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Hand-Held Fan Therapy and Changes in Respiratory Parameters in Hospitalized Patients with Congestive Heart Failure: A Nursing Case Series

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Abstract

Background: Congestive heart failure (CHF) is a progressive clinical syndrome characterized by impaired cardiac function and reduced ability to meet metabolic demands. Dyspnea is one of the most frequent symptoms and is commonly identified in nursing practice as an ineffective breathing pattern. Supportive non-pharmacological interventions may assist in relieving respiratory distress. Hand-held fan therapy delivers airflow to the facial area and has been suggested as a simple method to reduce breathlessness.
Objective: To describe changes in respiratory rate and oxygen saturation among patients with CHF following the application of hand-held fan therapy as part of inpatient nursing care.
Methods: A descriptive case series was conducted using the nursing process framework. Three hospitalized CHF patients with ineffective breathing patterns were observed in a cardiovascular ward at RSUD Koja Hospital, North Jakarta. Hand-held fan therapy was applied for approximately five minutes per session. Respiratory rate and oxygen saturation were monitored before and after the intervention period.
Results: All patients showed tachypnea at baseline (28 breaths/min). After repeated application of hand-held fan therapy, respiratory rates decreased consistently to 22 breaths/min. Oxygen saturation improved modestly from 93–94% to approximately 95%.
Conclusion: Hand-held fan therapy was associated with improved breathing patterns and oxygenation in patients with CHF. This intervention may be considered a supportive nursing strategy for managing dyspnea.

Keywords: Congestive heart failure; dyspnea; ineffective breathing pattern; hand-held fan therapy; nursing intervention; non-pharmacological management

INTRODUCTION

Congestive heart failure (CHF) is a progressive and multifactorial clinical syndrome that develops as a consequence of structural or functional abnormalities of the myocardium, resulting in impaired ventricular filling and/or ejection of blood. As cardiac performance deteriorates, reduced cardiac output leads to pulmonary venous congestion and insufficient

systemic oxygen delivery. These pathophysiological changes frequently manifest as dyspnea, which represents one of the most common and debilitating symptoms among patients with CHF. Persistent dyspnea increases respiratory workload, restricts physical activity, and substantially diminishes patients' functional capacity and quality of life (1,2).

In nursing assessment, dyspnea in individuals with CHF is frequently categorized as an ineffective breathing pattern. This condition is characterized by increased respiratory rate, shallow or irregular breathing, and the use of accessory respiratory muscles as compensatory responses to impaired ventilation. Ineffective breathing patterns not only contribute to physiological instability but also exacerbate anxiety, fatigue, and discomfort, thereby increasing the overall symptom burden experienced by patients (3).

Hand-held fan therapy has conventionally been applied as a non-pharmacological intervention to reduce the subjective discomfort associated with dyspnea. Beyond its perceptual benefits, recent clinical insights indicate that symptom relief may be linked to secondary alterations in respiratory function. The cooling sensation and directed airflow to the face are thought to attenuate anxiety responses, promote relaxation of accessory respiratory muscles, and contribute to a more regulated respiratory pattern. These mechanisms may influence neural control of breathing, resulting in improved ventilatory efficiency and stabilization of respiratory rhythm (4,5). Despite these proposed effects, empirical data demonstrating simultaneous changes in objective physiological indicators remain sparse. In particular, limited attention has been given to quantifiable outcomes such as respiratory rate and peripheral oxygen saturation when hand-held fan therapy is incorporated into standard inpatient nursing practice. This gap is especially evident in individuals with congestive heart failure, a population characterized by compromised cardiopulmonary function and heightened vulnerability to dyspnea. A clearer understanding of whether subjective respiratory comfort translates into measurable physiological improvement is therefore necessary to support the broader clinical integration of this intervention within hospital-based nursing care (6,7).

Accordingly, this study was designed as an exploratory nursing case series to descriptively examine changes in respiratory rate and oxygen saturation observed during the application of hand-held fan therapy in hospitalized patients with CHF. The study does not aim to evaluate effectiveness or establish causality, but rather to generate preliminary clinical insights that may inform future hypothesis-driven research.

METHODS

Study Design and Setting

This study employed a descriptive case series design to document clinical observations following the application of hand-held fan therapy in hospitalized patients with congestive heart failure. The design was selected to support detailed clinical description within a real-world nursing context where experimental control was not feasible. The study is explicitly hypothesis-generating rather than hypothesis-testing, and the findings are descriptive and non-comparative. No control group was included, and no causal inference regarding the intervention is intended (8).

