
Case Study: The Application Of Suction Therapy For Airway Clearance In Patients With Pneumonia In The Intensive Care Unit Of Hospital X

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Abstract

Pneumonia remains one of the leading causes of respiratory disorders among critically ill patients admitted to the Intensive Care Unit (ICU). Pulmonary inflammation increases airway secretion production, leading to ineffective airway clearance, particularly in patients with decreased consciousness or artificial airways. Retained secretions may cause airway obstruction, impaired gas exchange, hypoxemia, and respiratory failure. Endotracheal suctioning is a nursing intervention aimed at maintaining airway patency by removing accumulated secretions. To describe the implementation of suctioning in managing ineffective airway clearance among patients with pneumonia admitted to the Intensive Care Unit of Hospital X. This study employed a descriptive case study design using the nursing process approach involving two patients diagnosed with pneumonia and ineffective airway clearance. Data were collected through family interviews, direct observation, physical examination, medical record review, and respiratory assessment before and after suctioning over two consecutive days. Respiratory rate, oxygen saturation, breath sounds, sputum volume, sputum characteristics, and patient responses were evaluated. The implementation of suctioning improved respiratory status in both patients. In the first patient, respiratory rate decreased from 24 to 22 breaths/minute, sputum production decreased from approximately 15 mL to 10 mL, rhonchi diminished, and oxygen saturation increased from 97% to 99%. In the second patient, respiratory rate decreased from 20 to 19 breaths/minute, sputum production decreased from approximately 10 mL to 5 mL, sputum became less viscous, rhonchi diminished, and oxygen saturation remained stable between 98% and 99%. Suctioning performed according to the standard operating procedure effectively maintains airway patency, reduces secretion retention, improves respiratory patterns, and enhances airway clearance in critically ill patients with pneumonia.

Keywords: *Pneumonia, Suction, Airway Clearance, Intensive Care Unit, Nursing Care.*

INTRODUCTION

Pneumonia is an acute infection of the lung parenchyma caused by bacteria, viruses, fungi, or other microorganisms. The infection triggers an inflammatory process that causes the alveoli to fill with fluid, exudate, and secretions, thereby impairing the gas exchange process. As a result, patients experience impaired ventilation characterized by productive cough, increased sputum production, dyspnea, tachypnea, decreased oxygen saturation, and the presence of adventitious breath sounds such as crackles (World Health Organization (WHO), 2024). In critically ill patients, these conditions often progress to ineffective airway clearance, requiring prompt nursing intervention.

According to the World Health Organization (2024), lower respiratory tract infections remain one of the leading causes of death worldwide, accounting for approximately 2.18 million deaths annually. Pneumonia is the largest contributor within this disease group, particularly among older adults, patients with chronic diseases, and individuals with compromised immune systems. In Indonesia, the prevalence of pneumonia increased from 1.6% in 2013 to 2.0% in 2018 based on the Basic Health Research Survey (Kementerian Kesehatan Republik Indonesia, 2018). Furthermore, Siti Nurhafizaha et al. (2026) reported that pneumonia remains one of the leading causes of morbidity and mortality due to lower respiratory tract infections in Indonesia.

Patients with pneumonia admitted to the Intensive Care Unit (ICU) are at a higher risk of secretion retention than those treated in general wards. This condition is associated with decreased levels of consciousness, respiratory muscle weakness, mechanical ventilation, and the use of an endotracheal tube or tracheostomy, all of which impair the mucociliary clearance mechanism. The accumulation of secretions disrupts alveolar ventilation, increases the work of breathing, worsens

hypoxemia, and may ultimately lead to respiratory failure if not managed promptly (Ramírez-Torres et al., 2024).

Ineffective airway clearance is one of the most common nursing diagnoses among patients with pneumonia in the ICU. This diagnosis is characterized by ineffective coughing, increased sputum production, adventitious breath sounds such as crackles, altered breathing patterns, and the patient's inability to clear secretions independently (Pratiwi et al., 2024). In patients with decreased consciousness or those receiving mechanical ventilation, secretion retention may result in airway obstruction, atelectasis, impaired gas exchange, and an increased risk of ventilator-associated pneumonia (Putri & Siwi, 2026). Therefore, maintaining airway patency is one of the primary priorities in providing nursing care for critically ill patients.

