

# Bibliometric Analysis of the Current Landscape of Chronic Obstructive Pulmonary Disease (COPD) Nursing Interventions and Research

Sujuan Xu<sup>1</sup>, Qian Jin<sup>2</sup>, Jing Xia<sup>2</sup> 

<sup>1</sup>Comprehensive Internal Medicine Department of Zhijiang Campus, Tongde Hospital of Zhejiang Province, Hangzhou, Zhejiang, 310024, People's Republic of China; <sup>2</sup>Pulmonary and Critical Care Medicine, Tongde Hospital of Zhejiang Province, Hangzhou, Zhejiang, 310012, People's Republic of China

Correspondence: Jing Xia, Pulmonary and Critical Care Medicine, Tongde Hospital of Zhejiang Province, Hangzhou, Zhejiang, 310012, People's Republic of China, Email xiajing82894846@163.com

**Purpose:** Chronic Obstructive Pulmonary Disease (COPD) is a major global health issue, significantly impacting healthcare systems. Effective nursing interventions are crucial for improving patient outcomes and reducing hospitalizations. This study conducts a bibliometric analysis of nursing interventions and research in the management of COPD to identify key trends, contributors, and emerging research directions.

**Material and Methods:** We analyzed 1390 articles published before 2024, sourced from the Web of Science Core Collection (SCI-Expanded). Using R Bibliometrix, VOSviewer, and CiteSpace, we assessed publication trends, identified influential authors and institutions, and mapped research hotspots and collaborations. The analysis included quantitative metrics such as citation counts and co-citation networks, as well as qualitative assessments of thematic evolution.

**Results:** The analysis revealed a significant increase in research output on COPD nursing interventions, particularly after 2001, with a peak in publications around 2021, likely due to the COVID-19 pandemic. The United States, the United Kingdom, and China were the top contributors, accounting for over 45% of the total publications. Key research hotspots included acute exacerbations, quality of life, evidence-based nursing, and pulmonary rehabilitation. The study highlighted a shift from symptom management to more holistic, patient-centered care models.

**Conclusion:** This study emphasizes the critical role of nursing interventions in managing COPD and reducing its global burden. The identified research trends and emerging topics offer valuable insights for future research, underscoring the need for innovation in nursing practices and interdisciplinary collaboration. These findings aim to inform the development of more effective COPD nursing strategies and enhance clinical practice.

**Keywords:** chronic obstructive pulmonary disease, nursing, bibliometric analysis, research trends, patient-centered care

## Introduction

Chronic obstructive pulmonary disease (COPD), a progressive respiratory disorder characterized by irreversible airflow limitation, constitutes a global public health crisis of escalating magnitude.<sup>1</sup> Epidemiological data from a 2022 Lancet meta-analysis position COPD as the foremost contributor to global mortality and disability, with an estimated prevalence of 10.3% across populations.<sup>2</sup> Should current trends persist, COPD is predicted to become the third-leading cause of death worldwide by 2030, directly impacting 10% of the global population.<sup>3</sup> This widespread burden underscores the urgency of effective management strategies, particularly through nursing interventions, which have emerged as an essential component of COPD care. Evidence-based COPD nursing interventions have been shown to improve pulmonary function, mitigate symptom severity, enhance patients' quality of life, and reduce hospitalization rates.<sup>4-6</sup> These interventions play a critical role in addressing not only the clinical aspects of the disease but also the psychosocial impact on patients and caregivers, contributing to a more holistic management approach.

Despite these advancements, substantial gaps remain in understanding the full scope and structure of COPD nursing interventions. Although numerous studies have demonstrated the benefits of nursing interventions in COPD management, the integration of these interventions into diverse healthcare settings and their long-term effectiveness remains underexplored. Furthermore, a comprehensive and systematic analysis of the research landscape within COPD nursing is still lacking. This gap in knowledge is particularly significant in terms of mapping research trajectories and understanding the interdisciplinary nature of COPD nursing. While clinical outcomes such as symptom relief and improved pulmonary function are well-established, there is less clarity on how nursing interventions interact with other aspects of patient care, such as psychological well-being, caregiving dynamics, and socioeconomic factors.

Additionally, one of the key gaps in the existing literature is understanding how complementary therapies, such as acupuncture, can be integrated into mainstream nursing interventions for COPD management. Acupuncture has shown potential in alleviating symptoms in a variety of chronic conditions, but its role within COPD nursing interventions remains underexplored. While there is some evidence supporting its effectiveness, the integration of acupuncture into nursing protocols is not standardized, and there is a need for more focused research to examine its therapeutic potential in the context of COPD. This study aims to address these gaps by systematically analyzing the existing body of COPD nursing literature through bibliometric methods. By identifying research trends, influential contributors, and emerging areas, this analysis will provide a comprehensive understanding of the current state of COPD nursing interventions and help guide future investigations into underexplored areas such as the integration of complementary therapies.

The value of bibliometric analysis lies in its ability to identify key research themes and relationships within a vast body of literature. Compared with traditional narrative reviews, bibliometric methods provide a quantitative approach to evaluating trends, measuring the impact of key studies, and visualizing collaboration networks.<sup>7,8</sup> By analyzing co-citation patterns, scientific collaborations, and co-word associations, this study will provide insights into the evolving nature of COPD nursing interventions, highlighting how research is shifting and which areas remain underexplored. In particular, the study will focus on identifying gaps in the application of complementary therapies within COPD nursing, offering a roadmap for future research.

Furthermore, integrating complementary therapies such as acupuncture into nursing interventions represents an important frontier in COPD management. While acupuncture has been explored in the context of symptom alleviation for various chronic diseases, its application within the COPD nursing context remains underrepresented in existing literature. This study seeks to broaden the understanding of how such therapies can complement traditional nursing practices, offering a more integrated and holistic approach to COPD care. By systematically analyzing the potential of complementary therapies like acupuncture, this study will offer new perspectives on managing COPD in a more comprehensive and patient-centered manner.

## Materials and Methods

### Data Collection

We conducted a data search of the WOSCC database on 2 January 2025 using the following search formula: (“Nursing” OR “Nursings”) AND (“Chronic Obstructive Pulmonary Disease” OR “COPD” OR “Chronic Obstructive Lung Disease” OR “Chronic Obstructive Airway Disease” OR “COAD” OR “Chronic Airflow Obstruction”). A total of 1390 publications, categorized as “articles” in the English language, were included in the analysis. These publications were downloaded in both “BibTeX” and “Plain Text” file formats for further processing.

### Analytical Method

The R package Bibliometrix (version 4.3) was used to analyze the evolution through time of the literature volume in the field, the involvement of countries, institutions and authors, and the journals publishing the relevant articles. Furthermore, Bibliometrix facilitated a thematic analysis to explore the evolution of research themes and hotspots over time. VOSViewer (version 1.6.18) was used for visualizing and analyzing citations and co-citations of authors, journals and articles to detect intense collaborations between different authors and journals, and correlations and similarities between articles. CiteSpace (version 5.8.R1) was applied for co-citation analysis and burst detection, generating visual

maps for analyzing reference and keyword trends within the specific field. Microsoft Excel (2024) was used to arrange and summarize the analytical information related to countries, institutions, authors, articles, and keywords.

## Results

Our search strategy identified 1904 publications on nursing care for COPD patients in the WOSCC database. We subsequently narrowed the dataset to 1390 English-language articles published before 2024 for subsequent visualization and analysis by excluding other publication types such as reviews, conference abstracts, and books (Figure 1).