Participants

Three adult patients hospitalized with a medical diagnosis of congestive heart failure and a nursing diagnosis of ineffective breathing pattern were included. Due to limitations in available clinical documentation, detailed classification of heart failure severity (e.g., NYHA functional class), type of heart failure (HFrEF or HFpEF), and left ventricular ejection fraction could not be consistently obtained. All participants were receiving standard pharmacological management for CHF during hospitalization, and baseline oxygen therapy was administered according to medical indication. No changes in medication regimens were initiated specifically for the purpose of this observation. Given these factors, observed respiratory changes must be interpreted cautiously, as they may reflect clinical stabilization in addition to supportive nursing care (9).

Intervention

Hand-held fan therapy was delivered using a portable electric fan positioned approximately 15–20 cm from the patient's face, directed toward the nasal and perioral region. The fan was set at a low-to-moderate airflow intensity to ensure comfort and avoid excessive stimulation. Patients were placed in a semi-Fowler's position during the intervention. Each session lasted

approximately five minutes and was administered once daily over the observation period. The fan was cleaned according to hospital infection prevention protocols before and after use for each patient. The intervention was applied as a supportive nursing measure and did not replace pharmacological therapy or oxygen supplementation (10).

Outcome Measures

The primary outcome measure in this study was respiratory rate, expressed as breaths per minute. Respiratory rate was selected because it is a sensitive and clinically relevant indicator of respiratory workload and ineffective breathing patterns in patients with CHF. Measurements were obtained through direct observation by nursing staff as part of routine vital sign assessment. Respiratory rate and peripheral oxygen saturation were recorded at baseline prior to initiation of hand-held fan therapy and reassessed following the completion of the intervention period. Measurements were obtained as part of routine nursing vital sign assessment and were not intended to capture immediate post-session fluctuations. Given the descriptive nature of the study and reliance on routine clinical measurement, small variations in values may not have been captured with high temporal precision (11).

Data Analysis

Data were analyzed descriptively in accordance with the case series design. Individual patient data were summarized using absolute values and observed pre–post changes in respiratory rate and peripheral oxygen saturation. No inferential statistical analyses were conducted, and findings were interpreted as exploratory clinical observations rather than evidence of causality. Results were presented narratively to highlight patterns of response across cases.

Ethical Considerations

This observational study involved minimal risk and documented routine supportive nursing care. The intervention did not modify prescribed medical treatment. Verbal informed consent was obtained from all participants, and confidentiality was maintained through data anonymization. Patient comfort and safety were continuously monitored, and the intervention was discontinued if any discomfort occurred. Ethical principles of autonomy, beneficence, and non-maleficence were upheld throughout the study.

RESULTS

Respiratory Rate Changes

At the time of baseline assessment, all three patients demonstrated tachypnea, with respiratory rates measured at 28 breaths per minute. This finding is consistent with an ineffective breathing pattern commonly observed in patients with congestive heart failure (CHF), where increased respiratory drive reflects compensatory responses to impaired cardiac output and pulmonary congestion (12). Following repeated sessions of hand-held fan therapy, a gradual and consistent reduction in respiratory rate was observed in all cases. Nursing progress notes documented initial decreases in respiratory rate after the first intervention sessions, followed by further reductions during subsequent days of observation. By the end of the intervention period, respiratory rates stabilized at 22 breaths per minute for each patient, representing an absolute reduction of six breaths per minute. This reduction suggests improved breathing efficiency and a decreased respiratory workload. From a clinical perspective, a decrease of this magnitude is meaningful, as elevated respiratory rate is a key indicator of respiratory distress and ineffective ventilation in CHF patients (13,14). Importantly, the improvement was sustained over time, indicating a stable response rather than a temporary or situational fluctuation.

Table 1. Respiratory Rate Before and After Hand-Held Fan Therapy

Patient Code	Sex	Age (Years)	Baseline RR (breaths/min)	Post-Therapy RR (breaths/min)	Absolute Change
Patient 1	Female	55	28	22	−6
Patient 2	Female	63	28	22	−6
Patient 3	Male	60	28	22	−6

Early nursing observations documented initial reductions in respiratory rate following the first intervention sessions, with further decreases observed over subsequent days. The consistent pattern across patients indicates a stable response rather than temporary fluctuation.