One of the recommended nursing interventions for managing secretion retention is suctioning. Suctioning is the procedure of removing secretions using negative pressure through an endotracheal tube, tracheostomy, or other artificial airways with the aim of maintaining airway patency, improving pulmonary ventilation, enhancing oxygenation, and preventing complications caused by secretion accumulation (Ramírez-Torres et al., 2024). In critical care nursing practice, suctioning should be performed based on clinical indications while adhering to the 3A principles—aseptic (preventing cyanosis), aseptic, and atraumatic—to minimize complications such as hypoxemia, mucosal trauma, bleeding, and arrhythmias (Mardiana, 2025).

Several studies have demonstrated the positive effects of suctioning on the respiratory status of patients with pneumonia. Pratiwi et al. (2024) reported that suctioning performed over three consecutive days increased oxygen saturation from 95% to 98% and improved the patients' respiratory condition. Saydihuri and Fitri (2025) found that endotracheal suctioning reduced mean secretion production by 55.67%, thereby improving patients' respiratory function. Putri and Siwi (2026) also reported that suctioning increased oxygen saturation from 85–90% to 93–96%, accompanied by a reduction in adventitious breath sounds. In addition, Fathoni et al. (2023) explained that suctioning performed according to standard operating procedures was effective in maintaining airway patency in patients receiving mechanical ventilation.

Data from the ICU of Hospital X showed that between March and June 2026, a total of 42 patients with pneumonia underwent intensive care. Most patients experienced decreased levels of consciousness, resulting in ineffective cough reflexes and difficulty clearing secretions independently. Consequently, suctioning became one of the most frequently performed nursing interventions to maintain airway patency. Based on these findings, the authors conducted a case study involving two patients with pneumonia diagnosed with ineffective airway clearance to describe the implementation of suctioning and evaluate changes in respiratory status following the intervention.

RESEARCH METHODS

This study employed a descriptive case study design using the nursing process approach to describe the implementation of suctioning in patients with pneumonia experiencing the nursing problem of Ineffective Airway Clearance in the Intensive Care Unit (ICU) of Hospital X. The case study involved two patients selected through purposive sampling based on the following criteria: a medical diagnosis of pneumonia, tracheostomy with oxygen therapy via a T-piece, secretion retention, and receipt of suctioning according to clinical indications.

Data were collected over a two-day period through interviews with the patients' families, direct observation, physical examination of the respiratory system, and review of medical records. The physical examination included inspection, palpation, percussion, and auscultation to assess the patients' respiratory status. Supporting data included laboratory test results, chest radiographs, sputum culture or bronchoalveolar lavage (BAL) findings, and medical therapies administered during hospitalization.

The primary intervention was tracheostomy suctioning performed in accordance with the hospital's Standard Operating Procedures (SOPs). Before the procedure, patients received hyperoxygenation, followed by an assessment of the need for suctioning based on the presence of secretions, adventitious breath sounds, decreased cough effectiveness, and changes in respiratory status. Suctioning was performed using aseptic technique while adhering to the 3A principles (aseptic, acyanotic, and atraumatic). In addition to suctioning, patients received supportive interventions including inhalation therapy (Ventolin and Pulmicort), chest physiotherapy, oxygen therapy via T-piece, semi-Fowler's positioning, and pharmacological treatment according to the prescribed medical management.

The effectiveness of suctioning was evaluated using objective indicators, including auscultation findings (reduction in adventitious breath sounds/crackles), sputum volume (mL), sputum characteristics (color and consistency), respiratory rate (RR), oxygen saturation (SpO₂), and the patients' clinical responses following the procedure. The collected data were analyzed descriptively by comparing the patients' conditions before and after suctioning and then comparing the findings with those of relevant previous studies.

RESULTS AND DISCUSSION

Characteristics of the Patients

This study involved two patients admitted to the Intensive Care Unit (ICU) of Hospital X with a medical diagnosis of pneumonia and a nursing diagnosis of Ineffective Airway Clearance. Both patients were elderly women who experienced respiratory impairment due to increased secretion production and a reduced ability to clear secretions independently. This condition was associated with decreased levels of consciousness, resulting in an ineffective cough reflex and secretion retention in the airways. Both patients had tracheostomies and received oxygen therapy through a T-piece, requiring suctioning as the primary intervention to maintain airway patency.

