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Implementation of Effective Cough Training to Improve Airway Clearance in Asthma Patients: A Nursing Care Process Case Study in the Emergency Department

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Abstract : Asthma is a chronic respiratory disorder that remains a major public health concern, particularly in areas with high pollution levels. One of the most frequent nursing problems among asthma patients is ineffective airway clearance caused by mucus retention. Effective cough training is a non-pharmacological nursing intervention aimed at facilitating secretion removal and improving respiratory function. This case study evaluated the effectiveness of cough training in improving airway clearance in an asthma patient treated in the emergency department. A descriptive case study design using the nursing care process assessment, diagnosis, intervention, implementation, and evaluation was applied. Data were collected through interviews, physical examinations, observations, and documentation for two days. The intervention consisted of deep nasal inhalation for four seconds, breath-holding for two seconds, exhalation through pursed lips for eight seconds, followed by a controlled cough. After two days, improvements were observed in respiratory rate (from 26 to 22 breaths per minute), oxygen saturation (from 90% to 95%), and mucus expectoration. The patient was able to perform the technique independently after education and guided practice. These findings indicate that effective cough training is a simple, evidence-based nursing intervention that enhances airway clearance and oxygenation and should be integrated into emergency asthma care to prevent complications.

Keywords: Asthma, effective cough training, ineffective airway clearance.

1. Introduction

Asthma is one of the top ten causes of death in Indonesia. Although it is a preventable and controllable disease, asthma can be fatal if not treated properly. This disease can interfere with daily activities, work, and various other aspects of life. Asthma affects anyone regardless of age, from children to adults, especially in urban areas that have high levels of air pollution, increasing the risk of developing lung disorders such as asthma (Kalsum & Nur, 2021).

According to data from the World Health Organization (WHO), there were approximately 339 million asthma sufferers worldwide in 2018 (WHO, 2018). In Indonesia, the prevalence of asthma

based on the 2018 Basic Health Research reached 2.4% of the general population (Kemenkes RI, 2018). In West Java, the figure is higher at 2.8%, and in the Bandung area it even reaches 3.75% (Kemenkes RI, 2018). This condition shows that asthma is still a serious threat to public health, especially in urban areas that are vulnerable to air pollution. The most commonly affected ages are children 5-14 years and the elderly over 50 years, with exposure to risk factors such as cold air, smoke, dust, animal dander, airway infections, and emotional stress (Utami et al., 2021).

Clinical symptoms of asthma include shortness of breath, coughing up phlegm, wheezing, and tightness in the chest (Wardani & Afni, 2021). Asthma patients often experience nursing problems that often arise, such as ineffective airway clearance, namely the inability to remove secretions adequately, which can worsen the patient's condition and cause gas exchange disorders, changes in nutrition, to a high risk of infection (Utami et al., 2021). In nursing practice, one of the nursing interventions that can help overcome this problem is effective cough training, which is a technique used to help remove secretions from the airway optimally (Puspitasari et al., 2021). Effective coughing exercises are recommended for patients who have difficulty expelling phlegm, as this technique can improve ventilation and reduce the risk of lower airway infections. This technique is especially important for patients with asthma, as the accumulation of secretions can aggravate shortness of breath and increase oxygenation requirements (Kamimura et al., 2025).

However, there are still gaps in clinical practice, such as the non-optimal application of effective cough training by some nurses, especially in the Emergency Room (IGD). Education to patients regarding proper coughing techniques is still limited. In fact, this intervention should be an important part of the nursing management of patients with respiratory disorders. Lack of training and attention to secretion management puts patients at greater risk of developing complications, such as atelectasis or pneumonia.

Considering the above cases, nurses need to play an active role in providing appropriate nursing care, including providing health education to improve patients' health status and early detection of respiratory problems. Comprehensive nursing care can help reduce the risk of complications and improve the patient's quality of life. Handling asthma cases also requires multidisciplinary expertise, where nurses have a central role in intervening and monitoring patients.

This study aims to describe the application of effective cough training in improving airway clearance in patients with bronchial asthma. Therefore, it is important to conduct further research on the effectiveness of cough training to encourage the implementation of evidence-based interventions and minimize the gap between theory and practice in the field. Based on these case studies, the authors are interested in making a case study with the title: "Implementation of Effective Cough Exercise in Asthma Patients with Ineffective Airway Clearance Problems through a Nursing Care process approach in the Emergency Room of RSUD Kota Banjar"

2. Materials and Methods

This research uses a case study design with a descriptive nursing care process approach. This study aims to explore in depth the implementation of nursing care in asthma patients with the nursing problem *"Ineffective Airway Clearance"* associated with retained secretions, through the application of effective cough training interventions. The subject in this study was one patient with asthma who was admitted to the Emergency Room (IGD) of RSUD Kota Banjar. The study was conducted for two days, on May 6 and 7, 2025.