Oxygen Saturation Changes

Peripheral oxygen saturation (SpO_2) was monitored as a secondary indicator of respiratory status to complement changes in respiratory rate. At baseline, oxygen saturation values ranged from 93% to 94%, reflecting suboptimal oxygenation commonly reported in CHF patients with dyspnea due to impaired ventilation–perfusion balance. After the intervention period, all patients demonstrated modest increases in SpO_2, with post-therapy values reaching approximately 95%. Although the absolute numerical change was small, the improvement was observed consistently across all cases. When interpreted alongside reductions in respiratory rate, these findings suggest improved respiratory efficiency rather than isolated alterations in oxygen saturation alone. The combination of reduced respiratory rate with stable or slightly improved oxygen saturation indicates that patients were able to maintain adequate oxygenation with less respiratory effort, which is an important clinical goal in the management of dyspnea and ineffective breathing patterns (15,16).

Table 2. Oxygen Saturation (SpO_2) Before and After Hand-Held Fan Therapy

Patient Code	Baseline SpO_2 (%)	Post-Therapy SpO_2 (%)	Change (%)
Patient 1	93	95	+2
Patient 2	94	95	+1
Patient 3	94	95	+1

Trend of Respiratory Rate Reduction

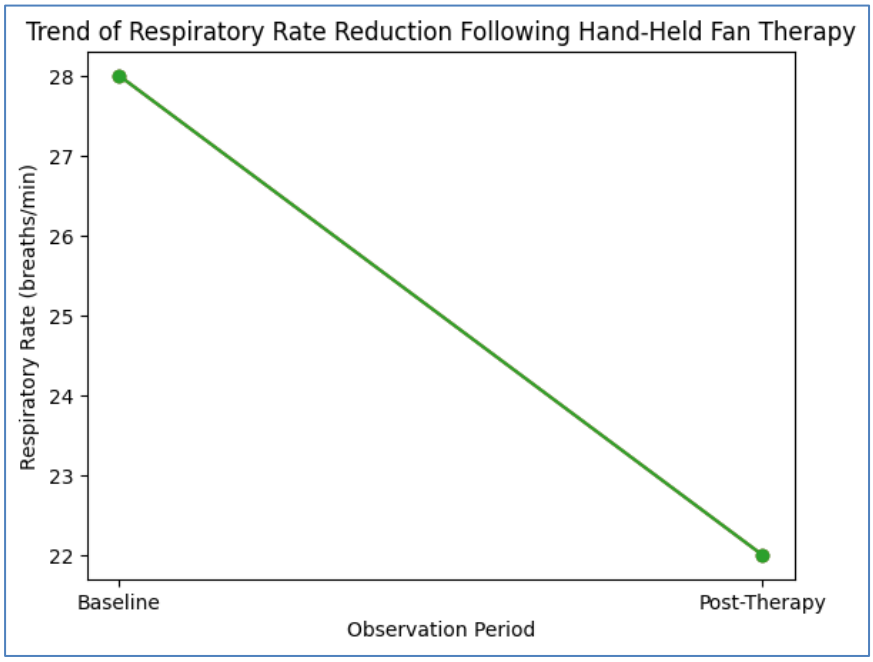

Figure 1 illustrates the temporal trend in respiratory rate from baseline to the post-intervention period. A clear downward trajectory was observed across all patients, with respiratory rates decreasing following early hand-held fan therapy sessions and stabilizing at lower values toward the end of the observation period. This pattern suggests a sustained improvement in breathing pattern rather than a short-lived response. Sustained reductions in respiratory rate are clinically relevant in CHF, as persistent tachypnea is associated with increased sympathetic activation, fatigue, and poorer functional outcomes. The consistent trend observed in this case series supports the potential role of hand-held fan therapy as a supportive intervention within nursing care for patients experiencing dyspnea.

DISCUSSION

This case series demonstrates that the application of hand-held fan therapy was consistently associated with improvements in objective respiratory parameters among patients with congestive heart failure (CHF) (17,18). The reduction in respiratory rate observed across all participants is clinically meaningful, as tachypnea is a well-recognized indicator of ineffective breathing patterns and increased respiratory workload in patients with impaired cardiac function. Persistent elevation in respiratory rate in CHF reflects compensatory mechanisms to maintain oxygen delivery in the presence of reduced cardiac output and pulmonary congestion. Therefore, the observed decrease in respiratory rate suggests a reduction in excessive respiratory drive and an improvement in breathing regulation (19).