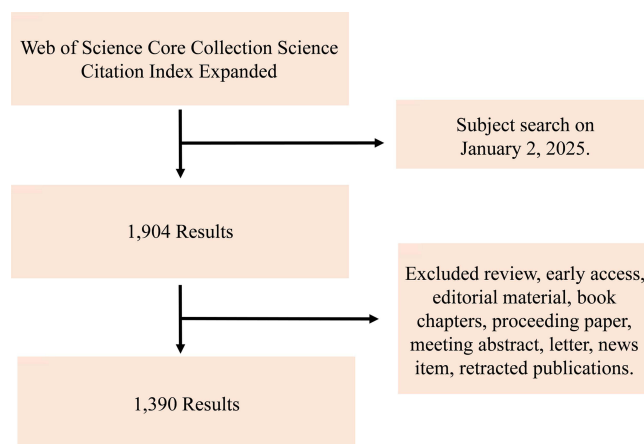
### Evolution of Academic Interest in Nursing Care for COPD Patients Before 2024

The annual scientific production curve (Figure 2A) illustrates a nearly exponential increase in the number of publications concerning nursing care for COPD patients before 2024. Before 1990, the annual number of publications in this field was virtually zero. During the period from 1991 to 2003, although the research output in this field began to increase, it remained extremely limited, with an average of fewer than 20 papers published per year. In the subsequent decade (2004–2024), the number of publications surged dramatically and peaked in 2021 at 103 papers. This upward trend is expected to continue and expand in the future (Supplementary Table S1). Additionally, the years 1993, 1995, and 2001 saw the highest average annual citation frequencies for scientific research (Figure 2B).

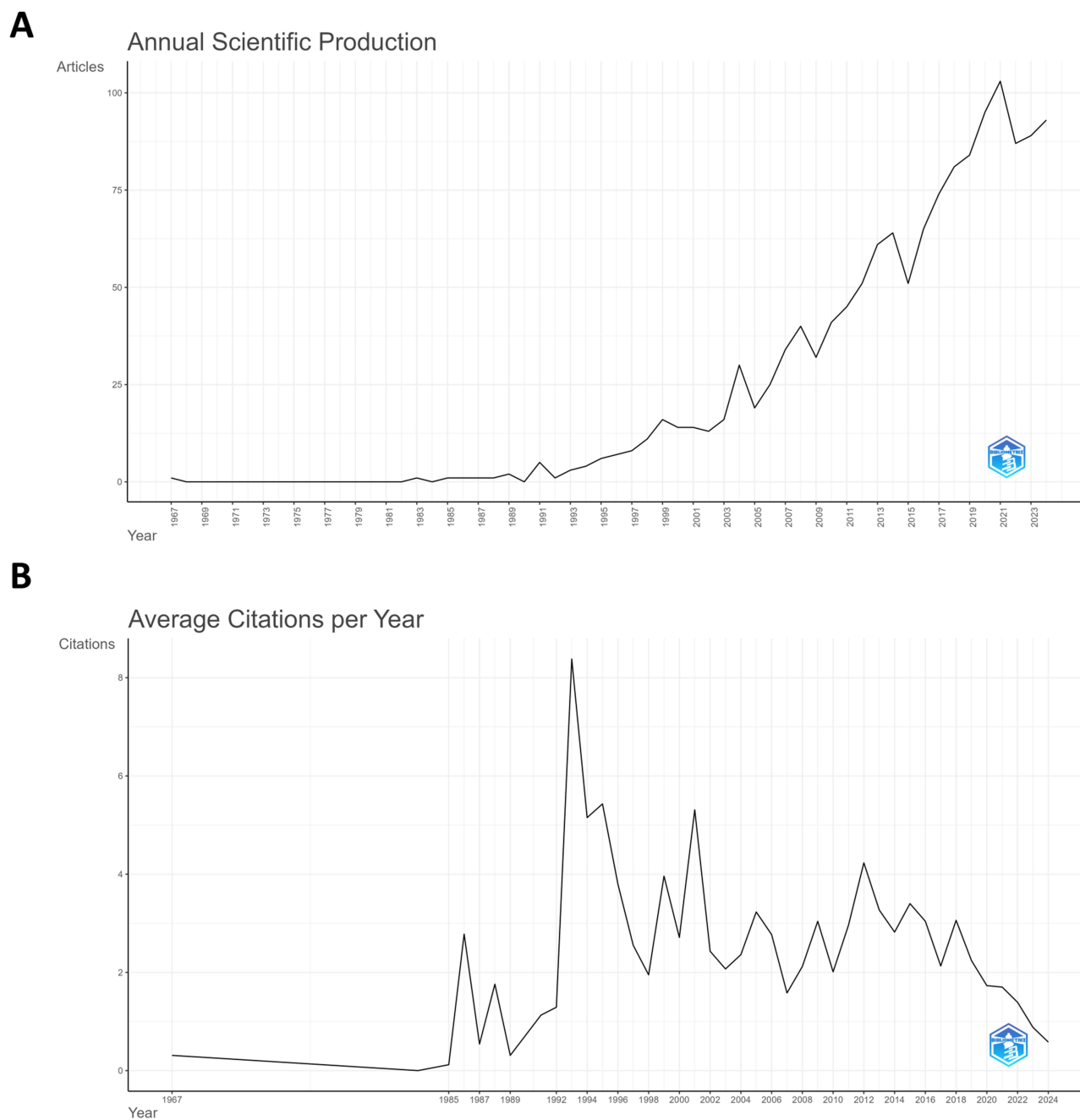
### Country & Affiliation Distribution

By December 31, 2024, research on the care of COPD patients had involved a total of 65 countries, underscoring the global scope and critical significance of COPD nursing interventions in addressing a widespread public health challenge. The top 10 countries in terms of publication frequency are presented in Supplementary Table S2, where the contributions of countries and institutions are clearly separated. This distinction is essential for maintaining clarity in presenting the geographical distribution of research activity and institutional output. The original structure, which listed countries and affiliations sequentially, was chosen to illustrate the global diversity and reach of the research, but it inadvertently could imply a direct correspondence between the two. In this revised presentation, we have maintained the separation of countries and institutions in order to avoid any misinterpretation while providing a more accurate reflection of the collaborative and institutional contributions to COPD nursing interventions.

A detailed co-authorship analysis further demonstrates the global collaboration that characterizes this field (Figure 3A). The co-authorship network highlights the strong and productive international collaborations, with countries such as the United States, United Kingdom, and China forming the backbone of these networks. The collaboration rates among the top three countries—6.8% for the United States, 7.1% for China, and 20.7% for the United Kingdom—underscore the robust academic partnerships and the shared research priorities that transcend national boundaries. These collaborations not only advance scientific understanding of COPD but also foster the development of innovative, cross-



