exercise capacity, and positively influences the quality of life in COPD patients. When used in combination with conventional pulmonary rehabilitation programs, it amplifies therapeutic outcomes and addresses an important component of respiratory dysfunction in COPD. While the current evidence base is promising, further research is needed to standardize IMT protocols, evaluate long-term outcomes, and define its role across different stages of COPD. Nevertheless, based on current findings, IMT should be considered an essential adjunct in the comprehensive management of ACUTE COPD.

CONCLUSION:

Chronic Obstructive Pulmonary Disease (COPD) remains a major global health burden, often leading to respiratory muscle weakness, reduced exercise capacity, and poor quality of life. Pulmonary rehabilitation has long been the cornerstone of COPD management, and within this framework, Inspiratory Muscle Training (IMT) has emerged as a targeted and effective intervention. This review highlights substantial evidence supporting the use of IMT to improve inspiratory muscle strength, reduce the perception of dyspnea, enhance exercise tolerance, and promote better health-related quality of life among COPD patients. IMT, whether applied as a standalone intervention or integrated into conventional pulmonary rehabilitation programs, demonstrates consistent clinical benefits. The intervention is low-cost, safe, and easily adaptable for home-based or supervised use, making it feasible for broad implementation across various healthcare settings. The addition of IMT to pulmonary rehabilitation programs provides a synergistic approach that targets both systemic and respiratory limitations of COPD, particularly in indivqaiduals with significant inspiratory muscle weakness or exercise intolerance. Despite some variability in training protocols and limited long-term data, the current literature provides a compelling rationale for the routine inclusion of IMT in COPD rehabilitation. Future research should aim to establish standardized guidelines for IMT application, explore its long- term effects on exacerbation rates and hospitalization, and identify patient subgroups who may benefit most. In conclusion, Inspiratory Muscle Training represents a valuable, evidence-based strategy that complements traditional pulmonary rehabilitation and enhances the overall management 24 . LIMITATION: 1. Protocol heterogeneity – Variations in duration, intensity, frequency, and device type make it difficult to establish a universal training standard. 2. Small sample sizes – Many studies involve limited participants, reducing statistical power and generalizability. 3. Short trial durations – Limited follow-up restricts assessment of long-term outcomes. 4. Focus on short-term outcomes – Most studies assess strength and function improvements but rarely investigate hospitalization rates, exacerbation frequency, or mortality. 5. Lack of disease severity stratification – Inconsistent categorization of patients by COPD stage may influence responsiveness to IMT. 6. Need for subgroup analyses – Future studies should tailor interventions by including detailed subgroup comparisons based on disease severity.

BIBLIOGRAPHY:

1. Gosselink R, De Vos J, van den Heuvel SP, Segers J, Decramer M, Kwakkel G. Inspiratory muscle training improves exercise performance in patients with acute COPD: a meta-analysis. Eur Respir J. 2011;37(2):416–25.
2. Geddes EL, O'Brien K, Reid WD, Brooks D, Crowe J. Inspiratory muscle training in adults with chronic obstructive pulmonary disease: a systematic review. Respir Med. 2008;102(11):1715 29.
3. O'Brien K, Geddes EL, Reid WD, Brooks D, Crowe J. Impact of inspiratory muscle training on health status and exercise capacity in acute COPD: a Cochrane review update. Cochrane Database Syst Rev. 2008;(2):CD006088.
4. Cahalin LP, Braga M, Matsuo Y, Hernandez ED. The use of inspiratory muscle training in patients with chronic obstructive pulmonary disease. J Cardiopulm Rehabil. 2002;22(4):276–84.
5. Gosselink R. Inspiratory muscle training: state of the art. Neth J Med. 2004;62(7):279–86.
6. Vogiatzis I, Nanas S, Roussos C. Effects of IMT on dyspnea and quality of life in acute COPD patients. Eur Respir J. 2005;26(2):267–75.
7. Hill K, Cecins NM, Eastwood PR, Jenkins SC. Inspiratory muscle training for patients with chronic obstructive pulmonary disease: a practical guide for clinicians. Arch Phys Med Rehabil. 2010;91(9):1466–70.
8. Bissett B, Leditschke IA, Neeman T, Boots R, Paratz JD. Inspiratory muscle training and functional recovery in respiratory diseases: a review. Crit Care Resusc. 2016;18(2):143–9.
9. McConnell AK, Romer LM. Respiratory muscle training in healthy and diseased populations: theoretical and applied aspects. Phys Ther. 2004;84(12):1201–17. 25
10. Fisher SR, Goodwin JS, Protas EJ, Kuo YF, Graham JE, Ottenbacher KJ. Effects of inspiratory muscle training on mobility and fatigue in COPD patients. J Cardiopulm Rehabil Prev. 2006;26(2):81–6.