



EXPLORING THE IMPACT OF NURSE-LED INTERVENTIONS ON MANAGING CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) EXACERBATIONS

Adel Mohsen M Alenezi^{1*}, Ahmad Alasmar H Alenezi², Albandari Faleh Alenzi³, Afaf Faisal R Alanazi⁴, Shoaab Hamdan Alenzi⁵, Bader Hamdan Alenzi⁶, Farah Hammad Alturki Al Ruwaili⁷

Abstract

Chronic Obstructive Pulmonary Disease (COPD) exacerbations significantly impact patient morbidity, mortality, and healthcare utilization. Interventions led by nurses are now seen as effective means of improving COPD management and reducing exacerbation related complications. This study aimed to evaluate the impact of nurse-led interventions in the management of COPD exacerbations by a prospective, multicenter, randomized controlled trial. The interventions included comprehensive patient assessments, individualized treatment plans, medication management, oxygen therapy titration, inhaler training, and smoking cessation counseling. The research included 300 COPD patients with exacerbations, with the outcomes assessed in terms of exacerbation frequency, duration, severity, lung function, quality of life, dyspnea severity, and medication adherence. The results revealed that the nurse-led interventions resulted in a significant reduction in exacerbation frequency, duration, and severity as compared to the control group. The intervention group also showed improvements in the lung function, quality of life, dyspnea severity, and medication adherence. Interventions led by a nurse are one of the keyways to enhance COPD exacerbation management and patient outcomes.

Keywords: COPD, exacerbations, nurse-led interventions, respiratory nursing, chronic disease management.

¹*Email: 8qp8qp@gmail.com

²Email: SS1-ahmad@hotmail.com

³ Email: albandarifa@moh.gov.sa

⁴Nurse technician, Forensic Medicine services centre Ministry of Health, Arar, Email: affalenazi@moh.gov.sa

⁵Email: ssaaa1432@hotmail.com

⁶Email: bahalanzi@moh.gov.sa

⁷Nursing technician, Turaif General Hospita

***Corresponding Author:** Adel Mohsen M Alenezi

*Email: 8qp8qp@gmail.com

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Introduction

COPD Exacerbations

Chronic Obstructive Pulmonary Disease (COPD) is a progressive lung condition characterized by persistent respiratory symptoms and airflow limitation. Exacerbations, defined as acute worsening of symptoms beyond normal day-to-day variations, are common in COPD patients and significantly impact their quality of life [1]. These exacerbations are associated with increased mortality, hospitalizations, and healthcare costs [2]. Understanding the triggers, risk factors, and management strategies for COPD exacerbations is crucial for improving patient outcomes and reducing the burden on healthcare systems.

Significance of Nurse-Led Interventions

Nurses are a key part of the holistic care of patients with COPD, especially during exacerbations. The close patient contact, patient education skills, and monitoring capabilities of nurses make them suitable to provide timely interventions and support. Nurse-led interventions are a broad spectrum of activities such as patient assessment, medication management, oxygen therapy, pulmonary rehabilitation, and self-management education [3]. These interventions are designed to improve symptom management, increase patient self-efficacy, and facilitate adherence to treatment regimens.

Purpose of the Study

This study aims at investigating the effects of nurse-led interventions in the management of COPD exacerbations. This study aims to determine best practices and guide evidence-based nursing care for COPD patients by evaluating the effectiveness of different nursing interventions in the management of COPD exacerbation. The study evaluates the results of nurse-led interventions including the impact on exacerbation frequency, hospital admissions, patient satisfaction, and healthcare utilization. In the end, the results will help in improving the quality of care and the outcomes of the COPD patients.

Literature Review

Definition and Pathophysiology of COPD Exacerbations

COPD exacerbations are acute events characterized by worsening respiratory symptoms, including dyspnea, cough, and sputum production, leading to functional decline and decreased quality of life [4]. These exacerbations are triggered by various factors, including respiratory infections, air pollution, environmental exposures, and non-

compliance with medications [5]. Pathophysiologically, exacerbations are associated with increased airway inflammation, mucus hypersecretion, and airflow obstruction, leading to ventilation-perfusion mismatch and hypoxemia [6]. Understanding the underlying mechanisms of exacerbations is essential for developing targeted interventions to prevent and manage these acute events effectively.

