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To cite this article: Cathy Benninger RN, MS, CNP & John G. Mastronarde MD (2015): Novel pulmonary rehabilitation approach in a 46-year-old female with significant decline in lung and functional status following H1N1, Journal of Asthma

To link to this article: <http://dx.doi.org/10.3109/02770903.2015.1033727>



Published online: 12 Sep 2015.



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ORIGINAL ARTICLE

Novel pulmonary rehabilitation approach in a 46-year-old female with significant decline in lung and functional status following H1N1

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Abstract

Introduction: Pulmonary rehabilitation (PR) is an established therapeutic intervention for improving limb muscle dysfunction, reducing morbidity and mortality in a variety of chronic lung conditions. Providers are instrumental in improving success by optimizing disease management, minimizing barriers and tailoring a program to meet the patient's goals and functional needs. **Case report:** We present a case of a young woman with mild asthma who developed severe chronic obstructive pulmonary disease following H1N1. She remained limited in instrumental activities of daily living following traditional PR but participated in therapeutic horseback riding with notable improvement in functional capacity and emotional well-being. **Conclusions:** There is a growing body of knowledge on the benefits of PR but little is known about the physiologic and psychological benefits of other forms of exercise such as horseback riding. This case highlights the importance of individualizing care and identifies a novel area of research to be explored.

Keywords

Asthma, H1N1, pulmonary rehabilitation, therapeutic horseback riding

History

Received 13 February 2015

Revised 2 March 2015

Accepted 20 March 2015

Published online 7 September 2015

Introduction

For the majority of people with exertional dyspnea related to lung disease the suggestion of exercise as a treatment modality sounds counterintuitive. Yet, exercise performed in a structured pulmonary rehabilitation (PR) program has been shown to reduce dyspnea, improve quality of life (QOL) and functional capacity of those with a variety of lung diseases, including chronic obstructive pulmonary disease (COPD), asthma, interstitial lung disease and others [1]. PR programs must be a minimum of eight weeks for the greatest physiological benefits; however, the effects will diminish over 6–12 months if physical activity is not continued [1]. To date, the majority of PR programs consist of a linear progressive resistance exercise program involving walking on a treadmill and or cycling [1]. However, new research has shown the benefits of utilizing a variety of exercises, including interval and strength training, upper arm strengthening and in unique circumstances neuromuscular electrical stimulation [1]. The definition of PR has also been revised to include an individualized exercise and education program focused on improving physical and emotional well-being as well as facilitating a long-term healthy lifestyle [1].

Case report

An active 46-year-old female with mild persistent asthma was well controlled on daily zafirlukast until 2009, when she contracted the H1N1 virus. For the next 12 months, she required oral methylprednisolone tapers every 3–5 weeks for treatment of asthma exacerbations. Her controller medications were stepped-up, but due to intolerance to inhaled corticosteroids she was placed on zafirlukast, azithromycin, tiotropium, albuterol and oxygen for hypoxemia. She continued to experience severe exertional dyspnea, weakness and loss of functional capacity. Her Asthma Therapy Assessment Questionnaire[®] (ATAQ) [2] score was 4/4 based on: poor asthma control; asthma-related limitations on daytime activities; night time awakening due to asthma; use of more than 12 puffs of rescue albuterol daily for symptom management in the past 4 weeks. She completed PR and continued pulmonary maintenance or warm water aerobics for 1 h 3 times a week with improved endurance and muscle strength but struggled with instrumental activities of daily living such as rising from a chair, folding laundry, putting away dishes and braiding her hair. She failed to recover sufficiently to return to work. Lung transplant was not an option due to her weight and medication intolerances.

On physical examination she was visibly dyspneic with exertion, mildly obese (body mass index-35), with diminished breath sounds bilaterally without wheezing. Pulse oximetry on room air was 94% at rest but dropped to 88% during exertion. The remainder of her exam was normal.

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Labs were within normal limits and revealed no eosinophilia. Chest radiographic findings were unremarkable. Spirometry steadily declined from a baseline forced vital capacity (FVC) of 106% and forced expiratory volume in 1 s (FEV₁) of 98% to FVC of 26% and FEV₁ of 21% predicted values by 2011.

