Article

Dyspnea Management in Patients with COPD: Non-Pharmacological Strategies

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Abstract

Dyspnea in patients with chronic obstructive pulmonary disease (COPD) is a complex symptom. It is most commonly understood as the subjective experience of difficulty in breathing due to airflow limitation that is not reversible. Its consequences are multidimensional involving all aspects of the patients' life including physical distress, psychological distress, as well as social isolation and high economic burden. It is a life-threatening symptom that could result in death or can greatly impair their quality of life. Nurses play a crucial role in helping the patients and their families learn how to prevent and manage the symptom. It is essential for nurses to understand its signs, symptoms, as well as the management strategies. Dyspnea management for patients with COPD consists of three strategic types: pharmacological strategies, non-pharmacological strategies, and other alternative treatments. This paper aims to describe mechanisms of dyspnea, its impact on the patients' life, and strategies for dyspnea management focusing on non-pharmacological strategies. These management strategies suggesting by nurses are important as they can be performed independently; however, they were reported as less frequently used in the patients'daily life. This paper will greatly benefit nurses who wish to provide more effective health care guidelines for the patients with COPD to better manange the symptom and to enhance their quality of life.

Keywords: chronic obstructive pulmonary disease; dyspnea management; non-pharmacological strategies

Introduction

Chronic obstructive pulmonary disease(COPD) is a common cause of morbidity and mortality worldwide. The World Health Organization (WHO) estimates that the global morbidity rate of COPD has been approximately 210 million cases in 2012. It is the fourth leading cause of death among all fatal diseases in the world.[1] According to the Ministry of Public Health of Thailand[2], the morbidity rate of COPD in Thai people is estimated at 1.5 million cases annually, making it the fifth leading cause of death for Thai people in 2016. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) staging system classifies severity of the patients with COPD into four categories based on the value of forced expiratory volume per second (FEV_1). These categories are labeled as mild, moderate, severe, and very severe stages respectively. Staging the severity of COPD is beneficial for healthcare providers as it enables them to provide the patients with more appropriate care and it helps with predicting the patients' life expectancy.

The patients with COPD generally suffer from multiple concurrent symptoms due to chronic bronchitis and emphysema which may contribute to airflow obstruction. Approximately 62 percent of patients with moderate to severe COPD reported variability in symptoms over a day or a week.[3] For Thai patients with COPD, the most distressing symptom is breathing difficulty, while the most prevalent conditions include shortness of breath, shallow breathing, and mucous congestion.[4] GOLD provided a similar report showing that the most common symptoms of COPD are dyspnea, chronic cough, and chronic sputum production.[5] Dyspnea awfully interferes with eating and the work of breathing. This brought about energy depletion resulting in weight loss and fatigue. Moreover, dyspnea during exertion can seriously impact daily activity and exercise capacity as well as the patients' quality of life.[6,7] It can be concluded that dyspnea is one of the most frequently distressing symptoms in patients with COPD. This paper aims to describe mechanisms of dyspnea, its effect on the patients' life and to provide non-pharmacological dyspnea management strategies from related literature, which can be implemented by nurses and other healthcare professionals aiming to enhance the quality of life of their patients with COPD.

Mechanisms of Dyspnea in Patients with COPD

Dyspnea refers to a sudden and severe shortness of breath or difficulty in breathing, which is usually found in patients with COPD. GOLD defines COPD as "a common preventable and treatable disease, which is characterized by persistent airflow limitation. Associated with an enhanced chronic inflammatory in the airways and with the response of the lungs to noxious particles or gasses, COPD is usually progressive."[5] Dyspnea in patients with COPD is a subjective experience that each individual has different thresholds for noticing, reporting, and rating the severity of the symptom.[8] Dyspnea consists of two phases: acute exacerbation and chronic dyspnea. Acute exacerbation is a sudden worsening of dyspnea, and each exacerbation may result in death. Chronic dyspnea is shortness of breath that lasts more than one month. The perception of dyspnea varies based on behavioral and physiologic responses of the patients.[9] The mechanisms of dyspnea in patients with COPD start with airflow limitation resulting in a reduction in the ratio of FEV_1, a decrease in lung compliance, and hyperinflation. This mechanism results in ventilation-perfusion (V_A/Q) mismatched and impaired gas exchange. The dynamic lung hyperinflation leads to increase in the elastic and threshold loads on the inspiratory muscles. As a result, this mechanism increases the work of breathing and consumes much oxygen, which creates dyspnea.[7] Therefore, dyspnea in patients with COPD causes the physical body to receive

less oxygen. Then, when oxygen or energy supplies become limited, the patients will have to make an extra effort to breathe. This effort definitely requires additional energy.

