



THE ROLES OF THE PHYSIOTHERAPIST IN THE MANAGEMENT OF RESPIRATORY DISEASES

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Abstract

Background: Although physiotherapy techniques alleviate most of the clinical manifestations of majority of respiratory diseases, the roles of physiotherapists in the management of these diseases are underutilized.

Objective: To highlight the roles of the Physiotherapist in the management of respiratory diseases.

Review: A review of the roles and aims of physiotherapy as well as the physiotherapy management modalities in respiratory diseases was done.

Conclusion

Physiotherapists use non-invasive, physiotherapeutic techniques that are safe and very effective in relieving symptoms, improving functional abilities and quality of life in individuals with respiratory diseases

Introduction

Physiotherapy (also known as Physical Therapy) is a healthcare profession concerned with maximizing quality of life (QoL) and movement potential within the spheres of health promotion, disease prevention and treatment as well as rehabilitation of an individual following disease or injury.¹ These spheres encompass physical, psychological, emotional, and social wellbeing of a patient, and also involve the development, maintenance, and restoration of the individual's maximum movement and functional ability.¹ Physiotherapy entails a protocol that is made up of the assessment, evaluation, and diagnosis of a patient's condition; the planning of an intervention or treatment; the actual treatment and the re-evaluation of any progress made by the patient based on a set of goals drawn up by a physiotherapist to help patient recovery.² Today, the approach to physiotherapy treatment protocols involve the use of evidence based practice and a conceptual framework derived from the World Health Organization's International Classification of Function, Disability and Health.³

Physiotherapists are multidimensional specialists in the field of preventive, curative and rehabilitative medicine trained to handle a wide variety of disease conditions such as musculoskeletal problems, neurological conditions, cardiorespiratory conditions, primarily focusing on the restoration and rehabilitation of the body's functional abilities following illness.¹ The Respiratory Physiotherapist is a specialist in the field of respiratory medicine with the responsibility of assessment and treatment of

individuals who suffer from medically-diagnosed disorders of the respiratory system and critically ill patients in the Intensive Care Unit (ICU) using non-invasive, physical techniques.⁴ He ensures that individual sufferers are relieved of their discomforting symptoms, regains as close to maximal functional ability and QoL as possible.⁴ Examples of common chronic respiratory diseases whose treatment involves the Respiratory Physiotherapists are [Asthma](#), [Bronchiectasis](#), [Chronic Obstructive Pulmonary Disease \(COPD\)](#), [Chronic Rhino sinusitis](#), [Hypersensitivity Pneumonitis](#), [Lung Cancer](#), [Cystic fibrosis](#) and [Adult Respiratory Distress syndrome](#).⁵

The scope of Physiotherapy in management of respiratory diseases

Physiotherapy involves taking a detailed history of the patient's condition and assessing the patient's symptoms objectively.² The history will include taking note of the following:

1. Current situation or presenting symptoms of the disease
2. Onset of the disease (either gradual or sudden)
3. Duration of symptoms which has to do with frequency or chronology (seasonal or daily variations)
4. Characteristics of the condition (quality or severity)
5. Effect of the disease on activity of daily living (ADL) and QoL
6. Living conditions and accommodation type of patients
7. Nature of patients' occupation and family/social history
8. Previous diagnosis of similar episodes, treatments and their efficacy



The Respiratory therapist also objectively assesses the following parameters:

1. Patients' vital signs,
2. Blood oxygen saturation (measured with a noninvasive oxygen monitor such as Pulse Oxymeter),
3. Shortness of breath / Breathing pattern,
4. Postural deformities (Barrel or pigeon chest, Kyphosis or scoliosis) and movement pattern,
5. Thoracic expansion measurements (Thoracic circumference during inspiration and expiration using a tape measure),
6. Presence of abnormal breath sounds eg wheeze (Auscultation),
7. Presence and nature of cough or secretions, including colour and quantity of secretions,
8. Pulmonary function measurement (using a spirometer),
9. Respiratory muscles' strength (using a manovacuometer),
10. Exercise capacity and tolerance (using a timed 6-minute walk test),
11. Other associated symptoms like fatigue level,
12. Weight and height (using a weighing scale and a height meter)
13. Outcome measures e.g. quality of life questionnaires,
14. Chest radiographs or results from other forms of investigation, including laboratory investigations.

