


## Section: Medical Surgical Nursing

### Cough therapy for sputum expulsion in patients with chronic obstructive pulmonary disease

Nia Afifatul Ulya , Estrin Handayani, Robiul Fitri Masithoh

#### Authors information

Department of Nursing, Universitas Muhammadiyah Magelang, Indonesia

 **Contactable email:** nia.afifatululya28@gmail.com / Article DOI: *On process*

#### Abstract

Chronic Obstructive Pulmonary Disease (COPD) encompasses a range of irreversible respiratory disorders, including chronic bronchitis, bronchiectasis, emphysema, and asthma. These conditions are characterized by persistent dyspnea and impaired airflow, presenting significant challenges in managing ineffective airway clearance. This study explores the efficacy of targeted cough therapy in improving sputum expulsion among patients with COPD experiencing ineffective airway clearance. Over a 3-day intervention period, patients participated in a regimen of specialized coughing exercises designed to enhance sputum removal. Post-intervention evaluations revealed that the implementation of effective cough techniques significantly improved airway clearance, highlighting their potential as a critical nursing intervention for COPD management. This study underscores the importance of integrating effective cough strategies into routine care to address the challenges of sputum management in patients with COPD, offering a practical solution to a common clinical problem.

**Keywords:** COPD; airway clearance; cough therapy; nursing intervention; nursing care

#### Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a broad category of irreversible disorders, including chronic bronchitis, bronchiectasis, emphysema, and asthma, which are characterized by dyspnea on exertion and reduced airflow into and out of the lungs (Sugeny, 2018). According to the 2016 Non-Communicable Disease Profile, COPD affects various age groups in Indonesia, with 1.809 cases reported in individuals as young as 6 years old. A study showed the prevalence of COPD in Indonesia was 3.7% in 2016, 2.4% in 2017, and 2.6% in 2018 (Agustin, 2023). COPD is a collective term for progressive lung diseases that obstruct airflow and make breathing difficult. It encompasses several conditions, including chronic bronchitis, emphysema, and bronchiectasis (Devine, 2008). These disorders are characterized by their irreversible nature, which means that while symptoms can be managed, the underlying lung damage cannot be completely reversed (Bollmeier & Hartmann, 2020). COPD primarily results from long-term exposure to harmful substances, such as cigarette smoke, air pollution, or occupational dust and chemicals. Chronic bronchitis, one of the main types of COPD, involves inflammation of the bronchial tubes, leading to persistent cough and mucus production (Dotan, So, & Kim, 2019). Emphysema, another key component of COPD, involves damage to the alveoli, the tiny air sacs in the lungs where gas exchange occurs, resulting in reduced oxygen supply to the blood and difficulty exhaling (Voelkel, Gomez-Arroyo, & Mizuno, 2011). Bronchiectasis, though less common, involves the abnormal and permanent dilation of the bronchi, leading to chronic infection and inflammation (Martínez García & Soriano, 2022). The combination of these conditions leads to progressive respiratory impairment and reduced quality of life.

Symptoms of COPD typically include chronic cough, increased mucus production, shortness of breath, and wheezing. These symptoms worsen over time, especially with continued exposure to risk factors like smoking (Tsiligianni & Kocks, 2020). Diagnosis is usually made through a combination of clinical history, physical examination, and pulmonary function tests, such as spirometry (Kahnert, Jörres, Behr, & Welte, 2023). While there is no cure for COPD, treatments such as medications, lifestyle changes, and pulmonary rehabilitation can help manage symptoms, improve quality of life, and slow disease progression (Khan et al., 2023). A common nursing problem in patients with COPD is ineffective airway clearance, often due to the accumulation of secretions. One effective management strategy is the implementation of effective coughing techniques (Westerdahl, Osadnik, & Emtner, 2019). Cough therapy offers significant benefits for managing COPD by enhancing the effectiveness of sputum clearance and improving respiratory function (Smith & Woodcock, 2006). This therapeutic approach focuses on teaching patients specific coughing techniques that help mobilize and expel mucus from the airways, which can otherwise accumulate and contribute to airway obstruction and respiratory distress (Belli et al., 2021). With improving sputum clearance, cough therapy can reduce the frequency of exacerbations, alleviate symptoms such as coughing and breathlessness, and enhance

overall lung function, thereby improving the patient's quality of life. Additionally, effective cough techniques can aid in reducing the risk of complications associated with COPD, such as infections and further lung damage (Schrijver et al., 2022). Regular implementation of cough therapy can help prevent the buildup of secretions that may lead to chronic infections or exacerbate the disease. This proactive approach not only supports better management of symptoms but also empowers patients to take an active role in their respiratory health, promoting greater independence and reducing the burden on healthcare resources. This method is designed to enhance the mobilization of secretions and reduce the risk of secretion retention. Effective coughing exercises are particularly beneficial for patients experiencing airway ineffectiveness (Agustin, 2023). Previous research has demonstrated that effective coughing can aid in sputum expulsion, alleviating shortness of breath and improving patient comfort (Agustin, 2023). Another study highlights that effective coughing techniques can address airway clearance issues and facilitate sputum removal among patients with COPD (Rohman, 2021). Given these findings, the author aims to implement nursing care focusing on effective cough therapy for patients with COPD.