The first patient (Mrs. O) was admitted to the ICU with a medical diagnosis of pneumonia accompanied by a history of stroke, dementia, and decreased consciousness. Assessment revealed a respiratory rate of 24 breaths/minute, oxygen saturation of 98% while receiving oxygen via a T-piece at 5 L/minute, adventitious breath sounds (crackles) over the left lower lung field, and thick sputum that could not be expelled spontaneously. These findings indicated secretion retention leading to ineffective airway clearance.

The second patient (Mrs. E) was also diagnosed with pneumonia accompanied by ineffective airway clearance. Assessment findings included a respiratory rate of 23 breaths/minute, oxygen saturation of 98%, crackles on auscultation, and a considerable amount of purulent secretions that could not be expelled independently due to an ineffective cough. Based on these conditions, both patients underwent suctioning according to the hospital's Standard Operating Procedures (SOPs) as the primary intervention to reduce secretion retention and maintain airway patency.

Condition Before Suctioning

Initial assessment showed that both patients experienced the nursing problem of Ineffective Airway Clearance caused by secretion retention, characterized by an ineffective cough, increased sputum production, adventitious breath sounds (crackles), and the inability to clear secretions independently. These conditions were associated with decreased levels of consciousness and the presence of a tracheostomy, which impaired the physiological airway clearance mechanism.

For Mrs. O, the assessment showed a respiratory rate of 25 breaths/minute, oxygen saturation of 97% while receiving oxygen through a T-piece at 5 L/minute, crackles over the left lower lung field, and approximately 15 mL of thick, cloudy sputum. The patient had a history of stroke, dementia, and sepsis, all of which contributed to a diminished cough reflex, making spontaneous secretion clearance difficult. In addition, bronchoalveolar lavage (BAL) culture demonstrated mixed bacterial and fungal infections, which aggravated pulmonary inflammation and increased secretion production.

For Mrs. E, the assessment revealed a respiratory rate of 23 breaths/minute, oxygen saturation of 98% with a T-piece at 4 L/minute, crackles over the right lung, and approximately 10 mL of thick, yellow purulent sputum. A history of post-cranioplasty following intracerebral hemorrhage (ICH) resulted in an ineffective cough reflex, causing secretions to remain in the airways and preventing independent secretion clearance. Sputum culture also showed the growth of *Pseudomonas aeruginosa*, indicating a respiratory tract infection.

The findings in both patients demonstrated that secretion retention was the primary cause of ineffective airway clearance. The accumulation of secretions obstructed airflow, increased airway resistance, impaired alveolar ventilation, and increased the work of breathing. These findings are consistent with the Indonesian Nursing Diagnosis Standards (SDKI), which state that Ineffective Airway Clearance is characterized by ineffective coughing, increased sputum production, adventitious breath sounds, altered respiratory rate, and the inability to clear secretions. In pneumonia, the inflammatory process causes the alveoli to fill with exudate, thereby increasing secretion production and impairing gas exchange.

These findings are consistent with the study by Pratiwi et al. (2024), which reported that patients with pneumonia and decreased consciousness tend to experience secretion retention due to an ineffective cough reflex. Furthermore, Rini and Imallah (2025) explained that patients with tracheostomies require comprehensive airway management, including suctioning, chest physiotherapy, inhalation therapy, oxygen therapy, and positioning to maintain airway patency and optimize respiratory function.

Implementation of Suctioning

Based on the assessment findings, both patients underwent tracheostomy suctioning according to the hospital's Standard Operating Procedures (SOPs) because secretion retention was identified, as evidenced by ineffective coughing, increased sputum production, and crackles on auscultation. Before the procedure, nurses reassessed the patients' respiratory status, including respiratory rate, oxygen saturation, breath sounds, sputum characteristics (volume, color, and consistency), and confirmed the proper functioning of the T-piece and oxygen flow. Hyperoxygenation was then provided as indicated to prevent hypoxemia during the procedure.