The aims of physiotherapy management in patients are to:

1. Improve ventilation by reducing breathlessness and the work of breathing
2. Improve diaphragmatic excursion and breathing control
3. Clear excess secretions
4. Teach effective coughing techniques
5. Improve lung function
6. Maintain sufficient mobility to prevent circulatory complications and restricted thoracic, shoulder girdle and arm movements
7. To correct postural deformities and ensure pain free movements
8. To strengthen weak respiratory muscles
9. To maintain or improve exercise tolerance and functional abilities
10. Improve general wellbeing of the patient and return the patient to as full and as independent a life as possible

The Chest physiotherapy management modalities are as follows:

A. Breathing Exercises: These exercises have value as an add-on therapy to medication and other standard treatments in respiratory conditions.⁶ They involve;

- I. Exercises that aim at manipulating the

pattern of breathing (Breathing Retraining);

- ii. Exercises that aim at increasing the strength and/or endurance of the respiratory muscles (Respiratory Muscle Strengthening);

Breathing Retraining

The major goals in breathing retraining are:

1. Reducing respiratory rate by decreasing the number of breaths taken per time
2. Encouraging deep breathing (Diaphragmatic breathing) through the use of the abdominal muscles and lower thoracic chest.
3. Encouraging breathing through the nose (Nasal Breathing)
4. Encouraging relaxation to decrease anxiety through relaxed, controlled breathing
5. Decreasing expiratory flow through pursed lip breathing

Examples of breathing retraining exercises are as follows:

a. Diaphragmatic Breathing – This technique involves breathing through the nose and holding the breath as long as possible while ensuring that the diaphragm moves maximally to help slow down the breathing rate and decrease the body's need for oxygen. It can be done in sitting or standing positions.

b. Pursed Lip Breathing - This is a breathing technique that consists of exhaling through tightly pressed (pursed) lips and inhaling through the nose with the mouth closed.⁷ It results in slower and deeper breaths with a shift in respiratory muscle recruitment from the diaphragm to the accessory muscles of breathing, leading to decreased breathlessness and improved oxygenation on exercise. With regular practice, it can help strengthen the lungs and make them work more efficiently.

c. Buteyko breathing- This technique was developed in the 1950s by a Russian doctor named Konstantin Buteyko. He developed it to control hyperventilation and anxiety which leads to shortness of breath in patients with asthma.⁸ It uses series of exercises to teach patients to breathe less deeply and less rapidly. Although it does not improve lung function, it helps reduce



breathlessness. The patient breathes normally through the nose for 2-3 minutes and then breathes out normally. He/she is then instructed to close the nose with the fingers, and hold. The length of time that the patient can hold his/her breath is noted after which the patient releases the nose and returns to nasal breathing. The patient then waits for 3 minutes before repeating the whole process and holding the breath for as long as possible.⁸

Respiratory Muscle Strengthening

These are specific trainings for the respiratory muscles using inspiratory muscle training equipment such as incentive spirometer to increase the capacity of the inspiratory muscles.^{9,10} These exercises increase the strength and endurance of the diaphragm and accessory muscles of respiration.¹¹ The patient is asked to sit upright in a chair and breathe in through a mouth piece of this external device as slowly and as deeply as possible, to enable the piston in the device to move up to the level indicated by the marker. The patient is then asked, to hold their breath for as long as possible and then exhale slowly and watch the piston fall back into the bottom of the column. This way, the respiratory muscles are forced to work harder, increasing their strength, leading to easier diaphragmatic breathing and a reduction in lung hyperinflation.

B. Airway Clearance Techniques

These manoeuvres include Forced Expiratory Techniques (FET) (Coughing and Huffing techniques) which are used to move secretions that are mobilized by deep breathing/thoracic expansion exercises, downstream towards the mouth.¹² A cough is a forced expiratory manoeuvre through a closed glottis while a huff is a forceful exhalation through an open throat and mouth. A huff is performed by breathing out forcefully through the mouth with an open throat while using the abdominal muscles to gently squeeze out the air. Huffing helps to move secretions from the small airways to the larger airways, from where they are removed by coughing.¹²

C. Active Cycle of Breathing Techniques

These are active breathing techniques performed by the patient and can be used to mobilise and clear excess pulmonary secretions and to generally improve lung function.¹³ It is a flexible method of treatment which can be used in conjunction with positioning and adapted for use with most patients. It consists of three phases Breathing Control, Deep Breathing Exercises, and Huffing or FET. It is used to achieve the following aims;

1. Loosen and clear secretions from the lungs.
2. Improve ventilation in the lungs.
3. Improve the effectiveness of a cough

Breathing Control and Deep Breathing Exercises are achieved through breathing retraining exercises while Huffing or FET is exhaling forcefully through an open mouth and throat instead of coughing.

D. Chest Percussion and Other Manual Techniques

Chest Percussion is a type of manual therapy and one of the interventions for airway clearance which augments the mobilization of secretions in one or more lung segments to the central airways.¹⁴ It is performed with cupped hands which strike the patient's chest wall in an alternating rhythmic manner over the lung segments being drained of excess secretions. The technique is applied over a towel to ensure it does not feel uncomfortable. When short periods of percussions (<30 sec) are combined with three or four thoracic expansion exercises via diaphragmatic breathing, no fall in oxygen saturation is seen. Other manual techniques used by Respiratory physiotherapists to clear secretions from the chest are manual shaking and vibration techniques and they are applied on expiration. They involve the physiotherapist using both hands to vibrate the lower chest wall in order to loosen secretions and allow them to be coughed out.¹⁵

E. Postural Drainage

This is a safe and effective technique for treating accumulated secretions in the lungs in conditions such as Lung abscesses, Bronchiectasis and Cystic fibrosis by placing the patient in positions where gravity will assist in mobilizing the secretions from the lung segments to the central larger bronchi.¹⁶ The secretions can be suctioned out or coughed out from the larger bronchi. The patient will be placed in each position for 20 to 30 minutes per session, three times daily. It can be done in the night to reduce coughing at night or in the morning to clear accumulated secretions during the night.¹⁶ Postural drainage is better done before meals. It is done in conjunction with chest percussion or mechanical chest vibration to help loosen the secretions.

