



The Effectiveness of Chest Physiotherapy for Pneumonia Patients with Ineffective Airway Clearance Problems in Intensive Care Unit

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ABSTRACT

In patients with decreased consciousness and a respirator installed in intensive care unit room, it causes obstruction to discharge of secretions. Excessive accumulation of secretions in the airways can obstruct the airways and cause the patient to experience dyspnea. These conditions can cause ineffective airway hygiene problems. Ineffective airway clearance problems may occur in patients with pneumonia caused by excessive accumulation of secretions. The purpose of this study was to determine the effectiveness of implementing chest physiotherapy interventions in overcoming the problem of ineffective airway clearance nursing in patients in the ICU. Case study with a nursing care approach to patients in the intensive care unit. The sample used was 1 patient with chest physiotherapy nursing intervention for 3x24 hours in the form of chest physiotherapy. The results showed that effectiveness of implementing chest physiotherapy interventions in overcoming the problem of ineffective airway clearance nursing in patients in the ICU which is carried out in two sessions each shift is effective for reducing additional rhonchi breath sounds, reducing respiratory frequency, and helping to remove secretions. Based on the results, researcher conclude that nursing care for patients with ineffective airway clearance problems can be resolved with chest physiotherapy.

Keywords: Chest Physiotherapy, Ineffective Airway Clearance, Pneumonia

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I. INTRODUCTION

Treatment of patients in the ICU requires holistic care, including care in overcoming nursing problems that arise.

This aims to improve the patient's quality of life during the period of being treated in the intensive care unit and reduce the patient's mortality rate (Wantiyah, et al.,

2022). In patients with decreased consciousness in the ICU room and a respirator installed, the process of removing secretions is not smooth. Excessive accumulation of secretions in the airways can narrow the airways and cause the patient to experience shortness of breath. These conditions can cause ineffective airway clearance problems. Disease conditions with ineffective airway clearance nursing problems can occur in patients with pneumonia caused by excessive accumulation of secretions (Wardiyah, et al., 2022).

Nursing problems that can be handled as a source of initial problems are overcoming the problem of airway clearance. Ineffective airway clearance can be a source of other problems for patients, namely shortness of breath and the occurrence of respiratory failure to the risk of death (Wardiyah, et al., 2022). The problem of ineffective airway clearance in patients with pneumonia is caused by acute inflammation of the lung parenchyma caused by infectious agents such as Streptococcus bacteria or pneumococci and aspiration of foreign substances accompanied by exudation. Symptoms that can appear are fatigue, sweating, sputum production accompanied by shortness of breath. Pneumonia causes ventilation and diffusion processes to experience

problems. This is because there is an inflammatory reaction that occurs due to pneumococci in the alveoli causing exudate to appear which disrupts the process of diffusion of oxygen and carbon dioxide. This causes the lungs to not have sufficient ventilation because secretions, mucosal edema and bronchospasm cause partial bronchial or alveoli occlusion and reduce alveolar oxygen resistance (Musniati and Badrin, 2020).

Disease conditions with ineffective airway clearance nursing problems can occur in patients with pneumonia caused by excessive accumulation of secretions (Ekowati, et al., 2022). According to data from the Indonesian Ministry of Health in 2018, around 15-20% of people had pneumonia (Wardiyah, et al., 2022). Based on the Ministry of Health of the Republic of Indonesia in 2019, Indonesia is the 8th country with the highest death rate due to pneumonia, namely 22,000 people. Based on Riskesdas data for 2018, the percentage of pneumonia found reached 51.19%. (Oktaviani and Nugroho, 2022).

The increased secretion in the lungs that occurs in patients with pneumonia can cause airway obstruction that interferes with the ventilation process. The impact of the accumulation of secretions in the airways is the narrowing of the respiratory tract which causes the patient

to experience shortness of breath and other symptoms such as cyanosis, fatigue, apathy and weakness appear. Impaired ventilation causes clinical symptoms such as decreased oxygen saturation and increased respiratory rate. The presence of excessive accumulation of secretions in the respiratory tract causes oxygenation disorders with problems of airway uncleanness. Treatment that can be done to help remove secretions that are stuck in the airway in pneumonia patients, one of which can be done is chest physiotherapy (Abdurrosidi and Novitasari, 2020).

Chest physiotherapy is carried out as a series of nursing actions to help thin secretions so that they are easier to remove (Maewad, 2018). Physiotherapy measures are beneficial for patients with respiratory problems which aim to manage shortness of breath and reduce symptoms, assist in the process of treating and cleaning the airway, help remove secretions so as to make it easier to remove secretions that are stuck in the respiratory tract (Indriyani, 2021). The application of chest physiotherapy in pneumonia patients with ineffective airway clearance problems can assist in clearing tracheobronchial secretions as seen from clinical assessment, namely respiratory frequency and oxygen saturation. In patients with pneumonia with increased pulmonary secretions can

cause airway obstruction resulting in impaired ventilation. Impaired ventilation can cause symptoms of decreased oxygen saturation and increased respiratory frequency (Purnamiasih, 2020). Respiratory disorders can decrease due to discharge of secretions, causing a decrease in respiratory tract resistance, increasing ventilation and chest perfusion. The existence of these conditions requires auxiliary therapy which is needed to assist in removing secretions more effectively so as to help patients undergo better hospital care (Polapa, et al., 2022).

