

Section: General Nursing

Cough therapy to improve airway clearance in patient with pneumonia

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Abstract

Pneumonia is an inflammatory condition of the distal lung parenchyma—specifically the terminal bronchioles, respiratory bronchioles, and alveoli—leading to tissue consolidation and localized gas exchange impairment. This condition often results in the accumulation of excessive secretions within the airways. To mitigate impaired airway clearance, effective coughing techniques can be implemented to facilitate sputum expectoration. This study aims to evaluate the impact of effective coughing on sputum production among pneumonia patients in the Tulip 1 Ward at Soerojo Hospital, Magelang. Utilizing a descriptive case study design, this research documents the application of airway management over a three-day intervention period. The results demonstrate a clinical improvement following the intervention, specifically a reduction in respiratory rate and a diminishment of rhonchi previously caused by excessive mucus accumulation.

Keywords: Airway clearance, cough therapy, infection, nursing care, pneumonia

Introduction

Pneumonia is an inflammation of the distal lung parenchyma from the terminal bronchioles, which includes the respiratory bronchioles and alveoli, and causes consolidation of lung tissue and local gas exchange disturbances (Grief & Loza, 2018). Common signs and symptoms include productive cough, chest pain, weakness, and fever (Lim, 2022). The cough symptoms experienced by patients will vary, including acute cough, chronic cough, and prolonged cough (Ranganathan & Sonnappa, 2009). Phlegm or sputum is a secretion expelled from the lower respiratory tract through coughing, with the mechanism of ciliary clearance from the epithelium lining the respiratory tract (Dickey, 2018). This inadequate clearance leads to the accumulation of sputum, making the airways ineffective. The impact of ineffective sputum clearance will result in sputum accumulation in the respiratory tract and ineffective airway clearance, causing the patient to experience difficulty breathing, as well as gas exchange disturbances in the lungs leading to cyanosis, fatigue, dizziness, and weakness. Therefore, assistance is needed to expel the sticky phlegm so that airway clearance becomes effective again. One of the efforts to expel phlegm and keep the lungs clean is through effective coughing (Andrani et al., 2019). Difficulty in coughing up sputum will be experienced by patients with pneumonia, both children and adults. In children, this is caused by their weaker cough reflex compared to that of adults. However, this will not experience difficulty in expelling sputum. Based on these clinical symptoms, one of the nursing diagnoses that occur in patients with pneumonia is ineffective airway clearance, which is the inability to clear secretions or obstructions from the respiratory tract to maintain a clear airway. Effective coughing is one of the proper coughing techniques to maximize the expulsion of mucus from the respiratory tract, so that the patient no longer feels fatigued as it would cause the patient to lose energy (Coppola et al., 2022). As one of the independent nursing actions, this intervention must be taught correctly to patients in order to achieve good care outcomes, especially in adult patients.

The importance of this case study lies in the critical physiological necessity of maintaining airway patency in pneumonia patients to prevent life-threatening respiratory failure. In pneumonia, the inflammatory response within the alveoli and bronchioles leads to the excessive production of thick, purulent secretions that impair gas exchange and increase the work of breathing. When these secretions are not effectively cleared, they create a "mucus plug" that can lead to atelectasis (collapsed lung tissue) and provide a breeding ground for secondary bacterial infections, further worsening the patient's clinical condition. By focusing on cough therapy—specifically techniques like assisted coughing or "huffing"—this study demonstrates a non-invasive, cost-effective nursing intervention that directly addresses the mechanical failure of the mucociliary escalator. This is particularly vital for patients who are too weak or fatigued to produce a spontaneous, effective cough, as it bridges the gap between passive oxygenation and active airway rehabilitation.