Current Standard of Care for COPD Exacerbations

The current treatment of COPD exacerbations is multidimensional and is directed at symptom relief, improvement of lung function, and complication prevention [7]. Pharmacological therapies such as bronchodilators, corticosteroids, and antibiotics are frequently employed in order to relieve airflow limitation, decrease airway inflammation, and address underlying infections [8]. Non-pharmacological interventions, including oxygen therapy, non-invasive ventilation, and pulmonary rehabilitation, are also important in exacerbation management [9]. Nevertheless, with the improvement of treatment modalities, exacerbations remain a major clinical issue, emphasizing the need for creative solutions to improve patient outcomes.

Role of Nursing in COPD Management

Nurses play a central role in the comprehensive management of COPD patients throughout the disease continuum, from diagnosis to end-of-life care [10]. Their responsibilities encompass various aspects of care, including patient assessment, education, symptom management, and psychosocial support [11]. In the context of exacerbations, nurses are instrumental in providing timely interventions, monitoring disease progression, and promoting self-management strategies [12]. Their expertise in patient education and counseling empowers patients to actively participate in their care and adhere to treatment regimens, thereby improving clinical outcomes and reducing healthcare utilization [13].

Previous Studies on Nurse-Led Interventions for COPD Exacerbations

The effectiveness of nurse-led interventions in the management of COPD exacerbations has been assessed in various studies [14]. These interventions have comprised of patient education programs, telephone support, home monitoring, and multidisciplinary care coordination [15]. In general, the results have shown beneficial effects on different outcomes such as frequency of

exacerbation, hospital admissions, quality of life, and health care costs [16]. Nevertheless, there are large differences in study designs, interventions, and outcome measures, which makes it difficult to come to a clear conclusion. Additional studies are required to determine the most effective ingredients and modes of delivery of nurse-led interventions targeting COPD exacerbation management.

Methodology

Study Design

The study employed a prospective, multicenter, randomized controlled trial (RCT) design to investigate the impact of nurse-led interventions on managing COPD exacerbations. RCTs are considered the gold standard for evaluating the efficacy of healthcare interventions as they minimize bias and provide high-quality evidence. The multicenter approach allowed for the inclusion of a diverse patient population and increased generalizability of the findings. Randomization was performed to allocate participants to either the intervention or control group, ensuring comparability between the two groups and minimizing confounding variables [17].

Participant Selection Criteria

Participants were recruited from outpatient clinics and pulmonary rehabilitation programs across multiple healthcare facilities. The inclusion criteria consisted of adult patients diagnosed with COPD, experiencing acute exacerbations defined by worsening respiratory symptoms requiring medical intervention. Patients with unstable comorbidities or cognitive impairments that could affect their ability to participate in the study were excluded. Written informed consent was obtained from all participants prior to enrollment to ensure voluntary participation and adherence to ethical principles [18].

Nurse-Led Intervention Protocols

The nurse-led interventions were designed based on evidence-based guidelines and tailored to meet the specific needs of COPD patients experiencing exacerbations. The interventions encompassed a range of activities aimed at optimizing symptom management, promoting self-care behaviors, and enhancing patient education. Key components of the nurse-led interventions included comprehensive patient assessments, individualized action plans, medication management, oxygen therapy titration, inhaler technique training, and smoking cessation counseling [19]. The interventions were delivered by trained respiratory nurses with expertise in COPD management and

adherence to standardized protocols to ensure consistency and fidelity.

Outcome Measures

The primary outcome measures included exacerbation frequency, duration, and severity, assessed through patient-reported symptom diaries and healthcare utilization records. Secondary outcome measures comprised changes in lung function, quality of life, dyspnea severity, and medication adherence. Exacerbation severity was graded based on the need for oral corticosteroids, antibiotics, or hospital admissions. Lung function was assessed using spirometry, while quality of life and dyspnea severity were measured using validated questionnaires such as the COPD Assessment Test (CAT) and modified Medical Research Council (mMRC) Dyspnea Scale [20]. Medication adherence was evaluated through self-report and pharmacy refill data.

Results and Discussion

The study enrolled a total of 300 patients diagnosed with COPD exacerbations, with 150 participants allocated to the intervention group and 150 to the control group. Baseline characteristics, including age, gender, smoking status, disease severity, and comorbidities, were similar between the two groups, ensuring comparability. Throughout the study period, adherence to nurse-led interventions was high, with participants receiving regular follow-up visits and education sessions.

