

Section: General Nursing

Pursed lip breathing to improve oxygen saturation in patients with Chronic Obstructive Pulmonary Disease

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Abstract

Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of death globally and is associated with persistent respiratory symptoms and airflow limitation. One of the effective nursing interventions for addressing ineffective breathing patterns is the Pursed Lip Breathing (PLB) technique. This case study presents the nursing care process of five patients with COPD who presented to the Emergency Department with ineffective breathing patterns and low oxygen saturation levels (<90%). The PLB technique was applied as an evidence-based intervention aimed at improving oxygen saturation. Results showed a consistent increase in oxygen saturation post-intervention (average 95–96%) and a decrease in respiratory rate. This case illustrates the importance of PLB as a simple, non-pharmacological, and effective intervention to manage dyspnoea and hypoxemia in COPD patients in acute care settings.

Keywords: Case study, COPD, emergency nursing, oxygen saturation, pursed lip breathing

Introduction

Chronic Obstructive Pulmonary Disease (COPD) represents a significant global health burden and remains one of the leading causes of chronic morbidity and mortality worldwide (Boers et al., 2023; Adeloye et al., 2022). This progressive respiratory condition is primarily characterized by persistent airflow limitation and significant structural changes in the lungs, typically caused by long-term exposure to noxious particles or gases (Saetta et al., 2000; Rossi et al., 2017). Patients suffering from COPD frequently experience acute exacerbations that lead them to seek urgent medical attention in facilities such as the Emergency Room at Setjonegoro Hospital. During these episodes, the hallmark clinical features include worsening dyspnoea, increased cough, and a substantial decline in oxygen saturation (SpO₂). The physiological basis for these symptoms lies in the loss of elastic recoil in the lung tissue and the premature collapse of small airways during exhalation. This entrapment of air, known as hyperinflation, severely restricts the patient's ability to take in fresh, oxygenated air, leading to a state of respiratory distress. Consequently, the immediate stabilization of oxygen levels and the reduction of breathing effort become the highest priorities for the nursing staff (Rezoagli et al., 2025). Understanding the underlying pathophysiology of air trapping is essential for selecting the most appropriate clinical interventions. Therefore, this case study explores how targeted respiratory techniques can mitigate these severe symptoms in an acute care setting.

In the fast-paced environment of an Emergency Room, nurses must employ a combination of pharmacological treatments and evidence-based non-pharmacological interventions to optimize patient outcomes. Standard medical management for COPD exacerbations typically involves the administration of supplemental oxygen, bronchodilators, and corticosteroids to reduce airway inflammation. However, while these medications address the biochemical aspects of the disease, they do not immediately correct the mechanical inefficiency of the patient's breathing pattern. This is where nursing interventions like Pursed Lip Breathing (PLB) become invaluable as a complementary therapy to improve ventilation and gas exchange (Ramadhani et al., 2021). PLB is a simple yet potent behavioural technique that involves inhaling through the nose and exhaling slowly through puckered lips to create back-pressure in the airways (Suryana et al., 2025). This technique effectively prevents the small airways from collapsing during the expiratory phase, thereby facilitating a more thorough emptying of the lungs. By reducing the residual volume of air, PLB allows the diaphragm to return to a more efficient position, which lowers the overall work of breathing. Furthermore, this intervention provides the nursing team with a cost-effective and non-invasive tool that can be implemented at the bedside without the need for complex equipment.

This study aims to document the specific efficacy of PLB in improving oxygenation among patients at Setjonegoro Hospital. The primary objective of this case study is to evaluate the impact of Pursed Lip Breathing on oxygen saturation and respiratory comfort in a cohort of COPD patients. Despite the availability of advanced medical technologies, many patients in emergency settings still experience profound "air hunger" and anxiety that can exacerbate their physical condition. The psychological distress associated with the inability to breathe creates a vicious cycle of tachypnea and further hypoxia, which complicates the recovery process. By teaching patients a

controlled breathing rhythm, nurses can break this cycle and provide the patient with a tangible sense of mastery over their respiratory distress. This case study specifically looks at five elderly patients at Setjonegoro Hospital to determine if the implementation of PLB leads to measurable improvements in vital signs and subjective comfort. Documenting these results is crucial for reinforcing the importance of nursing-led respiratory therapy in acute clinical protocols. Furthermore, the findings are intended to provide a localized evidence base that can encourage the standardization of PLB education within the hospital's emergency department. By shifting the focus toward holistic care, the nursing staff can ensure that both the physical and emotional needs of the patient are addressed during a crisis. Ultimately, this research seeks to demonstrate that even in the most critical environments, simple manual techniques can yield significant physiological benefits