Suctioning was performed using sterile technique while adhering to the 3A principles: aseptic, acyanotic, and atraumatic. Mrs. O underwent suctioning four times on the first day and three times on the second day according to clinical indications. Similarly, Mrs. E received suctioning four times on the first day and three times on the second day based on respiratory monitoring findings and increased secretion production.

Following suctioning, patients were reassessed through auscultation to evaluate changes in breath sounds, while respiratory rate, oxygen saturation, and the volume and characteristics of the removed sputum were also monitored. This evaluation aimed to determine the effectiveness of suctioning in maintaining airway patency and improving ventilation.

In addition to suctioning, both patients received supportive interventions, including semi-Fowler's positioning, inhalation therapy according to the prescribed medical treatment, chest physiotherapy, oxygen therapy via T-piece, and collaborative administration of mucolytics, antibiotics, and antifungal medications according to each patient's clinical condition. These combined interventions were intended to liquefy secretions, facilitate secretion mobilization to the main airways, control infection, and improve ventilation and oxygenation.

Performing suctioning according to clinical indications plays a crucial role in maintaining airway patency while preventing complications such as hypoxemia, mucosal trauma, bleeding, and arrhythmias. Ramírez-Torres et al. (2024) stated that suctioning should be performed based on clinical indications and evaluated through changes in respiratory status, including auscultation findings, secretion characteristics, and oxygenation status. These findings are supported by Pratiwi et al. (2024) and Saydihuri and Fitri (2025), who reported that suctioning combined with other respiratory therapies

effectively reduces secretion retention, improves ventilation, and enhances airway clearance in patients with pneumonia.

Outcomes of Suctioning

Suctioning was performed over a two-day period in both patients diagnosed with Ineffective Airway Clearance. The effectiveness of the intervention was evaluated based on auscultation findings, sputum volume and characteristics, respiratory rate, and oxygen saturation before and after the procedure.

In Mrs. O, following suctioning supported by inhalation therapy, chest physiotherapy, oxygen therapy via a T-piece at 5 L/minute, and semi-Fowler's positioning, sputum production decreased from approximately 15 mL on the first day to 10 mL on the second day. The sputum changed from thick and cloudy to a thinner consistency. Auscultation revealed a reduction in crackles compared with the pre-intervention assessment. Respiratory rate decreased from 25 to 22 breaths/minute, while oxygen saturation improved from 97% to 98–100%. The patient also appeared more comfortable and no longer exhibited the use of accessory respiratory muscles.

In Mrs. E, suctioning combined with inhalation therapy, chest physiotherapy, oxygen therapy via a T-piece at 4 L/minute, and semi-Fowler's positioning resulted in a reduction in sputum production from approximately 10 mL to 5 mL, with the sputum becoming thinner and changing to a whitish-yellow color. Auscultation demonstrated fewer crackles in the right lung compared with the pre-intervention findings. Respiratory rate decreased from 23 to 22 breaths/minute on the first day and from 20 to 19 breaths/minute on the second day, while oxygen saturation remained stable at 99%. In addition, the characteristic "gurgling" airway sound was no longer heard, and the patient appeared more comfortable following the intervention.

Overall, both patients demonstrated improvement in respiratory status following suctioning. These improvements were evidenced by reduced adventitious breath sounds on auscultation, decreased sputum volume, thinner sputum consistency, reduced respiratory rate, and improved or stable oxygen saturation. Nevertheless, both patients continued to require suctioning according to clinical indications because secretion production persisted throughout the observation period.

Table 1. Changes in the Indicators of Suctioning Effectiveness in Mrs. O During the Two-Day Intervention Period

Indicator	Day 1	Day 2
Respiratory rate (breaths/min)	25 breaths/min	22 breaths/min
Oxygen saturation (SpO ₂)	97%	98–100%
Breath sounds (auscultation)	Decreased crackles in the left lower lung	Minimal crackles in the left lower lung
Sputum production	Approximately 15 mL	Approximately 10 mL
Sputum characteristics	Cloudy and thick	Thinner consistency with reduced volume

Table 2. Changes in Suction Action Success Indicators on Mrs. E During Two Days of Implementation

Indicator	Day 1	Day 2
Respiratory rate (breaths/min)	22 breaths/min	19 breaths/min
Oxygen saturation (SpO ₂)	99%	99%
Breath sounds (auscultation)	Decreased crackles in the right lung	Minimal crackles in the right lung
Sputum production	Approximately 10 mL	Approximately 5 mL
Sputum characteristics	Yellow and thick	Yellowish-white and thinner