There are six essential modifiable risk factors related to dyspnea in patients with COPD. First, cigarette smoking affects the inflammatory response of airway and parenchyma, resulting in airflow limitation.[6] Second, environmental pollution referring to indoor and outdoor air pollution can cause an acute exacerbation.[5] Third, malnutrition can affect physical strength and the function of respiratory system, resulting in dyspnea.[10] Fourth, respiratory infection is related to the cause of acute exacerbation.[5,6] Fifth, psychological distress makes breathing difficulty and can disrupt gas exchange, which can eventually result in dyspnea.[8] Sixth, poor adherence to therapy and the ineffective use of bronchodilator can lead to the decline of lung function, thereby increasing the chance of dyspnea.[11] However, these risk factors can be regulated and prevented by nursing care, caregivers, and patients themselves in order to reduce dyspnea in patients with COPD.

Measurement of Dyspnea in Patients with COPD

Dyspnea is a subjective symptom which can be measured by direct examination of individual's perception of the patients with COPD. There are four effective tools that nurses can use to measure a patient's present level of dyspnea. These tools include the Dyspnea Numeric Rating Scale (DNRS), the Dyspnea Visual Analogue Scale (DVAS), the Modified Medical Research Council Scale (MMRC), and the Modified Borg Scale (MBS).[12] First, the DNRS is a convenient tool used to measure dyspnea's levels of severity and distress. Scores obtained from the DNRS range from 0-10 when 0 means "no dyspnea", and 10 means "extreme dyspnea"[13] Second, the DVAS is a horizontal line that is 100 mm. in length with dots, pictures, or verbal descriptors at the two ends.[14] On this line, patients can mark where they percieve as the representation of their current level of dyspnea. Scores of the DVAS ranging from 0 to 100 can be interpreted as follows: 0 means "no shortness of breath at all", while 100 means "maximum shortness of breath." Third, the MMRC is used to assess a patient's level of dyspnea based on their ability to perform physical activities which require minimal administration and a short time measurement within minutes. Scores of the MMRC range from grade 0 to grade 4 with grade 0 meaning "not troubled by breathlessness with strenuous exercise," and grade 4 meaning "too breathless to leave the house or breathless when getting dressed or undressed."[15] Fourth, the MBS is used to measure levels of dyspnea at rest and during performing activities using the Six-Minute Walk Test (6MWT). This is the most commonly assessed dyspnea based on exercise test in patients with COPD.[16] Scores of the MBS ranging from 0 to 10 referring to 0 as "no difficulty at all" and 10 as "maximum breathing difficulty."[14]

Impacts of Dyspnea in the Patients with COPD

Impacts of dyspnea in patients with COPD are multidimensional involving patients' perspectives in all areas including physical distress, psychological distress as well as the socio-cultural and economic dimensions. Physical distress can emerge as the result of increased effort during exertion, which usually requires extra breathing. This phenomenon can lead to activity limitation, weight loss, fatigue, and reduced exercise capacity.[7,12] Psychological distress of dyspnea includes anxiety, stress, fear, panic, and depression.[4, 12] The sociocultural dimension due to dyspnea comprises symptoms such as fatigue and the reduction of physical activity. Dyspnea can also result in loss of previously identified role and responsibility and the inability to earn a living, which can lead to social isolation.[3,12] Economic dimensions involve direct and

indirect costs or payment due to official care of the ailment. For Thai patients with COPD, hospitalization is a major cost in COPD management, which is estimated at 12,735 million baht per year.[2] Dyspnea is evidently a major health problem in patients with COPD. If not treated with proper management and effective nursing care, dyspnea is a life-threatening symptom that can result in death and/or impair the patients' quality of life. Nurses play a crucial role in assisting the patients with COPD to reduce and prevent its severity. Thus, it is necessary that they have a comprehensive understanding regarding mechanisms of the symptom, the knowledge regarding symptom management and the experience in aiding the patients to regulate their symptoms.