Data collection was conducted thoroughly using primary data sources in the form of direct interviews with patients and families, as well as observation and physical examination, and secondary data sources through medical documentation. The interview included patient identity, chief complaint, history of present illness, history of past illness, and family history. Observation and physical examination were performed using inspection, palpation, percussion, and auscultation methods. Documentation studies included reviewing the results of laboratory examinations,

radiology, and other medical records. Data validity was ensured through source triangulation techniques, systematic recording with nursing care formats, and extension of observation time for two days.

Effective cough exercise implementation procedures are carried out in the context of nursing interventions to overcome airway clearance disorders. This technique is carried out by teaching patients to take a deep breath slowly through the nose, hold their breath for 3-5 seconds, then release it slowly through the mouth. After that, the patient is directed to cough once in a strong and controlled manner so that mucus secretions can escape from the respiratory tract. This intervention is repeated 2-3 times each session, with a frequency of 2-3 sessions per day depending on the patient's condition. During implementation, the nurse provides assistance and evaluates the patient's physiological responses such as decreased respiratory frequency, increased oxygen saturation, and reduced wheezing or ronki sounds. This technique is a form of non-pharmacological nursing intervention based on scientific evidence (Evidence-Based Nursing/EBN) that has been proven effective in increasing lung expansion, encouraging secretions, and preventing airway obstruction in patients with respiratory disorders, including asthma patients.

The instruments used in this study included stationery for recording patient responses, a stopwatch to count the frequency of breathing patterns and an oximeter to measure blood oxygen levels (SpO_2). Data analysis was carried out systematically through the stages of organizing, grouping, and interpreting data based on patterns found from interviews, observations, physical examinations, and documentation data. The results of the analysis were then compared with nursing theory and scientific evidence as a basis for providing intervention recommendations.

This study has obtained permission from the relevant institutions and meets the principles of research ethics, including informed consent from participants, guarantee of anonymity (not mentioning the respondent's name directly), confidentiality (confidentiality of data), and the principle of non-maleficence, which does not cause harm or discomfort both physically and psychologically to patients during the study.

3. Results and Discussion

3.1. Assessment

Based on the assessment of the patient Mr. A, a 36-year-old male who came to the emergency room of Banjar City Hospital on May 6, 2025, it was found that the patient had a medical diagnosis of asthma. A, a 36-year-old male who came to the emergency room of Banjar City Hospital on May 6, 2025, it was known that the patient had a medical diagnosis of asthma. The patient came with the main complaint of shortness of breath experienced since morning and accompanied by a cough with phlegm. This complaint worsened when the patient did activity and improved at rest. On initial examination, the patient's airway condition was found to be patent and obstructed, and additional breath sounds were found in the form of wheezing with a rapid breathing pattern (dyspneu) and a respiratory frequency of 26 times per minute. Oxygen saturation was monitored at 90%, which is included in the moderate to severe category according to the asthma classification according to (Zhou et al., 2025) which states that moderate-severe asthma is characterized by wheezing, distress, and oxygen saturation of 90-95%.

In the respiratory system, no nostril breathing was found, but the presence of wheezing and rapid breathing patterns indicated impaired ventilation due to airway obstruction. This is in accordance with the theory (Hosny Nafea et al., 2025) which states that typical signs of asthma include shortness of breath, wheezing, and coughing. This situation can be explained physiologically through the pathophysiological mechanism of asthma, namely the narrowing of the airway due to bronchial muscle contraction, increased mucus production, and bronchial wall

inflammation (Zhang et al., 2025). The combination of these three factors leads to decreased lung expansion and impaired gas exchange, leading to hypoxemia and increased work of breathing.