In Mrs. O, respiratory status improved following two days of suctioning. Her respiratory rate decreased from 25 breaths/minute on the first day to 22 breaths/minute on the second day. Oxygen saturation remained stable within the range of 97–100% while receiving oxygen via a T-piece at 5 L/minute. Sputum production decreased from approximately 15 mL to 10 mL, accompanied by a change in secretion characteristics from thick and cloudy to thinner consistency. Auscultation also revealed a reduction in adventitious breath sounds (crackles) over the left lower lung field compared with the initial assessment, indicating improved airway patency.

In Mrs. E, suctioning also resulted in improved respiratory status. Her respiratory rate decreased from 20 breaths/minute to 19 breaths/minute, while oxygen saturation remained stable at 98–100% with oxygen delivered via a T-piece at 4 L/minute. Sputum production decreased from approximately 10 mL to 5 mL, with sputum characteristics changing from thick purulent secretions to a thinner, yellowish-white consistency. Auscultation demonstrated that the crackles initially heard over the right lung became minimal after the second day of intervention, indicating reduced airway secretion retention.

The effectiveness of suctioning in both patients was evaluated based on changes in clinical indicators, including auscultation findings, sputum volume and characteristics, respiratory rate, and oxygen saturation, rather than solely on the amount of secretions removed. The reduction in sputum volume, diminished crackles, decreased respiratory rate, and stable oxygen saturation indicated that suctioning helped maintain airway patency and improve pulmonary ventilation. These findings are consistent with Pratiwi et al. (2024), who reported that suctioning in patients with pneumonia reduced secretion retention, increased oxygen saturation, and improved airway clearance. Similarly, Saydihuri and Fitri (2025) stated that endotracheal suctioning performed according to clinical indications reduced secretion production, improved ventilation, and lowered the risk of respiratory complications.

According to the authors' analysis, the improvement in respiratory status observed in both patients was not solely attributable to suctioning but also to the comprehensive nursing and medical interventions provided. Inhalation therapy promoted bronchodilation and reduced airway inflammation, chest physiotherapy facilitated secretion mobilization toward the central airways, oxygen therapy maintained tissue oxygenation, mucolytic agents helped liquefy secretions, and antibiotics and antifungal medications controlled the underlying pulmonary infection. These findings are supported by Ramírez-Torres et al. (2024), who concluded that the effectiveness of suctioning is optimized when combined with other respiratory therapies and performed based on clinical indications rather than as a routine procedure.

Nevertheless, the nursing outcome of Ineffective Airway Clearance was not fully achieved in either patient because secretions continued to be produced, although in smaller amounts, and minimal adventitious breath sounds were still present. In addition, both patients continued to have risk factors affecting recovery, including tracheostomy, decreased level of consciousness, underlying comorbidities, and ongoing inflammatory processes associated with pneumonia. Therefore, suctioning should continue to be performed according to clinical indications and combined with other nursing interventions and medical therapies to maintain airway patency and optimize the healing process.

Discussion

The findings of this case study showed that both patients shared similar clinical characteristics. Both were diagnosed with pneumonia accompanied by the nursing diagnosis of Ineffective Airway Clearance due to secretion retention. Both experienced decreased levels of consciousness, had tracheostomies with oxygen support via a T-piece, and were unable to clear secretions independently because of impaired cough reflexes. Secretion accumulation resulted in adventitious breath sounds (crackles), increased sputum production, and impaired ventilation, necessitating suctioning to maintain airway patency. These findings are consistent with Pratiwi et al. (2024), who reported that patients with pneumonia and decreased consciousness are at high risk of secretion retention due to ineffective airway clearance. Likewise, Hapsari et al. (2024) explained that secretion retention is one

of the primary causes of Ineffective Airway Clearance in patients with pneumonia, thereby requiring interventions to maintain airway patency.