## Case Description

At the time of assessment, Mr. S, a 63-year-old male, was evaluated upon admission to the hospital. He is married, practices Islam, is of Javanese ethnicity, and has completed high school education. Mr. S works as a farmer and resides in a banyan home. His primary complaint upon hospital admission included chest pain, shortness of breath, and difficulty with phlegm expulsion. These symptoms led to his immediate visit to the emergency room, where he was subsequently admitted to the ward for further evaluation and treatment. During the initial assessment, Mr. S reported persistent shortness of breath, a productive cough, and significant challenges with clearing phlegm from his airways. These symptoms were consistent with his presenting complaints and highlighted the severity of his condition. Subjective data gathered from Mr. S indicated a substantial impact on his daily functioning and comfort due to these respiratory issues. Objective data collected included vital signs and additional observations: his blood pressure was recorded at 120/66 mmHg, pulse rate at 100 beats per minute, temperature at 36.2°C, respiration rate at 26 breaths per minute, and oxygen saturation (SpO<sub>2</sub>) at 92%. Additionally, auscultation revealed wheezing and crackling breath sounds, suggesting underlying airway obstruction and inflammation. The combination of Mr. S's subjective reports and objective findings underscores the complexity of his respiratory condition. The elevated respiratory rate and decreased oxygen saturation are indicative of compromised lung function, while the presence of wheezing suggests bronchospasm or inflammation. This comprehensive assessment provides a crucial foundation for tailoring an effective treatment plan aimed at managing his symptoms and improving his overall respiratory health. Continued monitoring and intervention will be essential in addressing his condition and enhancing his quality of life.

## Discussion

Subjective data was collected through interviews with the patient, while objective data came from direct observations. The patient reported experiencing shortness of breath, chest pain, a cough with phlegm, and difficulty expelling the phlegm. Observational data revealed a respiratory rate of 26 breaths per minute, an SpO<sub>2</sub> level of 92%, and additional breath sounds, specifically wheezing. These complaints align with the theoretical concepts regarding the signs and symptoms of COPD. A study explained that the primary complaints of COPD patients include coughing, shortness of breath, and sputum production, with shortness of breath being particularly distressing and impacting daily activities (Sandelowsky et al., 2021). Based on the data obtained, the author identified two primary nursing diagnoses. The first diagnosis was "ineffective airway clearance" due to retained secretions, as evidenced by the patient's cough with phlegm and difficulty expelling it, a respiratory rate of 26 breaths per minute, an SpO<sub>2</sub> of 92%, and the presence of wheezing (D.0001). This diagnosis was supported by a study noted that patients with COPD are highly susceptible to recurrent coughs and shortness of breath due to sputum obstruction in the airway (Sudirman, 2023). Therefore, prompt treatment and effective cough therapy are essential for expelling sputum. The second diagnosis identified was "ineffective breathing pattern" related to difficulty in breathing effort, as the patient reported shortness of breath, had a respiratory rate of 26 breaths per minute, an SpO<sub>2</sub> of 92%, and exhibited wheezing (D.0005). This diagnosis was raised due to the obstruction in the patient's respiratory tract caused by fluid or sputum, leading to an ineffective breathing pattern, which supports the first diagnosis and provides a framework for monitoring interventions.

The main issues identified in the case of patient with COPD were ineffective airway clearance and ineffective breathing patterns. The preparation of nursing interventions and patient outcome criteria adhered to the Standard Intervention of Indonesian Nursing (SIKI) and the Standard of Nursing Practice (SLKI), which guide the nursing process. For the nursing diagnosis of ineffective airway clearance, the outcome criteria included effective cough improvement, moderate sputum production improvement, moderate dyspnea improvement, and moderate respiratory rate improvement. The intervention chosen was effective cough exercises (I.08238), consistent with study that defines ineffective airway clearance as the inability to clear secretions or maintain an open airway (Febriyanti, Janu, & Immawati, 2021). Effective cough techniques are essential for helping patients expel sputum and overcoming airway clearance issues. For the second nursing diagnosis, "ineffective breathing pattern," the intervention selected was airway management (I.01011), with the outcome criteria focused on improving the breathing pattern (L.01004). This

intervention was chosen to complement the first diagnosis. Implementation of the interventions was conducted over three 24-hour periods. This involved identifying the patient's coughing ability, monitoring sputum retention, observing signs and symptoms of respiratory tract infections, explaining the purpose and procedures for effective coughing, adjusting the patient's position to Fowler or semi-Fowler, placing a pillow on the patient's lap, and recommending the intake of warm fluids. The patient was instructed to inhale through the nose for 4 seconds, hold for 2 seconds, and exhale through pursed lips for 8 seconds, repeating this deep breathing up to three times. After the third deep breath, the patient was advised to cough vigorously to expel secretions. Collaboration with nebulizer administration was also included. Following effective coughing exercises, the patient was able to expel phlegm, resulting in a patent airway.