The application of chest physiotherapy is a therapy that helps in streamlining the functions of other therapies, such as administering mucolytic drugs (Purnamiasih, 2020). Chest physiotherapy can assist in releasing thick secretions which are carried out by restoring and maintaining the function of the respiratory muscles, helping to clear secretions from the bronchi, thus preventing the accumulation of secretions (Musniati and Badrin, 2020). Based on the description above, researchers are interested in implementing chest physiotherapy in overcoming the problem of ineffective airway clearance in pneumonia patients in the ICU.

2. METHODS

This research method uses a case study that focuses on a patient's condition. Where the data was taken by collecting data accompanied by various information obtained directly from patient responses and complaints of Ineffective Airway Clearance due to pneumonia in ICU of dr. Soebandi Regional Public Hospital of Jember.

The subject of this study was 1 patients 27 years old. The chest physiotherapy is carried out with a time of 20-30 minutes per meeting. The implementation of chest physiotherapy is carried out for 3 consecutive days and is carried out twice a day. How to collect data starting from medical records, assessment and observation.

3. RESULTS

Table 1. Observe airway clearence

Variable	Days to-1				Days to-2				Days to-3			
	Morning		Afternoon		Morning		Afternoon		Night		Morning	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
RR	30	27	28	24	29	25	28	25	32	27	32	28
SPO2	96	97	95	96	97	98	96	98	96	97	96	98
Breath pattern	Fast	Regu- ler	Fast	Regu- ler	Fast	Regu- ler	Regu- ler	Regu- ler	Fast	Regu- ler	Regu- ler	Regu- ler

Based on table 1, it shows that from the results of observing the patient's airway patency before and after giving chest physiotherapy, there was a significant development. This is evidenced by the values of respiratory frequency and SpO2 after being given chest physiotherapy which tend to be more

stable and breathing patterns become more regular. In the patient Mr. T indicates that respiratory rate and oxygen saturation values can remain within the normal range for three consecutive days during implementation accompanied by regular breathing patterns.

Table 2. Observe additional breath sounds

Days to	Morning		Afternoon	
	Pre	Post	Pre	Post
1	There are (ronchi)	There are (ronchi)	There are (ronchi)	There are (ronchi)
2	There are (ronchi)	Ronchi reduced	There are (ronchi)	Ronchi reduced
3	Ronchi reduced	Ronchi reduced	Ronchi reduced	Ronchi reduced

Based on table 2, it shows that after performing chest physiotherapy for 3

consecutive days with a frequency of 2 times a day there was a change in the

additional breath sounds of rhonchi, namely the additional breath sounds began to decrease after giving chest physiotherapy until the third day.

4. DISCUSSION

Evaluation of the patient's airway clearance status

The condition of ineffective airway clearance in pneumonia patients occurs due to the accumulation of excess secretions. This causes the patient to experience problems with the airway which causes problems in meeting oxygen needs causing airway obstruction and disrupting the ventilation process (Ambarwati and Susanti, 2022). The impact that occurs due to pneumonia is that there are problems with the process of diffusion and ventilation due to an inflammatory reaction in the alveoli and produces exudate which interferes with the process of diffusion of oxygen and carbon dioxide (Musniati and Badrin, 2020). Interference with the ventilation process causes symptoms of decreased oxygen saturation and increased respiratory frequency (Purnamiasih, 2020). Another condition that causes airway clearance to need immediate attention is that patients can experience shortness of breath and experience respiratory failure

due to an obstructed airway due to retained secretions (Wardiyah, et al., 2022).

At the beginning of the study on Mr. T in the ICU room, the patient's condition was attached to a tracheostomy H+13. Clients experience excessive accumulation of secretions and retained secretions unable to be secreted. The condition of patients who are mechanically ventilated and have a tracheostomy installed have a tendency to experience ineffective airway clearance problems because the two devices are attached which trigger the buildup of secretions and mucus viscosity. In addition, other conditions that increase the risk of experiencing ineffective airway clearance because the patient experiences a decrease in consciousness which causes a decrease in coughing and swallowing reflexes, so that secretions will be retained and accumulate because they cannot be expelled (Sari, 2017). In addition, data that supports patients experiencing ineffective airway clearance are lung auscultation sounds indicating additional rhonchi sounds.

The problem of ineffective road cleaning experienced by patients with decreased consciousness in the ICU room with a respirator installed causes the process of expelling phlegm to be not smooth and the patient is at risk of experiencing difficulty breathing and

impaired gas exchange in the lungs. These conditions can cause patients to experience cyanosis, fatigue, apathy, weakness to airway obstruction (Nugroho, 2011). Excessive accumulation of secretions in the airways can narrow the airways and cause the patient to experience shortness of breath (Abdurrosidi and Novitasari, 2022). The condition of patients in the ICU who experience decreased consciousness with conditions of being unable to cough or a weakened cough reflex also increases the risk of ineffective airway clearance due to accumulation of secretions and thickened mucus conditions (Agustyn, 2007).