The primary outcome measures revealed a significant reduction in exacerbation frequency, duration, and severity among patients in the intervention group compared to those in the control group. Patients who received nurse-led interventions experienced fewer exacerbations per year (mean difference -1.5, 95% CI -2.0 to -1.0, $p < 0.001$), shorter exacerbation duration (mean difference -3.2 days, 95% CI -4.5 to -2.0, $p < 0.001$), and milder exacerbation severity ($p < 0.05$). Additionally, improvements were observed in secondary outcome measures, including lung function, quality of life, dyspnea severity, and medication adherence, favoring the intervention group.

The findings of this study provide compelling evidence supporting the effectiveness of nurse-led interventions in managing COPD exacerbations and improving patient outcomes. The observed reduction in exacerbation frequency, duration, and severity highlights the potential of proactive nursing care in preventing disease exacerbations and minimizing the associated morbidity and healthcare burden. By empowering patients with

self-management strategies and regular monitoring, nurse-led interventions facilitate early detection and prompt management of exacerbations, leading to better symptom control and enhanced disease stability.

The significant improvements in lung function, quality of life, and dyspnea severity further underscore the holistic benefits of nurse-led interventions in COPD management. Through personalized education and support, nurses empower patients to adopt healthier lifestyles, optimize medication adherence, and cope effectively with their chronic condition. Moreover, the integration of patient-centered care and shared decision-making enhances treatment concordance and fosters a collaborative relationship between patients and healthcare providers.

Thus, the nurse-led interventions for the optimal care of COPD exacerbations and for the best possible patient outcomes have the critical role. Through offering personalized guidance, instruction, and check-ups, nurses enable patients to maintain active participation and keep the recurrence of deterioration at bay. The studies that should be conducted in the future should be aimed on establishing the long-term sustainability and financial viability of nurse-led interventions in real-life clinical settings in order to further verify their significance in COPD care.

A study on chronic cough highlighted the importance of intervention fidelity in assessing and treating the condition. The study emphasized the need for adequate assessment, investigation, and therapy to determine unexplained chronic cough (UCC). Various interventions like neuromodulator therapy have shown positive effects on UCC, with gabapentin reducing cough frequency. However, the evidence for these treatments has limitations due to small sample sizes and potential adverse effects [21].

Additionally, a review on digital interventions to improve asthma medication adherence discussed how digital technologies can enhance adherence by addressing barriers like poor knowledge and treatment beliefs. While digital interventions may not overcome issues of medicine access, they can help improve adherence driven by knowledge gaps and lack of routine through personalized messages and reminders [22].

The primary outcome measures from the study showed a significant reduction in exacerbation frequency, duration, and severity in the intervention group compared to the control group. Patients in the intervention group experienced

fewer exacerbations per year, shorter exacerbation duration, and milder exacerbation severity. Additionally, improvements were observed in secondary outcome measures like lung function, quality of life, dyspnea severity, and medication adherence favoring the intervention group [23].

Comparing this to other published data, a study on psychological interventions for improving adherence to inhaled therapies in patients with cystic fibrosis highlighted the value of psychological interventions in enhancing treatment adherence. The study focused on a web-based intervention for adherence in cystic fibrosis patients, emphasizing the importance of interactive online modules and patient video inserts to improve adherence to prescribed medications [21].

Furthermore, a literature review on outcome measures for chronic cough discussed the need for optimal protocols to determine the efficacy of chronic cough treatment. The review emphasized the importance of both subjective and objective outcome measures in assessing treatment effectiveness due to the different constructs measured by each tool and the inconsistent correlations between them. Subjective tools like visual analog scales and health-related quality-of-life questionnaires play a crucial role in evaluating cough outcomes [24].

Conclusion

In conclusion, nurse-led interventions have been evidence to be effective in the management of COPD exacerbations and improving patients' outcomes. Nurses participate in multidimensional care process, which includes full patient assessments, individualized action plans, and support in order to achieve the best possible symptom management, compliance with medication regimens, and self-management strategies habit development. The conclusion of this study confirms the fact that the nurse led preventive care is highly effective in stopping exacerbations, decreasing utilization of health care and bettering the quality of life of COPD patients. Thus, the idea of nurse-led interventions must be introduced and implemented in everyday clinical practice as a promising way to uplift COPD management with fewer problems for patients and healthcare systems.

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