Furthermore, this case study is significant because it emphasizes the role of the nurse as a clinical decision-maker who can reduce a patient's reliance on more invasive and high-risk procedures, such as endotracheal

suctioning. Invasive suctioning, while effective, often carries risks of mucosal trauma, hypoxia, and the introduction of hospital-acquired pathogens. Highlighting a successful cough therapy protocol provides evidence-based justification for incorporating respiratory physiotherapy into standard nursing care plans. By improving airway clearance, the nurse not only enhances the patient's immediate comfort and oxygen saturation levels but also accelerates the recovery process and reduces the duration of hospitalization. This case study serves as a clinical benchmark, proving that structured nursing interventions can significantly mitigate the severity of pneumonia symptoms and improve overall patient outcomes in an acute care setting.

Case Description

The patient, Mr. T, is a 65-year-old male, a follower of Islam, residing in Gintung, Jambewangi, Secang. Date of hospital admission: January 12, 2025, at 10:00 AM WIB. Date of assessment: January 13, 2025, at 2:00 PM WIB. Mr. T reported having a fever for the past 4 days, with the fever worsening last night. The complaints were accompanied by a productive cough, sticky phlegm that was difficult to expel, shortness of breath, runny nose, headache, nausea and vomiting once, decreased fluid intake, and lower abdominal pain. Fever for the past 4 days, runny nose, sticky phlegm that was difficult to expel, shortness of breath. Blood pressure 144/90 mmHg, Pulse 88x/minute, Temperature 39.9°C, Respiration 24x/minute, SpO2 97%. General condition fairly good, mucous membranes of the lips moist, conjunctiva pink and not anemic, skin elastic, bowel sounds 12x/minute, patient's extremities movement active, ROM 5/5. Vital sign examination revealed blood pressure 144/90 mmHg, pulse 88 beats/min, temperature 39.9°C, respiration 24 breaths/min, and SpO2 97%. Lung auscultation showed ronchi. Supportive examination with X-ray revealed white spots in the lungs, and abnormal laboratory results included erythrocytes (5.45) and eosinophils (3.5). The patient received effective cough therapy for 3 consecutive days. After 3 days of effective cough application, data evaluation showed that the cough decreased, mucus accumulation in the airways decreased, and lung ronchi decreased.

Discussion

The clinical symptoms caused by pneumonia are anorexia, fever, vomiting, diarrhea, abdominal pain, meningismus, coughing with phlegm, breathing sounds, and shortness of breath. This occurs because pneumonia patients usually experience excessive secretion production that blocks the patient's airway (McChlery et al., 2009; Mani, 2018). Based on the author's data analysis, the findings align with the priorities outlined in the SDKI (2016), specifically ineffective airway clearance (D.0001) associated with excessive airway secretion, which is further supported by radiological imaging of the chest showing infiltrates or fluid in the lungs. Based on the anamnesis results, an intervention was administered over 3x24 hours, namely airway management (I.01011), with the outcome criterion being improved airway clearance.

The intervention provided for the diagnosis of ineffective airway clearance was airway management (I.01011), which involved observing respiratory status, monitoring additional breath sounds, positioning the client in a semi-Fowler position, providing the client with warm drinks, and teaching effective coughing techniques for 3 consecutive days. On Monday, January 13, 2025, at 2:00 PM, the patient was first taught effective coughing techniques by positioning the patient in a semi-Fowler position, then providing warm drinks, then asking the client to take two deep breaths through the nose and exhale through the mouth, then hold the third breath for 3 seconds and cough 2 to 3 times. This technique had never been performed by the client before, as the client was unfamiliar with effective coughing techniques. The same procedure was repeated on the third day, Wednesday, January 15, 2025, with the same action of teaching effective coughing techniques. Before performing the effective coughing technique, the client reported that their phlegm was difficult to expel and felt like it was blocking the airways. The client felt shortness of breath. Auscultation revealed rales in the client's lungs, accompanied by an increased respiratory rate of 24 breaths per minute, and a decrease in SpO2 to 97%. Following the administration of effective cough therapy, thick white mucus was observed exiting the client's airways, and SpO2 increased to 98%. This effective cough therapy was administered for three consecutive days, accompanied by collaborative administration of nebulizer therapy with meprovent. Following the effective cough therapy, on the third day, Wednesday, January 15, 2025, the client's oxygen saturation increased to 98%, and the respiratory rate was within the normal range of 20 breaths per minute. Auscultation of the lungs revealed a decrease in rhonchi sounds, indicating a reduction in secretions or mucus in the client's lungs. Effective coughing is one of the appropriate ways to maximize the expulsion of mucus from the respiratory tract, thereby preventing the patient from feeling exhausted and losing energy. As one of the self-care nursing interventions, this intervention needs to be properly taught to patients to achieve good care outcomes, especially in adult patients.