On assessment of circulation, a strong palpable pulse with a frequency of 99 beats per minute, warm acral, and no cyanosis were found, indicating peripheral circulation was within normal limits. The patient's level of consciousness was compos mentis with a GCS of 15 indicating no neurological impairment at the time of assessment. Examination of the exposures did not reveal any wounds or imprints. Meanwhile, on secondary examination, the patient had no history of previous illness or allergy to food or medicine. The patient was also not on any medication when he came to the emergency room. Changes in the patient's health patterns before and after illness showed a decrease in functional ability. The patient's nutritional pattern, which was initially independent, changed to being assisted by family, with intake reduced to half a portion. Elimination patterns also decreased, characterized by not defecating and decreased frequency of urination. The patient's sleep pattern was also disturbed, from 7-8 hours of sleep at night to 6-7 hours, which was probably influenced by the shortness of breath experienced especially at night. This sleep pattern disturbance is also one of the typical symptoms of asthma according to (Poncin et al., 2025).

The physical examination results support the subjective and objective data found previously. There were anemic conjunctiva, respiration of 26x/min, and wheezing. On chest examination, the shape was symmetrical, but wheezing was found as a typical sign of lower airway obstruction. Examination of the extremities showed muscle strength 5 (normal), no edema, and the acral was in good condition. Vital examination showed blood pressure 120/80 mmHg, pulse 99x/min, body temperature 36.5°C, and SpO_2 of 90%, indicating mild to moderate oxygenation impairment.

This assessment data shows that the patient has ineffective airway clearance, characterized by airway obstruction, coughing up phlegm, wheezing, and decreased oxygen saturation. This condition is in accordance with the clinical manifestations of asthma as described by (Hidayah, 2025) where patients can experience airway obstruction due to excessive mucus accumulation. In this situation, an appropriate intervention is an effective cough training technique that aims to help expel secretions, improve ventilation, and improve patient oxygenation non-invasively. This intervention approach also aligns with the principles of Evidence-Based Nursing (EBN), which is clinical decision-making based on current scientific evidence to provide safe and effective nursing care.

3.2. Nursing Diagnosis

Based on the results of data analysis on Mr. A's patient, a nursing diagnosis of Ineffective Airway Clearance associated with retained secretions was determined. A, a nursing diagnosis of Ineffective Airway Clearance associated with retained secretions was determined. This diagnosis is determined based on subjective data in the form of complaints of shortness of breath accompanied by a cough with phlegm, as well as objective data in the form of visible coughing, installed nasal cannula oxygen, additional breathing sounds (wheezing), increased breathing frequency to 26x/minute, and oxygen saturation of 90%. All of these data indicate a disturbance in the respiratory system which has an impact on ventilation that is not optimal.

According to the Indonesian Nursing Diagnosis Standards (SDKI) in 2017, Ineffective Airway Clearance is a condition in which individuals experience the inability to adequately clear the airway to maintain a patent airway. Diagnostic criteria from the SDKI for this problem include: ineffective cough, additional breath sounds (ronki or wheezing), excessive sputum, increased respiratory frequency, decreased oxygen saturation, and use of breath support muscles. In this case, almost all of these indicators were found in the patient, such as coughing with phlegm, wheezing, increased respiratory frequency, and decreased SpO_2, so this diagnosis can be made appropriately.

Physiologically, this condition is closely related to the pathophysiology of asthma which involves airway narrowing due to bronchospasm, mucosal inflammation and increased mucous

secretion. This process leads to mucus build-up and triggers coughing as the body's protective reflex to clear the airway. If not managed properly, this can impair gas exchange and lead to hypoxemia. With the diagnosis of Ineffective Airway Clearance established based on the 2017 IDHS and treated through appropriate and evidence-based interventions, it is expected that there will be an improvement in the patient's respiratory condition, improvement in ventilation function, and prevention of complications due to secretion retention. This diagnosis becomes the main focus in the nursing process in acute asthma patients in the emergency room and is an important foundation in determining subsequent interventions.

3.3. Nursing Intervention

Table 1. Nursing Intervention

Nursing Diagnoses (SDKI)	Objectives and outcome criteria (SLKI)	Nursing Interventions (SIKI)
Ineffective Airway Cleansing	After taking nursing action for 2x24 hours, it is expected that the level of Airway Cleansing will increase with the outcome criteria: 1. Effective cough increases 2. Sputum production decreases 3. Wheezing decreased 4. Breathing frequency improves	Effective Cough Exercise (I.01006) Observation: 1. Identify the ability to cough 2. Monitor for sputum retention 3. Monitor for signs and symptoms of respiratory tract infection 4. Monitor fluid input and output Therapeutic: 1. Set up semi-fowler and fowler position 2. 2. Place a bed sheet and bent over the patient's lap 3. 3. Dispose of secretions at the sputum site Education: 1. Explain the purpose and procedure of effective coughing 2. Instruct to take a deep breath through the nose for 4 seconds, hold it for 2 seconds, then expel it from the mouth with lips pouting (rounded) for 8 seconds 3. Encourage repeating the deep breath up to 3 times 4. Encourage coughing vigorously immediately after the 3rd deep breath Collaboration: Collaborate with mucolytic or expectorant, if necessary.