Dyspnea Management in Patients with COPD

Numerous research studies reveal a number of dyspnea management methods used by patients with COPD. The most useful dyspnea management methods perceived by the patients with COPD in Bangladesh included using bronchodilators, leaning forward position, and keeping still, while the least useful methods were using oxygen therapy and doing breathing exercise.[17] In Thailand, the most useful dyspnea management methods as perceived by the patients with COPD in Songkhla province included receiving assistance and advice from family members and physicians, using prescribed medication and inhalers and avoiding the exposure to allergic substances. The three least useful methods reported by the patients were listening to songs or music, using relaxation techniques, and doing exercises.[18] Interestingly, Srirat, et al.[4] founded that the most effective dyspnea management methods perceived by Thai patients with COPD in a university hospital and a provincial hospital included taking bronchodilator, using the pursed lip technique, and performing effective coughing. These studies indicated that a variety of dyspnea management strategies, both pharmacological and non- pharmacological, were used by COPD patients. However, while it was obvious that the cost of non- pharmacological strategies was relatively minimal and they apparently have no medicinal side effects, it was used less frequently than pharmacological strategies by the patients with COPD.[12,18,19] In this regard, it seems advisable, yet challenging, for nurses to raise the patients' attention and to promote the benefits of non- pharmacological strategies for their dyspnea management. This is also because these methods suggesting by nurses can be practiced independently. In other words, they can be performed at home, with no cost or any expense, by patients themselves or with the help of their family members in order to reduce dyspnea in patients with COPD.

Non-pharmacological Strategies for Dyspnea Management in Patients with COPD

Non- pharmacological strategies refer to any methods or techniques of dyspnea management that do not include administering medication in the patients. The principal goals of these strategies are to reduce dyspnea, to improve the quality of life, and to enhance physical and emotional conditions while performing daily activities.[6] Among non-pharmacological strategies, pulmonary rehabilitation is the main method used by patients which refers to the following strategies: (1) energy conservation techniques, (2) breathing techniques, (3) relaxation techniques, (4) exercise training, (5) nutritional strategies, and (6) secretion clearance strategies. The description of how to apply these techniques of non- pharmacological strategies in the patients' daily life is provided below:

1. **Energy conservation techniques**: For many patients with COPD, breathing requires a conscious effort, and this effort definitely requires additional energy. Thus, it is essential that they learn techniques of how to conserve energy while

performing daily activities so that they use less effort and less energy. Energy conservation techniques can help reduce the level of energy expenditure, which will decrease the sensation of dyspnea, whereby increasing the functionality of the patients.[20] Strategies for energy conservation include pacing activities, avoiding unnecessary activities, and having rest periods during prolonged tasks. Energy conservation principles or the six "Ps" can be summarized as guidelines for the patients with COPD[21] as follows;

1.1 Prioritize daily activities: This means making a list of what one needs to do as well as what one desires to do. This method helps the patients to learn to avoid unnecessary activities. Nurses and family members can help them set priorities, help them learn how to handle their daily high-risk tasks. These include activities such as prior setting of tools and/or daily equipment within reach, avoiding going outdoor when the temperature is cold, and refraining from lifting any heavy objects for saving energy.

1.2 Plan scheduling management: This refers to a realistic timetable for daily, weekly, and monthly tasks and prioritize them. These timetables can be developed cooperatively by the patients and their family. For example, the patients are suggested to perform any heavy housework that requires extra energy in the morning or to set it aside until whenever they have the highest level of energy. Beyond this, the patients should take a short break after each activity to reduce the chance of dyspnea.

1.3 Pace oneself: This means that the patients are advised not to rush, nor to go over ones' limits of energy, and slow down when necessary, such as while walking up the stairs, while speaking, and while eating. They are also advised to ask for assistance from family members, friends, and health-care providers when doing difficult tasks, walking on a long walkway, or when having dyspnea during exertion. Moreover, they should practice taking time to relax and to have a good night sleep as to recharge one's energy for the next day.

1.4 Positioning: This starts by advising the patients to notice which activities or physical positions make their symptoms get worse. With this awareness, they can avoid particular activities and organize home space in the way that they can avoid unnecessary movements. In addition, the patients should use their elbows and forearms to support their body while working to maintain a good posture including sitting. For example, in order to conserve their energy, the patients should sit rather than stand such as sitting while ironing, sitting while showering.[20, 22] Velloso, et al.[20] showed that the use of energy conservation techniques during activities of daily living could reduce energy consumption and dyspnea in patients with COPD. They suggested the energy conservation techniques as follows: (1) when doing personal hygiene activities, they should sit on a chair and rest their arms on the sink; (2) when putting on and taking off their shoes, they are advised to sit on a chair and raise the foot up with their legs crossed; (3) when reaching for things on high shelves, the patients' shoulders should be at the same level of the shelves. In contrast, when grabbing things on lower shelves, their pelvis should be at the same level of the shelves.

