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Implementing the Active Cycle of Breathing Technique (ACBT) for Managing Ineffective Breathing Pattern in a Patient with Congestive Heart Failure: A Case Study

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ABSTRACT

Background: Congestive Heart Failure (CHF) is a chronic clinical syndrome characterized by the heart's inability to pump blood effectively, often leading to dyspnea due to pulmonary congestion. The Active Cycle of Breathing Technique (ACBT) is a breathing exercise designed to regulate breathing patterns, improve ventilation, and facilitate sputum clearance, which may alleviate dyspnea in CHF patients. To evaluate the effectiveness of ACBT in reducing dyspnea in a CHF patient with an ineffective breathing pattern
Methods: A case study design with a nursing care approach was conducted over three days. The patient was assessed through interview and observation. A nursing diagnosis of Ineffective Breathing Pattern (SDKI D.0005) was established. Interventions included Airway Management (SIKI I.01011), semi-Fowler positioning, and ACBT administration for 15 minutes daily. Respiratory rate was measured using an oximeter, and dyspnea complaints were monitored.
Results: Before the intervention, the patient complained of dyspnea with a respiratory rate of 28 breaths/minute, using accessory muscles and nasal flaring. After three days of ACBT intervention, the respiratory rate decreased to 20 breaths/minute, and the patient reported no further dyspnea.
Conclusion: The ACBT intervention was effective in reducing respiratory rate and relieving dyspnea in a CHF patient with an ineffective breathing pattern. ACBT can be recommended as a non-pharmacological nursing intervention to manage dyspnea in CHF patients.

INTRODUCTION

Non-communicable diseases (NCDs) account for 71% of global deaths, with cardiovascular diseases being the leading contributor (Martin et al., 2024). Among these, Congestive Heart Failure (CHF) represents a significant and growing burden, with an annual incidence affecting approximately 64.34 million individuals and causing 9.91 million deaths worldwide (Emmons-Bell et al., 2022). In Indonesia, cardiovascular disease mortality is the third highest in Southeast Asia (Kementerian Kesehatan Republik Indonesia, 2023). National data estimates over 2.7 million people live with heart failure, reflecting an increasing prevalence (Maryana et al., 2023). Regionally, West Kalimantan reports a 1.31% prevalence of CHF, with Pontianak City ranking third within the province at 1.70% (Kementrian Kesehatan Republik Indonesia, 2018).

CHF is characterized by the heart's impaired ability to pump blood sufficiently, leading to unmet metabolic demands and symptoms such as dyspnea, orthopnea, cough, fatigue, and edema (Haider, 2023). Dyspnea, or shortness of breath, is the most prevalent and distressing symptom, often resulting from pulmonary congestion and complications like pleural effusion, which reduces lung capacity and can lead to hypoxia (Aarønaes et al., 2007; Ahmad et al., 2025; Elendu et al., 2024; Martin et al., 2024). Consequently, an ineffective breathing pattern due to increased work of breathing or secretion retention is a primary nursing diagnosis for CHF patients (Bader et al., 2017; Meyers & Goodlin, 2016; Piamjariyakul et al., 2019).

Standard medical management for CHF includes pharmacological agents like diuretics, vasodilators, beta-blockers, and ACE inhibitor (Ahmed et al., 2019; Barrett et al., 2023; Warraich et al., 2018). However, these treatments often provide insufficient relief from persistent dyspnea, particularly in outpatient or chronic care settings. This gap highlights the critical need for adjunctive non-pharmacological interventions to manage respiratory symptoms and improve patient comfort and functional status (Krówczyńska & Jankowska-Polańska, 2020; Nunciaroni et al., 2023).

One promising supportive therapy is the Active Cycle of Breathing Techniques (ACBT). This structured regimen comprises three phases: breathing control, thoracic expansion exercises, and forced expiration techniques (huffing) (Nunung Nurhayati et al., 2021). ACBT is designed to improve airway clearance, enhance lung ventilation, optimize oxygenation, and thereby alleviate shortness of breath (Surya Pratama & Wahyudi, 2024) . Evidence supports its effectiveness in various respiratory conditions, including bronchiectasis and pulmonary tuberculosis, and it is recognized as a beneficial nursing intervention for improving pulmonary function, such as in post-cardiac surgery care (Isnainy & Sekardhyta Ayuning Tias, 2019).

Despite its demonstrated benefits, simplicity, and cost-effectiveness, the systematic application of ACBT has not been integrated into the standard nursing care protocol for CHF patients in settings like the Sambiloto Room at Kartika Husada Hospital. Current management relies primarily on oxygen therapy, positional strategies (e.g., semi-Fowler's), and routine vital sign monitoring. This case study therefore aims to evaluate the implementation and effectiveness of ACBT as a structured, non-pharmacological nursing intervention to reduce dyspnea in a patient with CHF, addressing a notable gap in current clinical practice.