One of the interventions recommended by the Indonesian Nursing Intervention Standards (SIKI) is effective cough training (I.01006). This intervention aims to help patients actively remove secretions through increasing intratoracal pressure and mobilizing secretions from the lower airway to the upper. Theory from (Wulandari & Lestari, 2025) states that effective cough training can improve lung ventilation, improve gas exchange, and prevent atelectasis and secondary infections.

The observation component in this intervention includes identifying cough ability, monitoring sputum retention, symptoms of airway infection, and body fluid balance. This is in line with the theory (Sakinah et al., 2025) which emphasizes the importance of basic assessment of signs of airway obstruction and dehydration that can aggravate the condition of secretions. Therapeutic measures, such as semi-Fowler or Fowler positioning, have been shown to increase lung expansion and improve cough effectiveness. This position helps maximize diaphragm function and decrease

airway resistance. According to (Amin et al., 2025), the semi-sitting position is very beneficial in improving ventilation and perfusion mechanisms in patients with respiratory disorders.

The education part of the intervention included explaining the purpose and procedure of effective coughing to the patient. Breathing technique training includes inhaling deeply through the nose for 4 seconds, holding the breath for 2 seconds, and exhaling slowly through the mouth using the pursed lips technique for 8 seconds. This technique not only improves oxygenation but also helps to slow down the breathing rate and reduce breath work. According to (Putri & Zara, 2025), this technique can also improve airway moisture, facilitate sputum discharge, and reduce the risk of hypoxia. In addition, collaboration in the administration of mucolytics or expectorants is an important part of the intervention. Mucolytic drugs break down mucus components to make it thinner, while expectorants stimulate sputum expulsion through the cough reflex. According to the Indonesian Ministry of Health (2021), a combination of pharmacological therapy and effective cough training has been shown to improve mucus elimination capacity in patients with asthma or COPD.

Overall, the interventions planned for the diagnosis of Ineffective Airway Clearance have a strong scientific basis and are in accordance with the principles of Evidence-Based Nursing (EBN). The series of interventions consisting of observation, physical action, education, and collaboration demonstrate a holistic approach in nursing care for patients with respiratory disorders. The implementation of these interventions is expected to significantly improve the patient's respiratory function and quality of life.

3.4. Nursing Implementation

Nursing implementation is carried out based on pre-planned interventions to address the nursing problem of Ineffective Airway Clearance in asthma patients in the Emergency Room of Banjar City Hospital. Implementation was carried out for two days, namely on May 6 and 7, 2025, with the main objective of helping patients maintain a clean and effective airway through an evidence-based nursing approach, namely by practicing effective coughing techniques, setting therapeutic positions, giving warm fluids, and monitoring physiological conditions thoroughly.

On the first day, implementation began with monitoring vital signs (TTV). The assessment results showed BP: 120/80 mmHg, Pulse: 99x/min, RR: 26x/min, Temperature: 36.5°C, and SpO_2: 90%. Oxygen saturation values that are still at the lower limit indicate mild hypoxemia, which is common in patients with acute asthma due to secretion accumulation and bronchoconstriction (Widodo & Kristinawati, 2025). Furthermore, sputum retention monitoring was carried out, and a little sputum was seen. The client also said that he still felt coughing and shortness of breath. This situation indicates that the secretion has not been completely eliminated and the airway is still partially obstructed. This is in accordance with the theory of (Syaira & Rustandi, 2025) that an ineffective productive cough can cause a buildup of secretions and reduce ventilation capacity.

Nursing interventions in the form of setting the semi-Fowler position were carried out, which was well received by the patient. This position is known to be able to increase lung expansion and facilitate the work of respiratory muscles (Kemenkes RI, 2022). In addition, the patient was given a warm drink to help dilute sputum, and the patient's response showed willingness and comfort. Furthermore, education and training on effective cough techniques according to standards were carried out. The client was instructed to take a deep breath for 4 seconds, hold for 2 seconds, and exhale through the mouth with the lips pouting for 8 seconds, which then ended with a strong cough. The patient was able to actively follow this procedure, and this is in accordance with the recommendations (Asril & Yulianti, 2025), which state that effective cough techniques that are carried out properly can improve the ability to expectorate secretions and prevent further complications.