The modest yet consistent improvement in peripheral oxygen saturation further supports the observed changes in respiratory pattern. Importantly, the simultaneous reduction in respiratory rate alongside stable or slightly increased oxygen saturation indicates enhanced respiratory efficiency rather than a simple slowing of breathing at the expense of oxygenation. This pattern suggests that patients were able to maintain or improve gas exchange with reduced ventilatory effort, which is a desirable clinical outcome in the management of dyspnea and respiratory distress in CHF.

The underlying mechanism of hand-held fan therapy may involve sensory stimulation of facial airflow, which activates trigeminal nerve receptors and influences central processing of respiratory sensations. This sensory input has been proposed to reduce the subjective perception of breathlessness, promote relaxation, and attenuate anxiety-related increases in respiratory drive. In patients with CHF, dyspnea is shaped not only by physiological factors such as pulmonary congestion and reduced oxygen delivery but also by psychological and perceptual components. As a result, sensory-based interventions like hand-held fan therapy may be particularly effective as supportive strategies that address both dimensions of breathlessness.

From a nursing practice perspective, hand-held fan therapy offers several practical advantages. The intervention is non-invasive, inexpensive, and simple to administer, making it feasible for routine implementation in inpatient settings without additional equipment or extensive training. Importantly, it can be delivered independently by nurses as part of holistic patient care, reinforcing the role of nursing autonomy in symptom management. Furthermore, the technique can be easily taught to patients and family caregivers, facilitating continued use after hospital discharge and supporting patient self-management at home (20,21).

Several limitations of this study should be acknowledged. The small number of participants and the absence of a control or comparison group limit the generalizability of the findings and preclude causal conclusions. Improvements in respiratory parameters may have been influenced by concurrent pharmacological treatment, supplemental oxygen, or overall clinical stabilization during hospitalization. Additionally, subjective measures of dyspnea, such as validated breathlessness scales, were not applied systematically, restricting interpretation of patients' perceived symptom relief.

Despite these limitations, the consistency of respiratory improvements observed across all cases strengthens the descriptive value of this case series. The findings provide preliminary evidence supporting the incorporation of hand-held fan therapy as a supportive, non-pharmacological nursing intervention for patients with CHF experiencing ineffective breathing patterns. Future studies employing larger samples, controlled designs, and combined objective and subjective outcome measures are warranted to further evaluate the effectiveness of

this intervention and establish stronger clinical recommendations.

Study Limitations

This case series has several important limitations. The small sample size and absence of a control group prevent causal inference and limit generalizability. Improvements in respiratory parameters may reflect concurrent medical treatment, oxygen therapy, or overall clinical stabilization rather than the nursing intervention alone. The lack of standardized subjective dyspnea assessment restricts interpretation of perceived symptom relief, which is a primary target of fan therapy. Additionally, respiratory measurements were obtained through routine clinical assessment, which may limit precision. These constraints highlight the exploratory nature of the findings.

Implications for Nursing Practice

Despite these limitations, this study provides relevant implications for nursing practice. Hand-held fan therapy is a simple, low-cost, and non-invasive intervention that can be implemented independently by nurses as part of routine care for patients with congestive heart failure. The ease of administration and minimal resource requirements make it feasible in various clinical settings. Additionally, nurses can educate patients and caregivers on the proper use of hand-held fan therapy, supporting dyspnea management after discharge and promoting patient self-care. Incorporating this intervention into holistic nursing care may enhance patient comfort and complement standard medical management.

CONCLUSION

In this exploratory nursing case series, hand-held fan therapy was observed alongside reductions in respiratory rate and modest improvements in oxygen saturation among hospitalized patients with congestive heart failure experiencing ineffective breathing patterns. These findings describe physiological changes occurring during the intervention period but do not establish causality. As a low-risk, non-invasive, and easily implemented nursing measure, hand-held fan therapy may serve as a supportive and complementary strategy within holistic dyspnea management. Further controlled studies incorporating validated subjective dyspnea measures and standardized intervention protocols are required to clarify its clinical role.

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Author Contributions

RII: Conceptualization, study design, clinical supervision, manuscript drafting, and final approval.
RS: Data collection, implementation of nursing intervention, and documentation of clinical outcomes.
FN: Data collection, analysis of respiratory parameters, and contribution to manuscript writing.
HNK: Literature review, interpretation of findings, and critical manuscript revision.
AA: Data management, table and figure preparation, and manuscript editing.

Conflict of Interest

The authors declare no conflict of interest related to this study.

Data Availability Statement

The data used to support the findings of this study were obtained from routine nursing documentation and are not publicly available due to patient confidentiality and ethical considerations. De-identified data may be made available by the corresponding author upon reasonable request and subject to institutional approval.

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