Although both patients had the same nursing diagnosis, their clinical characteristics differed. Mrs. O had pneumonia complicated by sepsis, with a history of stroke, dementia, and mixed infections identified through bronchoalveolar lavage cultures, including *Stenotrophomonas diminuta*, *Candida glabrata*, and *Enterobacter cloacae* complex. These conditions resulted in a more severe inflammatory process, greater secretion production, and a slower recovery. In contrast, Mrs. E had pneumonia following cranioplasty for intracerebral hemorrhage (ICH), and sputum culture revealed *Pseudomonas aeruginosa*. In this patient, secretion retention was primarily associated with neurological impairment leading to a diminished cough reflex. According to Ramírez-Torres et al. (2024), patients' underlying clinical conditions, comorbidities, severity of infection, and the causative microorganisms all influence secretion volume and the patient's response to suctioning.

Based on these assessment findings, suctioning was selected as the primary intervention because both patients demonstrated clinical indications including secretion retention, ineffective cough, crackles on auscultation, and inability to clear sputum independently. Before the procedure, nurses assessed respiratory rate, oxygen saturation, auscultation findings, and sputum characteristics, followed by hyperoxygenation to prevent hypoxemia during the procedure. In addition to suctioning, both patients received inhalation therapy, chest physiotherapy, semi-Fowler's positioning, oxygen therapy via T-piece, and pharmacological treatment including mucolytics, antibiotics, and antifungal medications according to their respective clinical conditions. This approach is consistent with the recommendations of Ramírez-Torres et al. (2024), who emphasized that suctioning should be performed according to clinical indications and combined with other respiratory interventions to achieve optimal outcomes.

On the first day of intervention, both patients demonstrated improvement in respiratory status. In Mrs. O, suctioning removed approximately 15 mL of thick, cloudy secretions, accompanied by a decrease in respiratory rate from 25 to 22 breaths/minute, improvement in oxygen saturation to 98–100%, and reduced crackles on auscultation. In Mrs. E, approximately 10 mL of thick yellow secretions were removed, respiratory rate decreased from 23 to 22 breaths/minute, oxygen saturation increased to 99%, and crackles began to diminish. The success of suctioning was assessed not only by the amount of secretions removed but also through auscultation findings, sputum volume and characteristics, respiratory rate, and oxygen saturation. The reduction in crackles indicated decreased airway obstruction due to secretions, while the lower respiratory rate and stable oxygen saturation reflected improved ventilation and gas exchange. These findings are in agreement with Pratiwi et al. (2024), who reported that suctioning reduced secretion retention, improved oxygen saturation, and enhanced airway clearance in patients with pneumonia.

However, the first day of intervention did not completely resolve the nursing problem because both patients continued to produce secretions and still exhibited crackles, although their intensity had decreased. According to the authors' analysis, this was due to the ongoing inflammatory process associated with pneumonia, which continued to stimulate secretion production. Consequently, suctioning needed to be repeated according to clinical indications and combined with other respiratory therapies. This finding is supported by Saydihuri and Fitri (2025), who explained that patients with pneumonia and artificial airways require periodic endotracheal suctioning because secretions continue to be produced until the underlying infection is fully controlled.

On the second day, greater clinical improvement was observed. In Mrs. O, sputum production decreased to approximately 10 mL with a thinner consistency, respiratory rate remained at 22 breaths/minute, oxygen saturation remained stable at 99–100%, and only minimal crackles were detected on auscultation. In Mrs. E, sputum production decreased to approximately 5 mL, respiratory rate decreased to 19 breaths/minute, oxygen saturation remained stable at 99%, and crackles became less pronounced. The change in sputum consistency from thick to thinner was likely attributable to the combined effects of suctioning, mucolytic therapy, inhalation therapy, and chest physiotherapy, which

facilitated secretion mobilization toward the central airways. These findings are consistent with Fathoni et al. (2023), who reported that endotracheal suctioning combined with respiratory therapy improves ventilation effectiveness and maintains airway patency in mechanically ventilated patients.

According to the authors' analysis, the improvement in respiratory status observed in both patients was not solely attributable to suctioning. Suctioning directly removed airway-obstructing secretions, whereas inhalation therapy promoted bronchodilation and reduced airway inflammation, chest physiotherapy mobilized secretions from peripheral to central airways, mucolytic agents liquefied secretions, antibiotics and antifungal medications controlled the underlying pulmonary infection, and oxygen therapy maintained adequate tissue oxygenation. Therefore, the improvement in pulmonary status resulted from comprehensive and collaborative management rather than from a single intervention. This interpretation is consistent with Ramírez-Torres et al. (2024), who concluded that suctioning is more effective when combined with respiratory therapy and optimal infection control.