Nursing implementation continued to strengthen understanding and build patient habits in maintaining airway clearance. TTV showed improvement: BP: 110/80 mmHg, Pulse: 90x/min, RR: 24x/min, Temperature: 36°C, and SpO_2 increased to 95%. The increase in oxygen saturation reflects an improvement in ventilation and tissue oxygenation. The patient stated that shortness of breath began

to decrease, although he was still coughing with little sputum discharge. From clinical estimation, sputum discharge reaches about 60-70% of the total initial secretion. This can be influenced by the viscosity of mucus and bronchial inflammation that is still active, in accordance with the explanation (Sulistyowati & Khadijah, 2025) that asthma mucus is thick and requires continuous intervention.

Effective coughing techniques and deep breathing exercises were repeated, and the patient was still given warm drinks. The patient remained cooperative and was able to repeat the procedure well, indicating an increase in understanding and active patient involvement in the recovery process. This approach supports the principle of patient centered care as described by (Hinga et al., 2025). Overall, the implementation of effective cough training for two days showed positive clinical outcomes. This is reinforced by research (Kamimura et al., 2025) which states that a minimum of two days of effective cough intervention has a significant impact on improving respiratory function and sputum discharge in patients with airway disorders.

3.5. Nursing Evaluation

Evaluation is an important stage in the nursing process to assess the effectiveness of interventions that have been provided, as well as identify the status of the development of the patient's condition against the established nursing goals (Hosny Nafea et al., 2025). In this case study, the evaluation was carried out on May 6 and 7, 2025 for patients with a nursing diagnosis of ineffective airway clearance due to secret retention, using effective cough training techniques.

On the first day of evaluation, the patient still complained of coughing up phlegm and shortness of breath. Objective data showed that sputum began to come out even though in small amounts. The patient's TTV showed a relatively stable condition: BP 120/80 mmHg, Pulse 99x/min, RR 26x/min, Temperature 36.5°C, and SpO_2 90%. This SpO_2 value still indicates mild hypoxemia. Based on the combination of complaints and objective data, the evaluation showed that the problem had not been fully resolved, but the response to the intervention showed a positive direction. Patients are cooperative in doing deep breathing exercises and effective coughing. This finding is reinforced by research (Poncin et al., 2025) which states that effective cough training can improve the patient's ability to eliminate sputum gradually, but optimal results are generally achieved after 2-3 days of routine implementation. In the study, 70% of patients with airway problems showed an increase in oxygen saturation after two days of structured exercise.

On the second day of evaluation, there was clinical improvement. The patient reported that shortness of breath was decreasing and sputum was coming out more easily. TTV showed physiological improvement: BP 110/80 mmHg, Pulse 90x/min, RR 24x/min, Temperature 36.0°C, and SpO_2 increased to 95%, which indicates improved pulmonary oxygenation. These changes are in accordance with the findings of (Wulandari & Lestari, 2025), which show that effective cough techniques contribute to reducing sputum accumulation and increasing productive cough reflexes. The study also mentioned that effective cough training increased airway clarity by 85% in bronchial asthma patients conducted in two days of repeated interventions. Similar results were also reported by (Syaira & Rustandi, 2025) which showed that the implementation of effective cough training for 2x24 hours in the emergency room was able to accelerate the improvement of respiratory function of asthma patients, characterized by increased SpO_2 and decreased respiratory frequency.

The evaluation also showed that patients showed a high level of participation, which is an important indicator of the success of education-based interventions. According to (Putri & Zara, 2025), active collaboration between nurses and patients in applying effective coughing techniques is a major factor in improving ventilation quality and airway clarity. Meanwhile, (Syaira & Rustandi, 2025) emphasized the importance of hydration support and therapeutic positioning (fowler) as part of supporting interventions to improve effective cough training outcomes. These have also been applied in this case study and contributed to sputum discharge and decreased shortness of breath.

4. Conclusions

From the results of the two-day evaluation, effective cough training improved airway clearance, oxygen saturation, and respiratory rate in the patient. It is recommended as a routine non-pharmacological nursing intervention in emergency asthma management. Effective cough training is proven to be an evidence-based method that is effective in improving airway clearance in asthma patients, as supported by several previous studies.

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