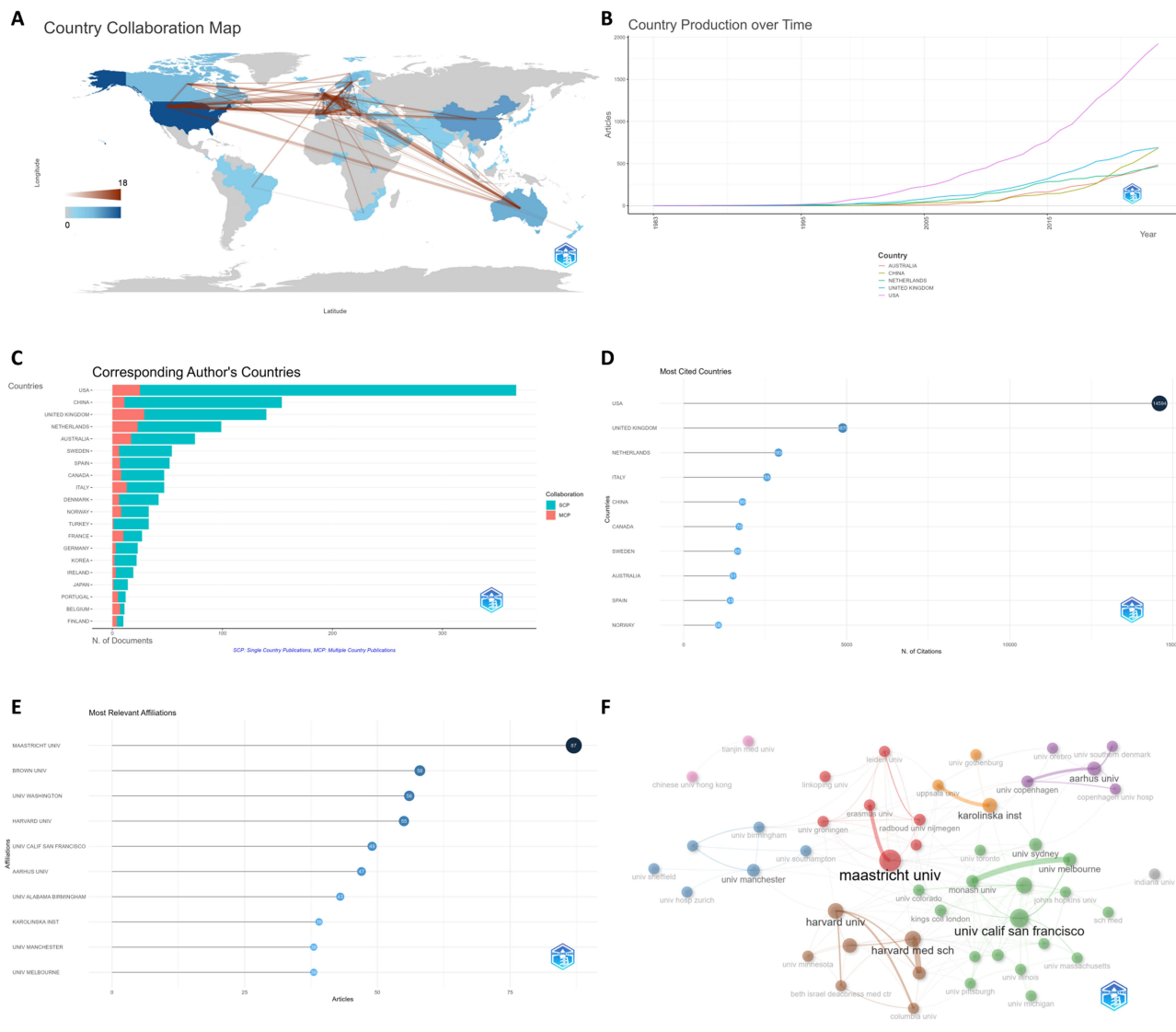
**Figure 1** Search strategy and dataset filtering process in COPD nursing interventions.



**Figure 2** Evolution of scientific production and citations in COPD nursing interventions (1990–2024). **(A)** Annual scientific production in COPD nursing interventions from 1990 to 2024, showing an exponential increase in publications since 2004. **(B)** Average annual citations per year for COPD nursing interventions articles, illustrating peaks in 1993, 1995, and 2001, and a general upward trend in recent years.

border nursing interventions that contribute to a more globally integrated approach to COPD management. These collaborations are instrumental in driving forward innovative COPD nursing interventions, fostering cross-border knowledge exchange, and strengthening the global capacity to address the growing burden of COPD.

Delving into specific national trends, the rapid rise of China in COPD research since 1999 is particularly noteworthy, as it has transitioned from a relatively minor player to one of the major contributors (Figure 3B). This ascent reflects broader global shifts in health research priorities, with a growing focus on improving COPD care within the context of rapidly developing healthcare systems. China’s growing prominence highlights not only the increasing contribution of Asian countries to global health research but also the heightened focus on enhancing COPD care in rapidly evolving healthcare landscapes.



**Figure 3** Country and affiliation distribution in COPD nursing interventions. **(A)** Co-authorship relationships between countries, highlighting significant international collaborations in COPD nursing interventions. **(B)** Publication frequency trend of leading countries, particularly showing China's rapid growth in recent years. **(C)** Top 10 countries by publication frequency in COPD nursing interventions (1990–2024), with the United States, United Kingdom, and China as the major contributors. **(D)** Total citation frequency by country, identifying the most influential countries in terms of citation impact. **(E)** Top institutions by publication frequency, with universities being the dominant contributors to the field. **(F)** Institutional collaboration network, showing partnerships between major research institutions.

Overall, the United States, United Kingdom, and China stand out as the predominant contributors, collectively accounting for over 45% of the total publications in this field (Figure 3C). The United States, which was among the first to engage in COPD nursing interventions, continues to lead globally with 1924 publications (26.5%). This sustained high output reflects the country's strong institutional support for COPD research, particularly in areas such as evidence-based nursing and pulmonary rehabilitation, which are crucial for improving patient outcomes. The United Kingdom, which first published its research on COPD care in 1987, maintains its position as the second-largest contributor to the field with 690 publications (9.5%). Its continued efforts are integral to shaping global COPD research, particularly in clinical management strategies and long-term care interventions for patients with COPD.