Comparison of the two cases revealed differences in therapeutic response. Mrs. O experienced a 33.3% reduction in sputum production (from 15 mL to 10 mL), whereas Mrs. E demonstrated a 50% reduction (from 10 mL to 5 mL). According to the authors' analysis, these differences were influenced not only by suctioning but also by each patient's underlying clinical condition. Mrs. O had sepsis, a history of stroke, dementia, and mixed bacterial and fungal infections, all of which contributed to a more severe inflammatory response and slower recovery. In contrast, Mrs. E's secretion retention was primarily associated with neurological impairment following ICH; therefore, once the infection began to resolve, her response to therapy improved more rapidly. These findings suggest that the effectiveness of suctioning is influenced by the patient's underlying condition, comorbidities, severity of infection, and the comprehensive treatment provided.

Overall, the findings of this case study demonstrate that suctioning is effective in helping maintain airway patency in patients with pneumonia admitted to the ICU. The effectiveness of the intervention was evidenced by reduced crackles on auscultation, decreased sputum volume, improved sputum characteristics, reduced respiratory rate, and improved or stable oxygen saturation. However, the effectiveness of suctioning cannot be separated from the concurrent supportive interventions provided. Therefore, suctioning should be considered an integral component of comprehensive airway management in patients with pneumonia, with careful consideration of each patient's clinical condition to achieve optimal therapeutic outcomes.

CONCLUSIONS

The implementation of suctioning in two patients with pneumonia diagnosed with the nursing problem of Ineffective Airway Clearance in the Intensive Care Unit (ICU) of Hospital X demonstrated improvements in respiratory status over the two-day intervention period. The effectiveness of the intervention was evidenced by a reduction in adventitious breath sounds (crackles) on auscultation, decreased sputum volume, changes in sputum characteristics to a thinner consistency, reduced respiratory rate, and improved or stable oxygen saturation. In Mrs. O, sputum production decreased from approximately 15 mL to 10 mL, while in Mrs. E it decreased from approximately 10 mL to 5 mL, accompanied by improvements in respiratory parameters in both patients.

Although both patients responded positively to suctioning, differences in the degree of clinical improvement were observed due to their underlying conditions. Mrs. O experienced a slower recovery because of sepsis, a history of stroke, dementia, and concurrent bacterial and fungal infections, whereas Mrs. E showed more rapid improvement because her secretion retention was primarily associated with neurological impairment following intracerebral hemorrhage (ICH).

The findings of this case study indicate that suctioning is an effective intervention for helping maintain airway patency in patients with pneumonia. However, its effectiveness is not solely attributable to suctioning itself but is also influenced by comprehensive therapy, including inhalation

therapy, chest physiotherapy, oxygen therapy via a T-piece, semi-Fowler's positioning, administration of mucolytic agents, antibiotics, antifungal medications, and each patient's underlying clinical condition and comorbidities. Therefore, suctioning should be performed based on clinical indications and incorporated into a comprehensive airway management strategy to achieve optimal respiratory outcomes in patients with pneumonia admitted to the ICU.