METHODS

Study Design and Setting

This study employed a nursing care case study design conducted at Kartika Husada Level II Hospital in Kubu Raya. The intervention was implemented over a three-day period from May 28th to May 30th, 2025. The participant was a patient diagnosed with Congestive Heart Failure (CHF) presenting with a primary nursing problem of an ineffective breathing pattern.

Data Collection and Instruments

Data were collected through a comprehensive nursing assessment. This included:

1. A structured interview to obtain subjective data and chief complaints.
2. Direct observation of breathing patterns, use of accessory muscles, and nasal flaring.
3. Physical examination of the respiratory system, focusing on respiratory rate, depth, and the presence of adventitious breath sounds. The primary instruments were a nursing care study format, an observation sheet, and a Standard Operating Procedure (SOP) for ACBT implementation to ensure intervention fidelity.

Intervention Procedure

The core intervention was the Active Cycle of Breathing Technique (ACBT), administered for 15 minutes daily for three consecutive days. The procedure, guided by the SOP, consisted of three stages performed in sequence per cycle:

1. Breathing Control: Relaxed, gentle diaphragmatic breathing.

2. Thoracic Expansion Exercises: Deep inhalations followed by a passive exhalation.
3. Forced Expiration Technique (Huffing): Controlled, forced exhalations to mobilize secretions. Each cycle lasted approximately 3 minutes. Five cycles were completed per 15-minute session. The patient performed the exercises in a semi-Fowler's position, with rest periods provided between stages as needed.

Evaluation and Data Analysis
A daily evaluation was conducted to monitor the patient's response. Effectiveness was measured against predefined indicators: a reduction in respiratory rate, decreased subjective sensation of shortness of breath, regularization of breathing pattern, and improved exercise tolerance. Data from interviews, observations, and physical assessments were analyzed descriptively to formulate the nursing diagnosis, guide the intervention plan, and evaluate the clinical outcomes of the ACBT intervention

RESULTS

Patient Identification and Medical History
Patient Profile: Mrs. N, 53 years old, female, admitted to Kartika Husada Level II Hospital, Pontianak, on May 28, 2025. Chief Complaint: Shortness of breath for three weeks, worsening in the past week. History of Present Illness: The patient reported progressive dyspnea accompanied by intermittent left-sided chest pain (radiating to the back, pain scale 4/10), palpitations, productive cough with difficult sputum expulsion, bilateral lower limb edema for one month, fatigue, and generalized weakness. The patient had a known history of heart disease but no regular medical follow-up.

Physical Examination and Diagnostic Findings
Vital Signs (on admission): Blood Pressure 133/90 mmHg, Pulse 54 bpm (Bradycardia), Temperature 36.2°C, Respiratory Rate 28 breaths/minute (Tachypnea), Oxygen Saturation 98% (with 3 L/min O2 via nasal cannula). Physical Examination: Bilateral ronchi in the lung bases. Bilateral pitting edema grade III (depth 5–7 mm, regression time ~7 seconds).
Supporting Examinations: Troponin I (non-reactive), Albumin 2.67 g/dL, Random Blood Glucose 98 mg/dL. Electrocardiogram (ECG): NSTEMI in leads I and aVL. Chest X-ray: Cardiomegaly.

Medical Diagnosis and Therapy
Medical Diagnosis: Congestive Heart Failure (CHF). Therapy Program: Oxygen therapy (3 L/min via nasal cannula), IV infusion RL 500 cc/day, IV Esomeprazole 40 mg, IV Furosemide 5 mg/hour, Oral VIP Albumin 2x1, Oral Spironolactone 1x25 mg, Oral ISDN 2x5 mg, Oral Warfarin 3 mg at night, Oral Digoxin 1x0.25 mg.

Nursing Assessment and Diagnosis
Based on comprehensive assessment, the primary nursing problems were identified using Standard Diagnosis Keperawatan Indonesia (SDKI):
1. Risk for Ineffective Myocardial Perfusion related to hyperlipidemia (SDKI D.0014).
2. Decreased Cardiac Output related to changes in afterload, evidenced by dyspnea (SDKI D.0008).
3. Ineffective Breathing Pattern related to impaired respiratory effort, evidenced by shortness of breath and tachypnea (SDKI D.0005). (Focus of Intervention)
4. Activity Intolerance related to an imbalance between oxygen supply and demand, evidenced by weakness (SDKI D.0056).

Nursing Intervention: ACBT Implementation
The primary intervention for the problem of Ineffective Breathing Pattern was the application of the Active Cycle of Breathing Technique (ACBT), guided by a Standard Operating Procedure

(SOP). The intervention was carried out for 15 minutes daily for three consecutive days (May 28–30, 2025), with the patient in a semi-Fowler position. Each session consisted of five cycles of:

1. Breathing Control (relaxed diaphragmatic breathing).
2. Thoracic Expansion Exercises (deep inhalation).
3. Forced Expiration Technique/Huffing (to mobilize secretions).