1.5 Pursed-lip breathing during exertion: This technique improves the mechanical efficiency of respiration by reducing dynamic hyperinflation, which, in turn, helps increase tidal volume and improve carbon dioxide elimination during exertion leading to better performance of daily activities for patients with COPD.[23] Pursed-lip breathing performed while doing daily activities such as walking and lifting heavy objects can reduce dyspnea during exertion. This is a valuable energy conservation technique useful for walking up the stairs. First, the patients should slowly inhale through their noses for two seconds during halt. Next, they should slowly

exhale through their lips for four seconds. This is done while walking up for three steps and they can repeat this step until the end.[21,22] Bailey, et al.[12] recommended lowering levels of physical exertion while performing daily activities and during the exhalation phase of respiration to reduce the respiratory rate and to prolong the duration of exhalation, which can eventually decrease dyspnea.

1.6 Having a positive attitude: It is commonly known that patients with any health conditions can benefit from having a positive attitude. It is particularly helpful in patients with COPD. This is because their emotional reaction can result in psychological symptoms, which can influence dyspnea. To prevent these, the patients are suggested to develop a positive attitude by maintaining optimistic stance, laughing, and remaining calm in all situations. Bailey, et al.[12] revealed that 25 percent of the patients with COPD, who could control dyspnea effectively, had reported using relaxation techniques, having positive thinking, listening to music, practicing yoga, and using humor. In summary, dyspnea management requires having a positive attitude combined with other techniques, which can result in better control of dyspnea and the prevention of psychological symptoms in patients with COPD.

2. **Breathing techniques**: This involves diaphragmatic breathing and pursed-lip breathing. The purposes of these two important breathing techniques are to reduce the respiratory rate and to prolong expiration while using a gently leaning forward posture. The diaphragmatic breathing technique is useful for improving the mechanical efficiency of the diaphragm.[20] This technique can be done to strengthen the diaphragm, to reduce the respiratory rate, and to increase alveolar ventilation. The steps are as follows: first, the patient puts one of his/her hands on the chest and the other hand on the abdomen. Then, the patient slowly inhales through his/her nose for two seconds focusing on abdomen moving outwards. Then, he or she slowly exhales through pursed-lip for four seconds focusing on abdomen inwards.[5-6] With regard to the pursed-lip breathing technique, it helps enable slow expiration, prevents collapse of small airway, increases gas exchange, and helps the patient control the rate and depth of respiration. This is the most useful pulmonary rehabilitation in patients with COPD. The steps are as follows: first, the patient slowly inhales through his/her nose for two seconds, then, purses his/her lips as if he or she would do when whistling. Then, the patient slowly exhales, while keeping lips pursed for four seconds, when not forcing his or her lungs to empty.[5-6, 21] Breathing techniques which should involve 15 minutes of breathing exercises can be applied three times daily. After eight weeks, it can improve scores obtained from a six-minute walk test, enhance lung function, reduce dyspnea, increase exercise capacity and quality of life in patients with COPD.[5, 7, 24]

3. **Relaxation techniques**: These techniques are particularly important for patients with advanced COPD as psychological distress can lead to dyspnea intensity.[23] Focusing on emotional states, these techniques are useful tools for relaxing, feeling of peace, and preventing emotional reactions in patients with COPD. A variety of relaxation techniques have been compiled and described as the methods that can be adapted to suit each individual. The techniques include progressive muscle relaxation, breathing techniques, distraction therapy, yoga, meditation, Tai Chi, biofeedback, and practicing imagination of peace.[18,23,25] These techniques could reduce anxiety, minimize psychological distress, and produce benefits for certain physiological parameters such as oxygen saturation and heart rate, which are not exclusively found in patients with COPD. Chan, et al.[26] show that mindful meditation of eight 60-minute weeks could help improve emotional function in patients

with COPD. However, according to the findings, these techniques may be helpful in reducing dyspnea in the short term, but they have not been shown any long-term effect.[25] Future studies are required as to prove the long-term effect of relaxation techniques in reducing dyspnea in patients with advanced COPD.

4. **Exercise trainings**: For patients with COPD, activity limitation can cause disability, cardiovascular malfunction, and skeletal muscle mass decline. Aerobic and resistance exercises can help restore and maintain functional independence in patients with COPD. These exercises are beneficial for increasing physical capacity, decreasing anxiety caused by dyspnea, enhancing independence in performing daily activities, reducing fatigue, and improving quality of life.[27] The recommendation of exercise training for patients with COPD involves both upper limb and lower limb training for 20-30 minutes per day such as walking, jogging, or forward arm raising as long as they can tolerate. Phuvipirome, et al.[28] revealed that the pulmonary rehabilitation program with *palunglompran* could reduce dyspnea and could increase self-efficacy in controlling dyspnea after an eight-week training. Apparently, one of the most important nurses' roles regarding dyspnea management is to advise their patients with COPD concerning exercise trainings and related issues.