For the second diagnosis of ineffective breathing patterns, the interventions included monitoring breathing patterns, additional breath sounds, and sputum, positioning the patient in semi-Fowler or Fowler position, providing oxygen, teaching effective cough techniques, and collaborating on nebulizer administration. Throughout this process, the patient was taught effective coughing techniques to monitor the success of the primary diagnosis interventions. After implementation, the patient's breathing pattern showed improvement. A study highlighted that patient demonstrated airway patency, with secretions expelled following effective coughing measures (Trevia, 2021). This confirmed the resolution of the airway clearance nursing issue. Effective cough nursing actions and inhalation therapy positively impacted airway cleanliness. It is recommended that COPD patients engage in independent nursing actions such as deep breathing and effective coughing. After the interventions, the patient was able to cough effectively and expel sputum. Several interventions and therapies have been found effective in improving airway clearance for patients, particularly those with respiratory conditions such as COPD and cystic fibrosis. Chest physiotherapy, which includes techniques like percussion, vibration, and postural drainage, helps loosen and mobilize secretions in the lungs (Volpe et al., 2023). Inhalation therapy using bronchodilators and mucolytics via nebulizers or inhalers can open the airways and thin mucus, facilitating easier expulsion (Sorino, Negri, Spanevello, Visca, & Scichilone, 2020). Positive Expiratory Pressure (PEP) therapy involves exhaling against resistance, helping to keep airways open and promote mucus clearance (Rocamora-Pérez et al., 2022). High-Frequency Chest Wall Oscillation (HFCWO) employs a mechanical device to create vibrations in the chest wall, aiding in secretion mobilization (Huang et al., 2022). The Active Cycle of Breathing Techniques (ACBT) combines breathing control, thoracic expansion exercises, and forced expiration techniques to assist in mucus clearance (Wilson, Saldanha, & Robinson, 2023). Additionally, autogenic drainage is a self-drainage technique that utilizes controlled breathing patterns to effectively mobilize secretions (Burnham, Stanford, & Stewart, 2021). These interventions collectively enhance airway clearance and improve respiratory function in affected patients.

Evaluation was conducted to assess the development and effectiveness of nursing actions throughout the nursing care program. For the nursing diagnosis of ineffective airway clearance, the issue was resolved by the third day, as indicated by the patient's ability to cough effectively and independently, decreased shortness of breath, reduced sputum, and improved respiratory rate (RR: 21 breaths per minute). Similarly, the diagnosis of ineffective breathing patterns was resolved by the third day, evidenced by the patient no longer requiring oxygen assistance, an improved respiratory rate (RR: 21 breaths per minute), an SpO<sub>2</sub> of 99%, decreased shortness of breath, improved breath depth, and a lack of accessory muscle use. The evaluation results indicate that effective cough therapy can successfully expel sputum, aligning with a study finding that effective coughing reduces shortness of breath and enhances comfort for patients with COPD (Agustin, 2023). Additional studies have shown that effective coughing can address the ineffectiveness of airway clearance in helping to expel sputum (Rohman, 2021). Further emphasized that effective coughing techniques, when combined with pharmacological therapy, can enhance sputum expulsion in patients with COPD. Thus, it can be concluded that effective coughing significantly influences sputum release in addressing ineffective airway clearance in patients with COPD.

## **Conclusion**

The study demonstrated that effective coughing exercises significantly aid in expelling sputum from the airway for patients experiencing ineffective airway clearance. The implementation of this intervention was conducted over three days, progressing from the orientation phase to termination, and proved to be an effective strategy in addressing the nursing problem of ineffective airway clearance. The evaluation after three 24-hour periods confirmed that effective cough therapy successfully facilitated sputum expulsion, thereby alleviating the associated complications. Future research is recommended to explore the long-term effects of effective coughing techniques on various patient populations with COPD and to investigate the optimal frequency and intensity of such interventions. Additionally, studies should consider integrating other complementary therapies, such as nebulization and airway management strategies, to enhance overall respiratory outcomes in these patients. This comprehensive approach could lead to improved clinical practices and better patient care in managing COPD-related airway clearance issues.

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