Evaluation and Outcomes

Patient response was evaluated daily through respiratory rate (RR), oxygen saturation (SpO2), breathing pattern, and subjective dyspnea report.

Day 1 (May 28, 2025): RR 26 breaths/min, SpO2 98% with O2, shallow tachypnea, use of accessory muscles. Problem unresolved; intervention continued.

Day 2 (May 29, 2025): RR decreased to 22 breaths/min, SpO2 99% with 2 L/min O2, breathing pattern more regular, sputum easier to expel.

Day 3 (May 30, 2025): RR normalized to 20 breaths/minute (eupnea), SpO2 stable at 97% without oxygen supplementation, no dyspnea complaint, normal vesicular breath sounds, symmetrical chest expansion, no accessory muscle use. The problem of Ineffective Breathing Pattern was resolved.

DISCUSSION

This case study identified shortness of breath as the primary nursing problem, diagnosed as an Ineffective Breathing Pattern related to impaired respiratory effort (SDKI D.0005) in a 53-year-old female patient with congestive heart failure (CHF) (Tim Pokja SDKI DPP PPNI, 2018). The patient's clinical presentation, including tachypnea, use of accessory muscles, and low oxygen saturation without supplementation, aligns with the pathophysiology of CHF where reduced cardiac output leads to pulmonary congestion and impaired gas exchange (Bader et al., 2017; Nazim et al., 2018; Warraich et al., 2018).

The progression of symptoms dyspnea, peripheral edema, chest pain, and fatigue is consistent with established CHF symptomatology. Activation of the Renin-Angiotensin-Aldosterone (RAA) system due to decreased cardiac output contributes to fluid retention and edema (Kasron et al., 2020), while myocardial ischemia from reduced coronary perfusion often manifests as chest pain (Barrett et al., 2023; Tecson et al., 2018). The patient's age is a significant risk factor, as degenerative vascular changes increase susceptibility to cardiovascular diseases (Sivanathan et al., 2024).

The implementation of the Active Cycle of Breathing Technique (ACBT) over three days demonstrated measurable clinical improvement. On the initial assessment (May 28, 2025), the patient exhibited tachypnea (26 breaths/minute), required oxygen supplementation to maintain saturation, and reported significant dyspnea. Following daily ACBT sessions, a progressive normalization of respiratory parameters was observed. By day three (May 30, 2025), the patient achieved eupnea (20 breaths/minute), maintained oxygen saturation at 97% without assistance, and reported complete resolution of dyspnea.

The effectiveness of ACBT can be attributed to its three-stage physiological approach. The breathing control phase promotes diaphragmatic breathing and parasympathetic activation, reducing anxiety and respiratory muscle overuse. The thoracic expansion exercises enhance alveolar recruitment and lung capacity, improving ventilation. Finally, the forced expiration technique (huffing) facilitates airway clearance by mobilizing secretions from peripheral to central airways without causing bronchial collapse (Parker & Browning, 2023). Collectively, these mechanisms improve lung compliance, optimize gas exchange, and reduce the work of breathing (Shara et al., 2022).

Beyond physiological benefits, ACBT also provided psychological advantages, including increased patient autonomy, reduced anxiety, and an enhanced sense of control over symptoms factors that contribute to improved quality of life and adherence to therapy (Koh et al., 2023).

Study Limitations and Recommendations

This study is limited by its single-case design and reliance on clinical observation parameters (respiratory rate, SpO_2, subjective report) without advanced objective measures such as arterial blood gas analysis. Furthermore, the accuracy of ACBT execution in each cycle was not formally assessed, which may influence outcome consistency. Future research should employ controlled designs with larger samples, incorporate objective pulmonary function measures, and include adherence checks to validate ACBT's efficacy as a standard non-pharmacological intervention for CHF-related dyspnea in diverse clinical settings.

CONCLUSION

This case study demonstrates that the implementation of the Active Cycle of Breathing Technique (ACBT) over a three-day period was effective in resolving the ineffective breathing pattern in a 53-year-old patient diagnosed with Congestive Heart Failure (CHF). The intervention successfully reduced the respiratory rate from 28 to 20 breaths per minute, eliminated the complaint of dyspnea, improved oxygen saturation without supplementation, and normalized breathing patterns without the use of accessory muscles. These findings indicate that ACBT is a viable, simple, and non-invasive non-pharmacological intervention that can be integrated into nursing care plans to manage respiratory distress in CHF patients. Future application of this technique in clinical practice is recommended to enhance patient outcomes and quality of life.

Author's Contribution Statement: L.W.L. was responsible for the conceptualization of the case study, direct implementation of the nursing intervention, data collection, and the initial drafting of the manuscript. K.R. supervised the clinical methodology, provided critical revisions to the nursing care plan, and assisted in data analysis and interpretation. K. contributed to the literature review, supported data collection and documentation, and reviewed the final manuscript. All authors have read and approved the final version of the manuscript for publication.

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