5. **Nutritional strategies**: Patients with COPD often experience an imbalance between energy intake and energy expenditure. If the patients do not compensate their needs for additional energy by taking in more calories, they can experience weight loss, protein insufficiency and energy malnutrition.[12] Therefore, nurses must consider and understand the impact of dyspnea and nutritional status of each patient. The aim of nutrition strategy is to acquire adequate energy, to minimize the risk of unexpected weight loss, to avoid loss of fat-free mass, to prevent malnutrition, and to improve pulmonary function. The metabolism of carbohydrate, fat, and protein can all be converted into carbon dioxide and water in the presence of oxygen. Carbohydrates will yield the most carbon dioxide.[10] Thus, nutrition therapy by consuming high-fat foods (i.e., salmon fish, tuna fish), low-carbohydrate diets, the avoidance of foods that cause gas (i.e., beans, sodas), and consuming small amount of food in a meal, but eating variedly four to five times per day, are all recommended for patients with COPD. However, nutritional supplement therapy with primarily high-calorie intake can be effective in maintaining and improving the muscle strength as well as exercise tolerance of the patients with COPD.[29] The management of malnutrition of Thai patients with COPD can contribute to the promotion of appropriate energy implying that nutrient intake is particularly important for them. In addition, assessment of nutritional status and individual calories needs that show levels of appropriateness of intake can affect the severity of malnutrition in the patients. This is because such assessment can help identify the extent of physical activity that patients should perform so as to improve their quality of life.[30]

6. **Secretion clearance strategies**: Techniques that have been used to aid sputum expectoration and improve mucociliary clearance in patients with COPD include air humidification, exercise, conventional chest physiotherapy, and autogenic drainage. These techniques can help reduce dyspnea, improve exercise tolerance, and improve health-related quality of life.[31] Effective coughing is the most common secretion clearance strategy used in an education program designed especially for patients with COPD which consists of deep breathing and controlled coughing and huffing.[12] The steps of huff coughing techniques are: (1) the patients sit up straight on a chair; (2) they take deep breath for two to three times; (3) they slowly inhale through one'nose for two seconds and hold breath for two to three

seconds; (4) they forcefully exhale in short, and cough two to three time for moving secretion from the air way.[5,6,12] Aiming to clear secretion from the air way, these techniques are useful and safe for individuals with COPD.[12,18,31] They are also beneficial for a long-term needing of respiratory-related hospitalization.[22,32] As for the patients who are not on a fluid-restricted diet, they should be encouraged to drink two to three liters of liquids per day. This will help keep mucus thin and help clear the airway.[10]

Applications of Dyspnea Management in Patients with COPD in nursing

Non-pharmacological strategies and rehabilitation programs in patients with COPD also involve recommendations on education for dyspnea management. These are outlined in the best practice guidelines for nurses stating that nurses working with individuals with COPD must have adequate knowledge and skills in educating the patients.[12] According to literature review, however, educating the patients regarding the techniques or 'how to' (i.e., giving them pamphlets or guidelines) are proved insufficient as they may not follow the steps regularly and precisely. Thus, it is suggested that nurses help the COPD patients develop an action plan that incorporates self-management strategies and seek ways to make sure that the intervention groups readily adapt the techniques.[12] Self-management is a patient-oriented biopsychosocial care which allows patients with COPD to understand their illness. It also aims to enable the patients to define self-management in their own way, and nurses can provide them with advice regarding dyspnea management. Non-pharmacological strategies, pulmonary rehabilitation programs, and self-management strategies are all indispensable instrumentals in enhancing functional status and quality of life in patients with COPD.

Conclusion

Dyspnea in patients with COPD is a major public health issue and its consequences are multidimensional, which can greatly impair the quality of life of the patients. Nurses play a crucial role in helping the patients reduce and prevent the severity of dyspnea by providing guidelines and advice to them, as well as their family, and ensuring the intervention so that that they can perform appropriate daily activities that can result in the improvement of their quality of life. To maximize their role in helping patients with COPD, it is necessary that nurses understand the symptoms of the disease, have the clinical knowledge of dyspnea management and its applications by the patients as well as the experience of how to assist them. Non-pharmacological strategies for self-management in patients with COPD is an approach that can provide nurses and other healthcare providers with guidelines to effectively and efficiently take care of the patients in improving the quality of life in patients with COPD.

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