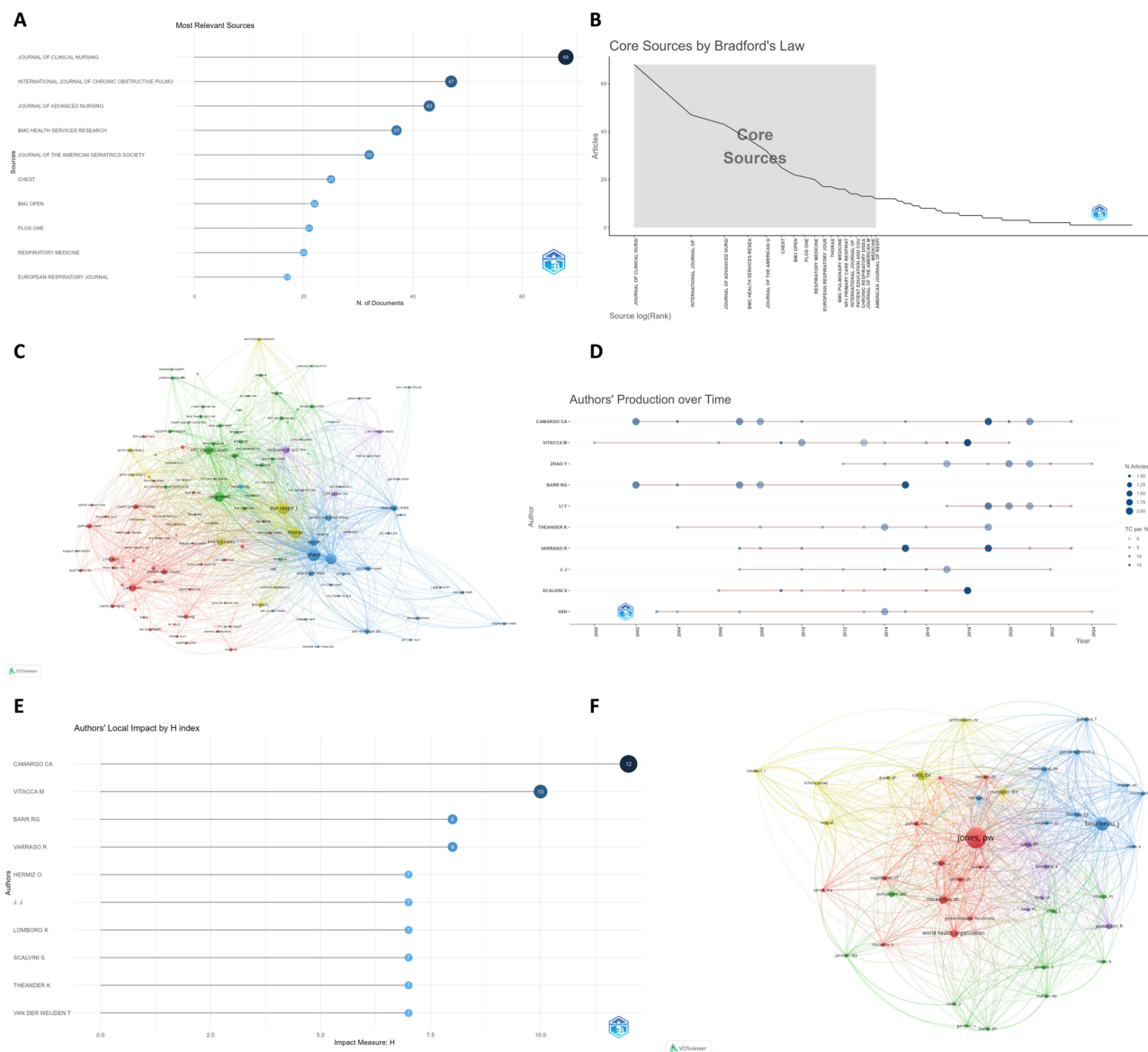
In terms of citation impact, the United States remains the leader with 14,594 total citations, followed by the United Kingdom (4876 citations), the Netherlands (2908 citations), and Italy (2555 citations) (Figure 3D). Notably, Italy, despite having fewer publications (243 papers), ranks fourth in citation impact. This discrepancy suggests that while Italy's output is relatively smaller, its research has had a significant and lasting impact on the field. This points to the critical role

that smaller but highly specialized research communities can play in influencing global scientific discourse, further underscoring the importance of citation frequency as a more comprehensive measure of research impact than mere publication volume. This highlights the importance of citation frequency as a measure of the global influence of research, beyond publication volume alone.

The analysis of institutional contributions reveals that universities are at the forefront of COPD nursing interventions. Among the 2347 institutions identified, those with more than 50 publications—such as Brown University, the University of Washington, and the University of Maastricht—have played pivotal roles in shaping the field (Figure 3E). Notably, five of the top 10 institutions are based in the United States, reflecting the central role that American academic institutions continue to play in COPD research. The University of Maastricht from the Netherlands leads with 87 publications, a testament to the strong institutional commitment to COPD research in Europe. The global collaborative network of institutions, as illustrated in Figure 3F, highlights how key academic centers across North America and Europe form the critical backbone of COPD research. Their strong ties not only promote interdisciplinary collaboration but also set the stage for the development of best practices in COPD nursing care. The institutional collaboration network illustrates the academic partnerships that foster innovation, with stronger ties between top institutions in North America and Europe. This interconnectedness facilitates knowledge exchange, interdisciplinary collaboration, and the development of best practices that influence global COPD nursing care strategies.

## Journal & Author Contributions

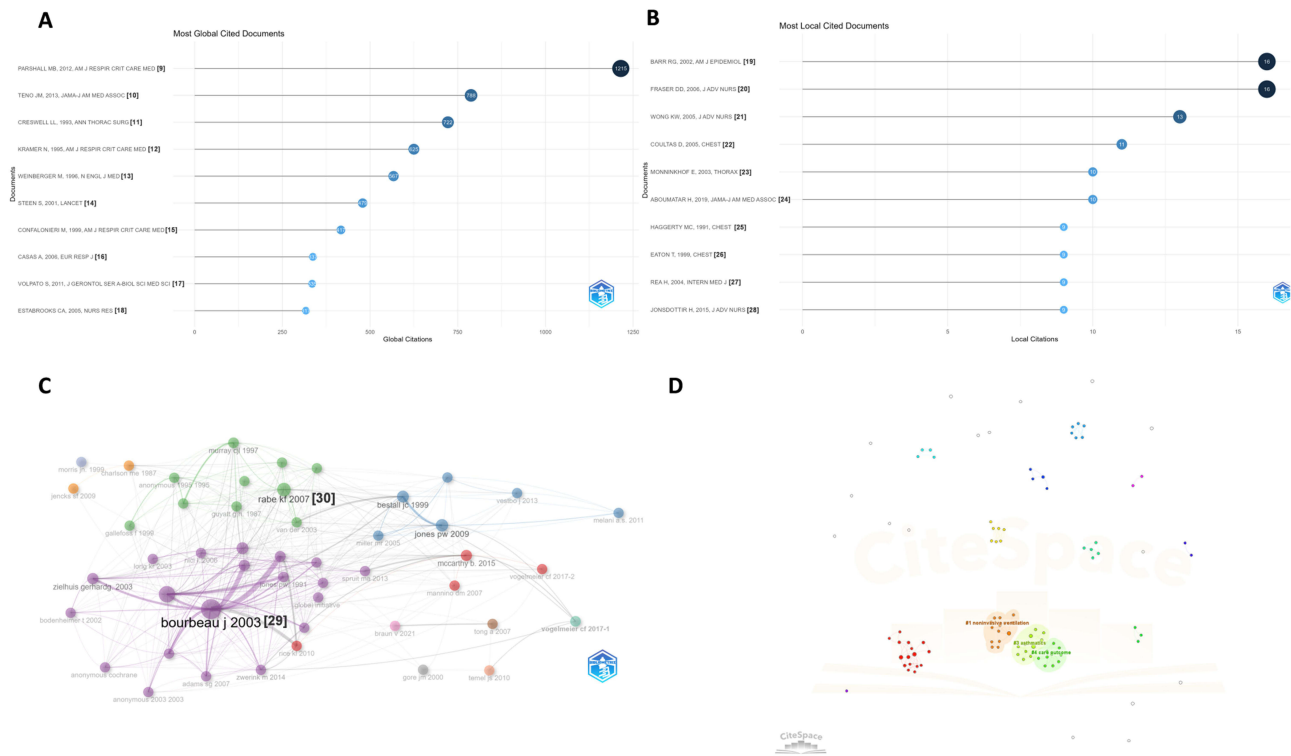
A total of 432 journals have published articles on COPD care. Five journals have published more than 30 articles (Figure 4A). The top-ranking journal is *The Journal of Clinical Nursing* (68 articles, 0.5%), followed by *International Journal of Chronic Obstructive Pulmonary Disease* (47 articles, 0.3%) and *The Journal of Advanced Nursing* (43 articles, 0.3%). Among the top 10 most prolific journals in this field (Supplementary Table S3), six are in the Q1 quartile of the Journal Citation Reports (JCR), and two have impact factors exceeding 10: *CHEST* (IF: 10.3) and *European Respiratory Journal* (IF: 14.3). According to Bradford's Law of Scattering, the most productive 19 journals all belong to the core journals of a specific subject, with *The Journal of Clinical Nursing* and *International Journal of Chronic Obstructive Pulmonary Disease* being the top two journals (Figure 4B). Additionally, by applying a minimum citation count of 20 to the selected journals, we identified 129 journals that met the threshold and mapped their co-citation network (Figure 4C). VOSViewer classified the journals into six categories based on their similarity: red, green, blue, yellow, purple, and cyan. The larger the node circle, the more times the articles published by a journal have been cited, while the thicker and more numerous the connections between nodes, the stronger the co-citation intensity. In Figure 4C, *CHEST* (total link strength 17,481), *European Respiratory Journal* (total link strength 17,140), *Thorax* (total link strength 13,615), and *Respiratory Medicine* (total link strength 12,580) not only have high citation frequencies but also exhibit the strongest total link strength in the co-citation analysis. We ranked the top 10 authors based on the number of articles they published in this field and analyzed the temporal evolution of their productivity and citation counts (Figure 4D). The lines in the figure represent the intervals between the years in which the authors published their articles. The larger the node circle, the more articles published in that year, and the darker the node circle color, the higher the total citation count for that year. Authors such as Camargo CA, Vitacca M, and Zhao Y have made significant contributions to publications in this field. Additionally, Camargo CA, Barr RG, Walters EH, and Wood-Baker R have achieved important citation counts in their respective research work (Supplementary Table S4). Among the top 10 most prolific authors, Camargo CA has the highest H-index, indicating that his research has been widely recognized within the discipline (Figure 4E). Furthermore, we analyzed the co-citation of authors who had at least 20 citations, with 45 authors reaching the threshold. The three authors with the strongest co-citation links are Jones PW (total link strength 502), Bourbeau J (total link strength 391), and Celli BR (total link strength 259) (Figure 4F). Notably, Jones PW is connected to 44 other authors and is the most co-cited author. The line between Jones PW and *Bourbeau J* appears to be the thickest, with a link strength of 42, indicating a strong co-citation relationship between these two authors.