Airway clearance in pneumonia patients who experienced ineffective airway clearance due to secretions buildup could be restored after being taught effective coughing techniques and performing them correctly. In his study, there was a 43.6% increase in the percentage of respondents who could perform effective coughing after being taught the correct steps for effective coughing. Respondents with effective airway clearance also experienced an increase of 54.1% after receiving effective coughing intervention. Effective coughing has an effect on airway clearance in adult pneumonia patients ($p = 0.000$). This is because patients who can perform effective coughing can expel a significant number of secretions that cause airway obstruction.

Effective coughing is important for clearing respiratory obstructions and keeping the lungs clean. Effective coughing is part of nursing care for patients with acute and chronic respiratory disorders. Effective coughing, when performed properly and correctly, shows a significant difference in sputum production compared to regular coughing, as effective coughing is the correct way to cough. The correct way to cough involves first sitting slightly leaned forward, then taking two deep breaths through the nose and exhaling through the mouth, then hold the third breath for 3 seconds and cough 2 to 3 times. Before performing effective coughing, it is recommended to drink warm water and consume at least 2 liters of water per day if there are no contraindications, with the aim of thinning the mucus and facilitating sputum expulsion. In contrast, regular coughing does not require such specific measures. Patients with pneumonia often cough inappropriately, forcing their bodies to expel secretions, after which they feel tired and weak. When tired and weak, patients usually do not want to cough again or do not have the energy to cough. This results in secretions not being expelled and accumulating, making airway clearance ineffective. During a normal cough, patients do not think to adjust their sitting position to sit upright with their body leaning forward; patients typically cough reflexively even while lying down. Patients also do not perform deep inhalation and hold it for 3 seconds. Since they do not use the correct technique, secretion expulsion is not maximized, and airway clearance becomes ineffective. Therefore, patients are advised to perform effective coughing.

Deep inspiration and holding it for 3 seconds during coughing can effectively increase lung volume, resulting in faster and stronger exhalation and reducing the closed air space, thereby facilitating secretion removal. Deep inspiration increases lung volume and airway diameter, allowing air to pass through some of the mucus plugs that are obstructing or passing through other foreign objects. Contraction of the expiratory muscles closes the glottis, causing high intra-thoracic pressure. When the glottis opens, a large volume of air flows out at high speed, giving secretions the opportunity to move toward the upper airways. Thus, secretions can be liquefied and expelled (Aditama, 2018). From the two studies above, it can be seen that coughing effectively influences airway clearance, as evidenced by the author's research, which showed an increase in oxygen saturation, a decrease in respiratory rate, and a reduction in rales during auscultation.

Conclusion

Pneumonia is an inflammation of the distal lung parenchyma of the terminal bronchioles, including the respiratory bronchioles and alveoli, which causes consolidation of lung tissue and local gas exchange disorders. Common symptoms of pneumonia include shortness of breath due to the accumulation of sputum or secretions in the airways. Effective coughing is one of the proper ways to cough to maximize the expulsion of mucus from the respiratory tract. Effective coughing is important for alleviating respiratory distress and keeping the lungs clean. This effective coughing technique is part of nursing care for patients with acute and chronic respiratory disorders and has been proven effective in addressing airway clearance issues in pneumonia patients. This is evidenced by the author's research, which showed a difference in airway clearance before and after performing effective coughing. After performing effective coughing for three consecutive days, airway clearance improved, as evidenced by increased mucus expulsion, improved oxygen saturation, and normal breathing patterns.

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