REFERENCES

- Annashr, N. N., Nopianto, Asliana Sainal, A., Sukmawati, Murni, N. S., Nurnainah, Weraman, P., Muslimin, D., Prasetyanto, D., & Hasyim, H. (2022). *Pengendalian penyakit di Indonesia*. PT Global Eksekutif Teknologi.
- Fathoni, A., Cembun, A., Dramawan, A., Rusmini, R., & Emilyani, D. (2023). Penghisapan sekresi endotrakeal pada pasien dengan ventilator mekanik. *Indonesian Health Issue*.
- Hidayani, R. (2022). *Pneumonia: Epidemiologi, faktor risiko pada balita*. CV Pena Persada. <https://osf.io/preprints/thesiscommons/adn5z>
- Hidayati, S., & Haryanto, A. (2025). *Analisis asuhan keperawatan gangguan pertukaran gas pada pasien pneumonia dengan menggunakan intervensi dukungan ventilasi dan deep breathing exercise di ruang ICU Infeksius RSUD dr. Wahidin Sudiro Husodo Kota Mojokerto* (Doctoral dissertation). Perpustakaan Universitas Bina Sehat PPNI.
- Joo, D.-H., Park, H. C., Kim, J. H., Yang, S. H., Kim, T. H., Kim, H.-J., Song, M. J., Lim, S. Y., Kim, S. A., Bae, H. W., Ahn, Y. H., Yoon, S. M., Park, J., Lee, H. Y., Lee, J., Lee, S.-M., Lee, J. C., & Cho, Y.-J. (2024). Clinical efficacy and safety of an automatic closed-suction system in mechanically ventilated patients with pneumonia: A multicenter, prospective, randomized, non-inferiority, investigator-initiated trial. *Diagnostics*, 14 (11), Article 1068. <https://doi.org/10.3390/diagnostics14111068>
- Kementerian Kesehatan Republik Indonesia. (2018). *Riset kesehatan dasar (Riskesdas) 2018*. Kementerian Kesehatan Republik Indonesia.
- Mardiana, L. (2025). *Penerapan tindakan suction pada pasien pneumonia dengan penurunan kesadaran yang memiliki masalah keperawatan bersihan jalan napas tidak efektif* (Karya Ilmiah Akhir Profesi Ners). Program Studi Profesi Ners, Fakultas Kedokteran, Universitas Sriwijaya.
- Ni'mah, et al. (2024). *Konsep medis penyakit pneumonia*.
- Novianti, R., Siwi, A. S., & Nurya. (2025). Penerapan suction dalam asuhan keperawatan pada pasien TBC dengan bersihan napas tidak efektif di ICU.
- Paludi, M. A., et al. (2025). A systematic review on suction-based airway clearance devices for foreign body airway obstruction.
- Patel, N., et al. (2022). Methods and applications in respiratory physiology. *Frontiers in Physiology*, 13, 838414. <https://doi.org/10.3389/fphys.2022.838414>
- Persatuan Perawat Nasional Indonesia. (2024). *Standar diagnosis keperawatan Indonesia (SDKI): Definisi dan indikator diagnostik* (Edisi revisi). DPP PPNI.
- Persatuan Perawat Nasional Indonesia. (2024). *Standar intervensi keperawatan Indonesia (SIKI): Definisi dan tindakan keperawatan* (Edisi revisi). DPP PPNI.
- Persatuan Perawat Nasional Indonesia. (2024). *Standar luaran keperawatan Indonesia (SLKI): Definisi dan kriteria hasil keperawatan* (Edisi revisi). DPP PPNI.
- Potter, P. A., Perry, A. G., Stockert, P. A., & Hall, A. M. (2021). *Fundamentals of nursing* (11th ed.). Elsevier.
- Pratiwi, F. I., Rosida, N. A., & Nurlaily, A. P. (2024). Asuhan keperawatan pada pasien pneumonia: Bersihan jalan napas tidak efektif dengan intervensi suction.
- Puspitasari, D., & Handayani, S. (2024). Fisiologi sistem pernapasan dan mekanisme pertukaran gas. *Jurnal Kesehatan Respirasi Indonesia*, 6(1), 15–23.

- Putri, A. A., & Siwi, A. S. (2026). Penerapan intervensi suctioning dalam asuhan keperawatan pada pasien di ICU.
- Ramírez-Torres, C. A., Andrade-Gómez, E., Giménez-Luzuriaga, M., Lozano, C., & Sapiña-Beltrán, E. (2024). Closed suction system in tracheal suctioning in the critically ill patient connected to mechanical ventilation: A systematic review. *Archivos de Bronconeumología*, 60(2), 116–118.
- Saydihuri, B., & Fitri, E. Y. (2025). Penerapan endotracheal suctioning sebagai upaya preventif terhadap ventilator associated pneumonia.
- Shoar, S., & Musher, D. M. (2020). Etiology of community-acquired pneumonia in adults. *Pneumonia*, 12, 11. <https://doi.org/10.1186/s41479-020-00074-3>
- World Health Organization. (2024). *Pneumonia*. World Health Organization.