**Figure 4** Journal and author contributions in COPD nursing interventions. **(A)** Top journals by number of publications in COPD nursing interventions, including The Journal of Clinical Nursing and International Journal of Chronic Obstructive Pulmonary Disease. **(B)** Bradford's Law of Scattering applied to journals, highlighting the concentration of articles in core journals. **(C)** Co-citation network of journals, showing the interconnections between key journals in COPD nursing interventions. **(D)** Author productivity and citation counts over time, indicating the growth of contributions from leading authors. **(E)** Top 10 authors by H-index and citation count, identifying the most influential authors in COPD nursing interventions. **(F)** Co-citation analysis of authors, revealing strong collaborative networks among key researchers.

## Reference Citations & Co-Citation

Global citation (GCs) measures the citation frequency across the entire literature database. As of 2024, articles related to COPD care had accumulated a total of 41,874 GCs. Based on GC ranking, five documents had citation counts exceeding 500 ([Supplementary Table S5](#)). Among them, the official statement on the mechanisms, assessment, and management of dyspnea published by the American Thoracic Society in *the American Journal of Respiratory and Critical Care Medicine* in 2012 topped our dataset with 1215 GCs ([Figure 5A](#)).<sup>9</sup> Using bibliometric methods, we calculated the local citations (LCs) for the entire set of references used in this study, which measures the number of citations a document receives from the analyzed dataset. In our dataset, 264 documents in this field were cited, with a cumulative total of 680 LCs, among which six documents had LC counts of 10 or more ([Supplementary Table S6](#)). The validation of the COPD definition based on a questionnaire in the Nurses' Health Study by Barr et al in 2002 received the most LCs,<sup>10</sup> indicating widespread recognition by scholars in this field ([Figure 5B](#)).

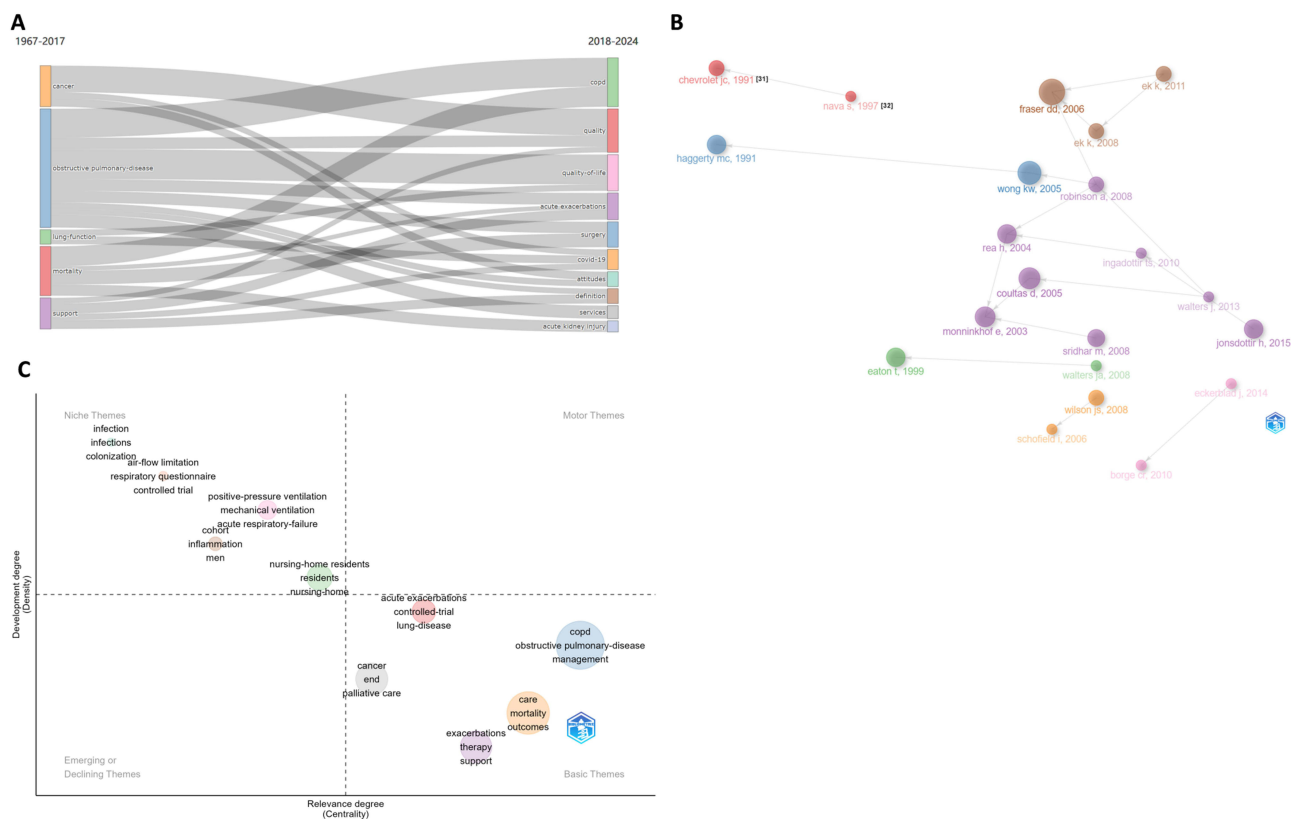


**Figure 5** Reference Citations and Co-Citation Analysis in COPD nursing interventions. **(A)** Global citation frequency and ranking of the most cited documents in COPD nursing interventions, including highly cited works like the 2012 statement by the American Thoracic Society. **(B)** Local citation frequency for the selected documents, emphasizing the citation impact within the study’s dataset. **(C)** Co-citation analysis of references, revealing relationships between key studies in COPD nursing. **(D)** Co-citation clusters in the literature, highlighting central research themes such as noninvasive ventilation and pulmonary rehabilitation.