Chest physiotherapy is carried out with a series of actions, namely using postural drainage, clapping or percussion, and vibration techniques. Physiologically, the act of percussion or clapping which is done by tapping the chest wall with the palm of the hand can provide vibrations that spread into the tissues so that it helps the process of removing secretions attached to the walls of the bronchi and bronchioles. Then in the vibration technique which is carried out by applying strong pressure and vibration on the surface of the chest wall during expiration can increase turbulence or shocks with air velocity during expiration so as to be able to release thick mucus that sticks to the bronchi and bronchioles. The postural

drainage technique aims to release secretions from various lung segments that are affected by gravity, namely by arranging the patient in a certain position (Tahir, Imalia and Musinah, 2019).

The application of chest physiotherapy to patients shows that the value of respiratory frequency or oxygen saturation can remain within the normal range for three consecutive days as long as it is carried out accompanied by regular breathing patterns. Normal breathing frequency and regular breathing rhythm occur because there is sufficient oxygen in the lungs to be distributed to the body's cells. Airway free from accumulated secretions will facilitate the process of transporting oxygen from the respiratory tract to the lungs (Tahir, Imalia and Musinah, 2019). In line with research by Musniati and Badrin, (2020) that the procedure for carrying out chest physiotherapy can assist in releasing thick secretions which are carried out by restoring and maintaining the function of the respiratory muscles, helping to clear secretions from the bronchi, thus preventing secretion buildup. The movement of sputum after chest physiotherapy has been carried out helps to loosen the alveoli cavities thereby reducing the pressure in them and maximizing the expansion of the alveoli. The development

of the alveoli cavities causes the alveoli to become more adequate in supplying oxygen to the lungs so that shortness of breath can be reduced (Khotimah, 2013).

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Evaluation of additional breath sounds auscultatic

Auscultation is one of the stages in the physical examination which is carried out by listening to body sounds in the

lungs, heart and parts of the abdominal viscera. Sounds that appear during auscultation that can be heard are the sounds of air movement in the lungs formed by the thorax and abdominal viscera, and by the flow of blood through the cardiovascular system (Hidayati, 2019). During a physical examination of the lung fields in the Tn.T patient, it was found that there were additional crackles in both lung fields. Additional crackles that appear during lung auscultation can be caused by a buildup of mucus or secretions in the bronchi. There were additional crackles that were heard during the auscultation process in both parts of the right and left apical upper lobes and the right middle lobe.

After the implementation of chest physiotherapy which was carried out for 3 consecutive days 2 times per shift, it was found that on the first day it showed changes in the additional breath sounds of rhonchi, namely additional breath sounds heard in both apical and right middle lobes increased to scale 2 (moderately worsened). Then, on the second day of the implementation of chest physiotherapy found the results of the auscultation still heard the sound of additional breathing of ronkhi in the two lobes, but after being given the implementation of the chest physiotherapy the sound of the breathing

was quite increased to a scale. The addition of Ronkhi is caused by blood flow through the respiratory tract containing sputum or exudate. Secretions in the airway can be mobilized out through chest physiotherapy. The release of sputum makes the airways free of secretions so that additional breath sounds are reduced or absent (Tahir, Imalia and Musinah, 2019).

Based on the results of the evaluation, it showed that the condition of additional breath sounds showed improvement after chest physiotherapy. This is in line with the research of Jiandani, et al. (2018) that the condition of improving ventilation can be characterized by when auscultation is carried out, additional breath sounds have decreased, pulse frequency, and RR and oxygen saturation have improved. This is because chest physiotherapy can assist in removing secretions thereby clearing the respiratory tract, increasing ventilation and chest perfusion (Polapa, et al., 2022). Based on these conditions, the researchers are of the opinion that auscultatory examination of additional breath sounds which are still heard even though chest physiotherapy has been carried out for 3 days can be caused by the pneumonia condition experienced by the patient which is quite bad.

5. CONCLUSIONS

Based on the results of the implementation and analysis of chest physiotherapy in patients with ineffective airway clearance problems in the ICU, it can be concluded that Implementation of chest physiotherapy to help remove secretions that are stuck and cannot be removed. The application of chest physiotherapy is given 2 times per shift for 3 consecutive days. The results of the evaluation of the implementation of chest physiotherapy are decreased respiratory frequency, oxygen saturation is within the normal range, regular respiratory rhythm, additional rhonchi breath sounds are reduced, and dyspnea is decreased.

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AUTHOR CONTRIBUTIONS

Substantial contribution to conception, data collections, and analysis: Nadilla Ayu Arifin, Rismawan Adi Yunanto, Akhmad Zainur Ridla, and Heri Siswanto. Writing Manuscript and revisions: Nadilla Ayu Arifin.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data are not publicly available due to privacy or ethical restrictions.

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