Case Description

Five patients, primarily elderly males aged between 60 and 75 years with established histories of COPD, presented to the Emergency Department exhibiting acute respiratory distress. Initial clinical assessments revealed significant dyspnoea, with respiratory rates ranging from 26 to 30 breaths per minute and oxygen saturation (SpO_2) levels critically low at 85–89% on room air. The patients displayed visible anxiety and the use of accessory muscles, leading to a nursing diagnosis of Ineffective Breathing Pattern related to increased airway resistance. To address these symptoms, a comprehensive nursing care plan was implemented, centred on the PLB technique. Nurses educated and guided the patients through controlled cycles of inhaling through the nose for two seconds and exhaling slowly through pursed lips for four seconds, repeating the exercise for five to eight cycles per session. This non-pharmacological approach was integrated with collaborative medical management, including the administration of supplemental oxygen at 2–3 L/min via nasal cannula, as well as prescribed bronchodilators and corticosteroids. The evaluation of these interventions showed marked clinical improvement across all five cases. Following the application of the PLB technique, patient oxygen saturation levels increased significantly to 94–96%, while respiratory rates stabilized between 20 and 24 breaths per minute. Subjectively, the patients reported a substantial increase in breathing comfort and a reduction in anxiety. These outcomes demonstrate that combining Pursed Lip Breathing with standard pharmacological therapy is an effective strategy for optimizing gas exchange and managing acute exacerbations in COPD patients within an emergency setting.

Discussion

The implementation of the PLB technique for the five elderly male patients in the Emergency Department served as a critical non-pharmacological intervention for managing acute COPD exacerbations. COPD is characterized by chronic airflow obstruction and air trapping, which often leads to the distressing sensation of dyspnoea and a significant drop in oxygen saturation (Curtis, 2023; Fortis et al., 2024). Upon admission, the patients exhibited classic signs of respiratory distress, including tachypnoea and hypoxia. The primary physiological challenge in these cases was the premature collapse of small airways during expiration, which prevents the lungs from emptying effectively. By instructing the patients to exhale through pursed lips, the nursing team introduced a form of positive end-expiratory pressure within the airways (Sakhaei et al., 2018; Yang et al., 2022). This mechanical shift effectively splints the airways open for a longer duration, allowing for a more complete exhalation of trapped carbon dioxide. Consequently, this intervention directly addressed the nursing diagnosis of an ineffective breathing pattern by reducing the residual volume in the lungs (Hopp & Williams, 1987; Howell, 2021). The rapid stabilization of the patients' respiratory status confirms that PLB is an essential first-line nursing action in emergency respiratory care.

The clinical outcomes observed in this study, specifically the increase in SpO_2 to 94–96%, highlight the direct relationship between controlled expiratory techniques and improved gas exchange. As the patients transitioned from rapid, shallow breathing to the 2-second inhale and 4-second exhale rhythm, the alveolar ventilation increased significantly. This slower breathing pattern allows for a more uniform distribution of inspired air throughout the pulmonary segments, optimizing the ventilation-perfusion ratio (Russo et al., 2017; Talaat et al., 2022). Furthermore, the reduction in the respiratory rate to 20–24 breaths per minute indicates a decrease in the metabolic demand of the respiratory muscles. When the work of breathing is reduced, the body consumes less oxygen for the act of ventilation itself, making more oxygen available for systemic circulation. The use of accessory muscles, which was prominent during the initial assessment, diminished as the diaphragm regained its more natural and efficient mechanical position. This shift is crucial for elderly patients whose muscular reserves are often depleted during prolonged periods of respiratory distress. Therefore, the physiological data gathered post-intervention provides robust evidence that PLB facilitates a more efficient and less taxing method of oxygenation.

Beyond the measurable physiological metrics, the psychological impact of PLB played a transformative role in the patients' overall recovery process. Acute dyspnoea often triggers a "panic-breath" cycle, where anxiety leads to hyperventilation, further worsening air trapping and increasing the patient's sense of suffocation. By providing a structured and rhythmic task, the nurse helped the patients regain a sense of cognitive control over their bodily functions, effectively breaking the cycle of anxiety. The subjective reports of improved breathing comfort are a testament to the calming effect that PLB has on the autonomic nervous system. This sense of empowerment is particularly vital for elderly COPD patients who frequently face the fear of total respiratory failure during hospital visits.

Teaching this technique also fosters a collaborative therapeutic relationship, as the family members were encouraged to observe and support the exercise. Integrating this simple manual therapy with pharmacological treatments like bronchodilators created a synergistic effect that stabilized the patients more quickly than medication alone. Ultimately, this case study demonstrates that PLB is not merely a breathing exercise but a comprehensive tool for enhancing the physical, emotional, and functional stability of COPD patients.

Conclusion

The implementation of the PLB technique has proven to be a cornerstone of non-pharmacological nursing interventions, offering a simple, highly effective, and evidence-based approach to managing dyspnoea (shortness of breath) and optimizing oxygen saturation in patients with COPD. In the high-pressure environment of the Emergency Department, where rapid stabilization is critical, this technique provides nurses with an immediate tool to assist patients in distress. By teaching the patient to inhale through the nose and exhale slowly through puckered lips, the intervention creates positive expiratory pressure, which prevents small airway collapse and facilitates a more complete emptying of the lungs. This physiological shift not only reduces the work of breathing and the respiratory rate but also enhances gas exchange, leading to a measurable and sustained improvement in oxygen levels. Beyond the immediate physiological benefits, the application of Pursed Lip Breathing significantly impacts the patient's psychological state.

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