Co-citation analysis is a tool for revealing shifts in paradigms and schools of thought in longitudinal studies. By conducting co-citation analysis on the literature, we explored the interrelationships among the documents. Using the Walktrap clustering algorithm in bibliometrics, we analyzed 48 co-cited visualized documents with a minimum edge count of 2 (Figure 5C). In 2003, Bourbeau J published a study on self-management interventions for COPD patients in *Archives of Internal Medicine (JAMA Internal Medicine)*, which demonstrated the strongest connections with other references and occupied a prominent position among the references in this field.<sup>29</sup> Additionally, employing CiteSpace clustering algorithm and Log-Likelihood Ratio (LLR) method, we conducted a detailed analysis and thematic labeling of the 1390 included articles, thereby delineating 12 central clusters within the largest connected component of the co-citation network (Figure 5D). These clusters are both interdependent and independent. Among them, the three most prominent clusters revolve around noninvasive ventilation, asthma, and early outcomes.

### Research Focus & Frontier Analysis

Guided by the observed growth trend in scientific production in this field, we divided the time frame into two distinct periods (before 2017 and 2018–2024) to effectively examine and describe the evolution of themes in the literature (Figure 6A). Before 2017, research in this field primarily focused on aspects such as “obstructive pulmonary diseases”, “cancer”, and “lung function”. Over the past seven years, research has emphasized “acute exacerbations”, “COVID-19”, and “quality of life”, indicating a gradual shift in focus from basic disease mechanisms to clinical management and patient quality of life. These two periods demonstrate interdependence and complementarity. Additionally, we mapped the historical trajectory of research in this field, with each trajectory reflecting a research theme and its core authors/literature (Figure 6B). Using bibliometric methods, we divided the application of nanotechnology in research on diabetes and its complications into seven thematic chains, represented by red, blue, green, pink, yellow, purple, and brown nodes. One important topic is the advantages and disadvantages of noninvasive mechanical ventilation for COPD patients. In



**Figure 6** Research focus and frontier analysis in COPD nursing interventions. **(A)** Evolution of research themes before 2017 and 2018–2024, with a noticeable shift from basic disease mechanisms to clinical management and patient quality of life. **(B)** Historical trajectory of research themes and key authors, showing the growing importance of topics like acute exacerbations and telehealth. **(C)** Cluster analysis of research themes, identifying emerging trends such as patient-centered care, respiratory questionnaires, and mechanical ventilation.

1997, Chevrolet et al reported a case highlighting that mechanical ventilation can be highly time-consuming for caregivers when treating certain patients with chronic respiratory insufficiency, necessitating a balance between resource investment and patient benefits.<sup>31</sup> Building on this, Nava et al conducted a prospective trial in 2019 to evaluate and compare the human and economic resources required for noninvasive mechanical ventilation (NIMV) and invasive mechanical ventilation (InMV) in treating COPD patients.<sup>32</sup> They found that NIMV is a more effective treatment option, especially in resource-limited settings, laying a theoretical foundation for the optimized treatment of COPD patients. In the purple thematic chain, key articles focus on “home care practices for COPD”, exploring the positive impact of home care models on patient recovery and quality of life.

By applying clustering algorithms to the keyword network, various themes within the specific domain are highlighted (Figure 6C). The horizontal axis represents centrality, indicating theme relevance, while the vertical axis represents density, indicating theme development. Each bubble signifies a network cluster, with the bubble title containing words that are highly prevalent within that cluster. The size of the bubble corresponds to the frequency of occurrence of the clustered terms. Analysis of Figure 6C reveals the current research themes in this field. Themes in the upper left corner (Niche Themes) are likely to be more specific or emerging but are developing rapidly. These include “Infection”, “Infections”, “Colonization”, “Air-flow limitation”, “Respiratory questionnaire”, “Controlled trial”, “Positive-pressure ventilation”, “Mechanical ventilation” and “Acute respiratory-failure”. Meanwhile, the basic themes (Basic Themes) in the lower right corner include “COPD”, “Management of obstructive lung disease”, “Nursing”, “Mortality”, “Outcomes”, “Exacerbations”, “Therapy” and “Support”. These themes have higher relevance within the research domain but relatively lower levels of development, primarily because research on these topics is already relatively mature.

## Discussion

### General Information

We extracted pertinent research on nursing care for COPD patients before 2024 for comprehensive analysis and visualization. As a professional domain, COPD care did not mature in research and theory until after 2001. It is important to note that prior to the late 1990s, COPD lacked a universally accepted diagnostic standard. Terms such as chronic bronchitis and emphysema were often used interchangeably, and diagnoses were primarily based on symptoms such as chronic productive cough or post-mortem anatomical findings. This historical lack of consensus in COPD diagnostic criteria posed significant challenges to the validity and comparability of research findings from this period. As a result, studies published before the late 1990s should be interpreted with caution, as they may not reflect a standardized or accurate understanding of COPD. The progress in COPD care theory and research from 2015 to 2024 has led to an increasing number of researchers focusing on this field, maintaining a large volume of published articles. According to data from BMJ, compared to 1990, the age-specific prevalence and mortality rates of COPD globally decreased by 8.7% and 41.7%, respectively, in 2019.<sup>33</sup> This decline in global COPD prevalence and mortality coincides with the growth trend of published articles on COPD care, indicating that advancements in COPD care are contributing to better patient outcomes. Moreover, a peak in literature publication observed around 2021 is likely related to COVID-19. The outbreak of COVID-19 has prompted researchers to pay more attention to the nursing models of respiratory diseases, especially in tele-nursing and self-management.<sup>34</sup> For example, the application of tele-nursing in the self-management of COPD patients has gradually increased, showing good outcomes, and patients have also shown a positive attitude towards this model.<sup>35,36</sup> This trend indicates that the field of COPD care is still developing and maintaining sustained research interest, with increasing attention to innovative care models that cater to patient-centered, personalized needs.

### Main Research Content

The intellectual trajectory of COPD nursing interventions has undergone significant thematic transformations since its inception, reflecting evolving clinical paradigms, global health challenges, and the expanding understanding of COPD as a chronic condition requiring multifaceted care. Currently, the main research areas in the field of COPD care can be summarized as acute exacerbations, quality of life, risk factors, evidence-based nursing, and pulmonary rehabilitation.

Acute exacerbations of chronic obstructive pulmonary disease (AECOPD) are critical events in COPD patients, characterized by a worsening of dyspnea and/or increased cough and sputum production, with symptom deterioration occurring within a 14-day period.<sup>37</sup> Our analysis demonstrates that clinical nursing interventions aimed at managing acute exacerbations have significantly advanced, particularly in the development of tailored care plans and the use of therapeutic technologies. These advancements are pivotal for improving patient outcomes and reducing hospital admissions. Previous studies have shown that exacerbations are often triggered by respiratory infections, air pollution, or other environmental factors, which induce local or systemic inflammatory responses, further damaging the airways.<sup>36,38</sup> Studies have also explored how nursing interventions, such as enhancing inhaler techniques or improving respiratory therapy adherence, can directly influence the frequency and severity of exacerbations.<sup>39–41</sup>

Pulmonary rehabilitation, a cornerstone of COPD care, has been proven to improve exercise capacity, reduce hospital admissions, and lower the incidence of unplanned health checkups. The 6-minute walk test, introduced by the American Thoracic Society in 2002, is now widely used as a simple yet effective tool to assess the functional capacity of COPD patients.<sup>42</sup> In addition to physical rehabilitation, nursing interventions that address psychosocial factors have gained recognition in improving patient quality of life, demonstrating the need for holistic care models that go beyond physical recovery. Smoking cessation, as a critical component of pulmonary rehabilitation, remains a key area of focus for nursing interventions. Nurses are increasingly involved in the management of smoking cessation programs, which have been shown to significantly enhance lung function and reduce disease progression.<sup>43</sup>