She was motivated to improve physical functioning and contacted a local therapeutic riding horse stable in 2012. Modifications were made to the saddle for oxygen attachment and the occupational therapist structured a progressive program to improve balance, core, upper and lower body strength through grooming, tacking, and various riding tasks. She continued maintenance exercises twice a week and performed 15 min of grooming and tacking followed by a 45 min riding session every week with reported reduction in overall dyspnea, improved mobility, functional capacity, independence and QOL. Additionally, in 2013, modest improvements were noted in FVC and FEV₁ to 36% and 32%, respectively, and her ATAQ scores were 2/4.

Discussion

Participating consistently in an exercise program is a challenge for those with chronic lung disease. COPD exacerbations have been associated with physiological changes in the muscle [3]. Limb muscle dysfunction, particularly in the lower body leads to poor exercise tolerance, lower QOL, increased health care utilization and overall survival [3]. The physiological link between limb muscle dysfunction and COPD is poorly understood but the effects are long lasting with only partial improvement three months after an exacerbation, without intervention [3]. Exercise improves limb muscle function and morphology and is recommended as soon as possible after an exacerbation [1,3].

There are a number of other physical and psychological factors in COPD which limit exercise participation, including supplemental oxygen, degree of dyspnea at baseline, extent of hyperinflation of the lungs, self-motivation, self-efficacy and depression [4]. Participation is also influenced by the enjoyment associated with the activity [5]. Providers are instrumental in helping patients manage barriers by optimizing medical management of the underlying disease and comorbidities, ordering supplemental oxygen with the greatest portability, assessing limitations in basic and instrumental activities of daily living, ordering PR and assisting patients to explore physical activities meaningful to them.

Best practice guidelines which outline a specific combination of exercises for the greatest physiologic and functional impact remain to be established. Additionally, very little is known about non-traditional exercise interventions or options for pulmonary patients who do not have access to PR or have not reached functional outcome goals with PR. In one small study, low-intensity aquatic exercise was shown to be equivalent to floor exercise in reducing dyspnea and improving lung function in moderate to very severe COPD participants [6].

Therapeutic horseback riding (TR) has been utilized for many years to enhance outcomes in children with speech, intellectual and motor disorders [7]. Recently, small studies

describe improved balance, lower limb strength and QOL when used in the elderly [8] and those who are post cerebral vascular accident [9] or with multiple sclerosis [10]. Strength building is obtained through grooming, saddling and riding activities [11]. Electromyography measurements during a trot indicates the rectus abdominis, trapezius, arm and shoulder muscles are engaged in a rhythmic pattern in response to the horses movements to keep the rider stabilized [12]. Shurtleff et al. suggest a 45 min riding session results in 3000–5000 contractions of the core muscles to maintain balance and posture as the horse adjusts gait, speed and direction [13]. Cerulli et al. noted increased maximal oxygen consumption (VO₂ max), leg and shoulder muscle strength and QOL in breast cancer survivors after 16 weeks (2 h per week) of TR [11]. However, there are no published studies that have measured the effect of TR on muscle strength or lung function in those with pulmonary disease.

Conclusion

This case raises awareness of the importance of identifying and managing barriers which may limit a patient's ability to exercise and tailoring a program based on their personal interests in order to meet physical goals and support psychological well-being. Additional research is needed to determine best practice guidelines which maximize physiologic and functional capacity for participants during and after PR.

Clinical pearls

- (1) Assess ability to perform basic and instrumental activities of daily living.
- (2) Consider PR as a therapeutic modality for those with physical limitations as a result of their lung disease.
- (3) Optimize medical management prior to starting PR.
- (4) Treat exacerbations early to reduce morbidity and encourage resumption of exercise soon after an exacerbation.
- (5) Identify and reduce barriers to maintaining an exercise program.
- (6) Help patients identify meaningful activities which promote an active lifestyle even if the activity is non-traditional.

Declaration of interest

The authors report no affiliations or involvement in any organization or entity with financial interest or non-financial interest in the subject matter or materials discussed in this manuscript. The authors report no funding or grants associated with this manuscript.

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