F. Heat Therapy

Heat is used by physiotherapists to alleviate pain and induce the release of endorphins, powerful opiate-like chemicals which block pain transmission. Heat can be employed in different forms to relieve the symptom of chest pain, especially musculoskeletal chest pain in chronic respiratory conditions. An example of heat therapy modality used by Physiotherapists for this purpose is Infrared therapy.¹⁷ Infrared radiation is an invisible form of electromagnetic energy which



has a wavelength that is longer than that of the visible light. It enables multiple forms of energy to be transferred into the subcutaneous tissue (approximately 2–3 cm deep) without stimulation.¹⁷

Another heat therapy that has proven to be effective in loosening mucous secretions from the airways and lungs of patients with respiratory diseases as well as improves ventilation is inhalation of hot water vapours. The patient sits on a chair with a bucket of very hot water at his/her feet; he/she places a big towel over his/her head and covers the bucket as well with the same towel placed on the head. He/she breaths in deeply the rising vapour for about 15 minutes. This procedure is repeated several times a day. In acute respiratory conditions such as COVID-19 where there is pneumonia, this therapy helps in resolving the pneumonia.¹⁸ Heat therapy causes increase in cutaneous vasodilatation which brings about a redistribution of blood supply from the central towards the periphery. This means increased blood supply to skin and reduced blood supply to the internal organs including the lungs. There will be less supply of the inflammatory cells, chemicals and fluid brought by the blood to the lungs in response to the infection of the respiratory organs. This will reduce inflammation and in turn improve the gaseous exchange between the alveoli sacs in the lungs and blood in the capillaries supplying the lungs. This will lead to improved oxygenation of the blood and decreased mortality caused by hypoxaemia.

It is important to drink lots of water not only to replace the increased lost body fluids through increased sweating during the heat therapy but also to increase the hydration of the body for metabolic purposes as well as loosen mucous secretions for easy expectoration.

G. Interferential Therapy

The basic principle of Interferential Therapy (IFT) is to utilize the significant physiological effects of low frequency electrical stimulation of nerves without the associated painful and somewhat unpleasant side effects. Two electrical currents at slightly different frequencies are produced, and at the point where they cross over one another, the two currents interact to produce a lower frequency, therapeutic current. The IFT device then delivers a continuous stimulation of this low frequency current deep into the affected tissues using a 4,000Hz carrier wave to overcome skin impedance. This low frequency current has a

beneficial effect on the immune system and stimulates the production of endorphins which brings about a long term pain relief and some local anaesthesia. Aweto et al¹⁹ reported that there were significant improvements in selected pulmonary parameters, Asthma Control Test Score and Asthma Quality of Life Questionnaire Score following a six week study of the effects of IFT on selected outcome measures in patients with asthma.

H. Laser Therapy

Laser therapy (delivered in the form of low level Laser Therapy or Laser Acupuncture) has bio-stimulative and tissue regenerative properties as well as antimicrobial, anti-inflammatory and analgesic effects.²⁰ It improves gaseous exchange in the lungs, eases wheeze in patients with asthma and improves pulmonary function as well as enhances immunity with other health benefits. Experimental studies with animals as well as clinical trials in humans have demonstrated its anti-inflammatory effects in different lung diseases, including asthma and COPD.²⁰ This therapy has also been shown to be of beneficial effect when used in combination with drug therapy and breathing pattern retraining techniques.²⁰

I. Musculoskeletal Exercise Training and Postural Techniques

Patients with chronic respiratory conditions may have postural adaptations, muscle shortenings, and chronic pain that are independent of disease severity. Chronic Obstructive Pulmonary Disease (COPD) may cause changes in the shape of the thoracic cage by increasing lung volume and hyperinflation and individuals with Asthma commonly present with the following postural distortion patterns; forward head posture, shoulder forward position, overly rounded upper back, anterior and posterior rib misalignments elevation, protraction of the scapular girdle and semi flexion of the arm.^{21,22} Exercises that aim at increasing the flexibility of the thoracic cage and improving posture are usually beneficial to such patients. They are encouraged to perform Range of motion (Flexibility) exercises to the neck, trunk and shoulders as well as postural correction and retraining to counter all these postural adaptations. Lean-forward postures frequently relieve dyspnoea in patients with COPD by reducing respiratory effort. The shifting of abdominal contents elevates the depressed diaphragm cranially, resulting in improved performance. The most benefit occurs in patients with severe hyperinflation, who have inward movement of the upper abdomen.