### Future Research Hotspots

Emerging research directions are being shaped by technological innovations, such as artificial intelligence (AI) and personalized medicine, and by ongoing disparities in global COPD care. AI-driven models for exacerbation prediction

hold promise for moving from reactive to proactive COPD care, yet challenges related to algorithmic bias and the need for real-world validation remain substantial.<sup>44</sup> These predictive models could be further enhanced by integrating nursing perspectives, focusing on patient-specific characteristics such as comorbidities, psychological states, and social determinants of health. It is important to note that prior to the late 1990s, COPD lacked a universally accepted diagnostic standard, with terms such as chronic bronchitis and emphysema being used interchangeably. This historical lack of consensus posed challenges to the validity of research findings from this period. Another exciting area of research lies in the airway microbiome, which presents opportunities for personalized nursing interventions that aim to modify microbial populations to alleviate symptoms and slow disease progression. Despite promising preliminary results, mechanistic understanding of how the microbiome impacts COPD remains underexplored.<sup>45,46</sup>

While high-income countries dominate global research outputs, low- and middle-income countries (LMICs), which account for approximately 90% of global COPD mortality, contribute less than 15% of COPD research.<sup>47</sup> This stark disparity highlights the urgent need to develop context-specific interventions tailored to the unique challenges faced by these regions. Future research should prioritize the development of community-based, nurse-led rehabilitation programs in LMICs, focusing on low-cost, scalable interventions that can reduce the burden of COPD and improve patient outcomes in resource-limited settings. Longitudinal care models, which integrate management of COPD with comorbid conditions and psychosocial needs, are essential for addressing the comprehensive needs of aging populations.<sup>48</sup> Current COPD management protocols primarily focus on acute exacerbations, with less emphasis on long-term care and prevention. Research into these long-term care models should explore multidisciplinary care teams, including nursing, to address the complex, multifactorial nature of COPD care in aging populations.<sup>49,50</sup>

## Persistent Methodological Challenges

Despite significant advancements, methodological challenges remain. One major limitation in COPD nursing interventions is the fragmentation of cross-institutional collaborations, evidenced by the low percentage of co-authored publications between key research nations like the United States and China. This lack of collaboration impedes the global sharing of knowledge and the development of unified care guidelines. Increased collaboration between institutions across high, middle, and low-income countries is crucial for the development of more inclusive, globally relevant COPD care practices.

Furthermore, the environmental impact of COPD care, such as the carbon footprint of metered-dose inhalers and the waste generated by single-use personal protective equipment (PPE), remains a significant gap in the literature. Addressing these issues presents a unique opportunity to align COPD management with broader environmental health objectives, exploring sustainable alternatives to traditional care models. These challenges highlight the need for comprehensive, multidisciplinary collaboration, particularly in bridging the gap between bibliometric productivity trends and patient-centered outcome measures.

As the field of COPD nursing care evolves, there is a critical need to transition from symptom-focused care models to precision nursing frameworks that account for the multifactorial nature of the disease. This approach should emphasize personalized, holistic interventions that integrate clinical care with psychosocial support, addressing the diverse needs of COPD patients. These shifts in research focus will be instrumental in mitigating the projected global rise of COPD as the third-leading cause of mortality by 2030.

## Strength & Limitations

In our approach, we initiated this process by extracting relevant articles from the widely recognized WOSCC SCI-Expanded database, which is renowned for its high-quality repository of publications. Subsequently, we integrated R Bibliometrix, VOSViewer, and CiteSpace for a comprehensive visualization analysis. The synergy between these different software tools aids in a more objective interpretation of the results. Our methodology encompasses both qualitative and quantitative analyses, examining differences in the number of papers, countries, institutions, journals, authors, and citation relationships to identify the field's outstanding contributors. By analyzing article topics and keyword content, we aim to provide a nuanced understanding of the prevailing hotspots and emerging trends in COPD patient care. Importantly, no bibliometric analysis of this field has been conducted in such detail before. This pioneering effort aims to enrich the existing research data in this area and provide scholars with new perspectives and valuable references.

This study is not without limitations. The analysis software and systems employed were specifically tailored for a single database. Although the WOSCC database is highly authoritative and covers a broad range of research, the possibility of overlooking relevant studies from other databases remains. Additionally, for systematic analysis, we chose to exclude non-English articles. While most research in this field is conducted in English, this decision may lead to the omission of relevant data. Finally, in the bibliometric-driven thematic analysis, each keyword is linked to only one topic, thereby preventing the use of topics to group documents for more detailed meta-information analysis.

## Conclusion

In conclusion, this bibliometric analysis of COPD nursing interventions highlights key research areas, including acute exacerbations, patient quality of life, evidence-based nursing, and pulmonary rehabilitation. These areas are vital for improving patient outcomes and reducing hospitalizations. The study also underscores the growing focus on personalized care models and innovative interventions like tele-nursing and self-management. New technologies, including the use of artificial intelligence (AI), are playing an increasingly important role in the monitoring of symptoms, adherence to treatment, and early warning systems for exacerbations. These innovations are expected to revolutionize COPD care, enabling more proactive and personalized approaches. While high-income countries lead global research, there is a pressing need for more research in low- and middle-income countries, where COPD burden is greatest. Future research should prioritize longitudinal studies and explore the long-term impact of nursing interventions, particularly in resource-limited settings, to enhance COPD care through multidisciplinary collaboration.

## Abbreviations

COPD, Chronic obstructive pulmonary disease; SCI, Science citation index; R, R programming language; VOSviewer, Visualization of similarities viewer; CiteSpace, Citation space; QS, Quality score; AE, Acute exacerbation; QoL, Quality of life; EBN, Evidence-based nursing; PR, Pulmonary rehabilitation; COVID-19, Coronavirus disease 2019; LCS, Local citation score; TLS, Topical localized score.

## Ethics Approval and Consent to Participate

This study does not involve human participants or animal subjects, and therefore, ethics approval and consent to participate are not applicable.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors report no conflicts of interest in this work.

## References

1. Halpin DMG, Criner GJ, Papi A, et al. The 2020 GOLD science committee report on COVID-19 and chronic obstructive pulmonary disease. *Am J Respir Crit Care Med.* 2021;203:24–36. doi:10.1164/rccm.202009-3533SO
2. Adeloye D, Song P, Zhu Y, et al. Global, regional, and national prevalence of, and risk factors for, chronic obstructive pulmonary disease (COPD) in 2019: a systematic review and modelling analysis. *Lancet Respir Med.* 2022;10:447–458. doi:10.1016/S2213-2600(21)00511-7
3. Fazleen A, Wilkinson T. Early COPD: current evidence for diagnosis and management. *Ther Adv Respir Dis.* 2020;14:1753466620942128. doi:10.1177/1753466620942128
4. Helvacı A, Gök Metin Z. The effects of nurse-driven self-management programs on chronic obstructive pulmonary disease: a systematic review and meta-analysis. *J Adv Nurs.* 2020;76:2849–2871. doi:10.1111/jan.14505
5. Aranburu-Imatz A, López-Carrasco JC, Moreno-Luque A, et al. Nurse-led interventions in chronic obstructive pulmonary disease patients: a systematic review and meta-analysis. *Int J Environ Res Public Health.* 2022;19:9101. doi:10.3390/ijerph19159101
6. Lareau SC, Fahy B, Meek P, et al. Chronic obstructive pulmonary disease (COPD). *Am J Respir Crit Care Med.* 2019;199:P1–P2. doi:10.1164/rccm.1991P1
7. Wan Y, Shen J, Ouyang J, et al. Bibliometric and visual analysis of neutrophil extracellular traps from 2004 to 2022. *Front Immunol.* 2022;13:1025861. doi:10.3389/fimmu.2022.1025861
8. Arruda H, Silva ER, Lessa M, et al. VOSviewer and Bibliometrix. *J Med Libr Assoc.* 2022;110:392–395. doi:10.5195/jmla.2022.1434
9. Parshall MB, Schwartzstein RM, Adams L, et al. An official American Thoracic Society statement: update on the mechanisms, assessment, and management of dyspnea. *Am J Respir Crit Care Med.* 2012;185:435–452. doi:10.1164/rccm.201111-2042ST
10. Barr RG, Herbstman J, Speizer FE, et al. Validation of self-reported chronic obstructive pulmonary disease in a cohort study of nurses. *Am J Epidemiol.* 2002;155:965–971. doi:10.1093/aje/155.10.965
11. Teno JM, Gozalo PL, Bynum JP, et al. Change in end-of-life care for Medicare beneficiaries: site of death, place of care, and health care transitions in 2000, 2005, and 2009. *JAMA.* 2013;309(5):470–477. doi:10.1001/jama.2012.207624
12. Creswell LL, Schuessler RB, Rosenbloom M, Cox JL. Hazards of postoperative atrial arrhythmias. *Ann Thorac Surg.* 1993;56(3):539–549. doi:10.1016/0003-4975(93)90894-N
13. Kramer N, Meyer TJ, Meharg J, Cece RD, Hill NS. Randomized, prospective trial of noninvasive positive pressure ventilation in acute respiratory failure. *Am J Respir Crit Care Med.* 1995;151(6):1799–1806. doi:10.1164/ajrccm.151.6.7767523
14. Weinberger M, Hendeles L. Theophylline in asthma. *N Engl J Med.* 1996;334(21):1380–1388. doi:10.1056/NEJM199605233342107
15. Steen S, Sjöberg T, Pierre L, Liao Q, Eriksson L, Algotsson L. Transplantation of lungs from a non-heart-beating donor. *Lancet.* 2001;357(9259):825–829. doi:10.1016/S0140-6736(00)04195-7
16. Confalonieri M, Potena A, Carbone G, Porta RD, Tolley EA, Umberto Meduri G. Acute respiratory failure in patients with severe community-acquired pneumonia: a prospective randomized evaluation of noninvasive ventilation. *Am J Respir Crit Care Med.* 1999;160(5 Pt 1):1585–1591. doi:10.1164/ajrccm.160.5.9903015
17. Casas A, Troosters T, Garcia-Aymerich J, et al. Integrated care prevents hospitalisations for exacerbations in COPD patients. *Eur Respir J.* 2006;28(1):123–130. doi:10.1183/09031936.06.00063205
18. Volpato S, Cavalieri M, Sioulis F, et al. Predictive value of the short physical performance battery following hospitalization in older patients. *J Gerontol A Biol Sci Med Sci.* 2011;66(1):89–96. doi:10.1093/geron/66.1.89
19. Estabrooks CA, Midodzi WK, Cummings GG, Ricker KL, Giovannetti P. The impact of hospital nursing characteristics on 30-day mortality. *Nurs Res.* 2005;54(2):74–84. doi:10.1097/00006199-200503000-00002
20. Fraser DD, Kee CC, Minick P. Living with chronic obstructive pulmonary disease: insiders' perspectives. *J Adv Nurs.* 2006;55(5):550–558. doi:10.1111/j.1365-2648.2006.03946.x
21. Wong KW, Wong FK, Chan MF. Effects of nurse-initiated telephone follow-up on self-efficacy among patients with chronic obstructive pulmonary disease. *J Adv Nurs.* 2005;49(2):210–222. doi:10.1111/j.1365-2648.2004.03280.x
22. Coultas D, Frederick J, Barnett B, Singh G, Wludyka P. A randomized trial of two types of nurse-assisted home care for patients with COPD. *Chest.* 2005;128(4):2017–2024. doi:10.1378/chest.128.4.2017
23. Monninkhof E, van der Valk P, van der Palen J, van Herwaarden C, Partridge MR, Zielhuis G. Self-management education for patients with chronic obstructive pulmonary disease: a systematic review. *Thorax.* 2003;58(5):394–398. doi:10.1136/thorax.58.5.394
24. Aboumatar H, Naqibuddin M, Chung S, et al. Effect of a hospital-initiated program combining transitional care and long-term self-management support on outcomes of patients hospitalized with chronic obstructive pulmonary disease: a randomized clinical trial. *JAMA.* 2019;322(14):1371–1380. doi:10.1001/jama.2019.11982
25. Haggerty MC, Stockdale-Woolley R, Nair S. Respi-Care: an innovative home care program for the patient with chronic obstructive pulmonary disease. *Chest.* 1991;100(3):607–612. doi:10.1378/chest.100.3.607
26. Eaton T, Withy S, Garrett JE, Mercer J, Whitlock RM, Rea HH. Spirometry in primary care practice: the importance of quality assurance and the impact of spirometry workshops. *Chest.* 1999;116(2):416–423. doi:10.1378/chest.116.2.416
27. Rea H, McAuley S, Stewart A, Lamont C, Roseman P, Didsbury P. A chronic disease management programme can reduce days in hospital for patients with chronic obstructive pulmonary disease. *Intern Med J.* 2004;34(11):608–614. doi:10.1111/j.1445-5994.2004.00672.x
28. Jonsdottir H, Amundadottir OR, Gudmundsson G, et al. Effectiveness of a partnership-based self-management programme for patients with mild and moderate chronic obstructive pulmonary disease: a pragmatic randomized controlled trial. *J Adv Nurs.* 2015;71(11):2634–2649. doi:10.1111/jan.12728
29. Bourbeau J, Julien M, Maltais F, et al. Reduction of hospital utilization in patients with chronic obstructive pulmonary disease: a disease-specific self-management intervention. *Arch Intern Med.* 2003;163:585–591. doi:10.1001/archinte.163.5.585
30. Rabe KF. Treating COPD--the TORCH trial, P values, and the Dodo. *N Engl J Med.* 2007;356(8):851–854. doi:10.1056/NEJMe068307
31. Chevrolet JC, Jolliet P, Abajo B, et al. Nasal positive pressure ventilation in patients with acute respiratory failure: difficult and time-consuming procedure for nurses. *Chest.* 1991;100:775–782. doi:10.1378/chest.100.3.775
32. Nava S, Evangelisti I, Rampulla C, et al. Human and financial costs of noninvasive mechanical ventilation in patients affected by COPD and acute respiratory failure. *Chest.* 1997;111:1631–1638. doi:10.1378/chest.111.6.1631

33. Safiri S, Carson-Chahhoud K, Noori M, et al. Burden of chronic obstructive pulmonary disease and its attributable risk factors in 204 countries and territories, 1990–2019: results from the Global Burden of Disease Study 2019. *BMJ*. 2022;378:e069679. doi:10.1136/bmj-2021-069679
34. Simons SO, Hurst JR, Miravittles M, et al. Caring for patients with COPD and COVID-19: a viewpoint to spark discussion. *Thorax*. 2020;75:1035–1039. doi:10.1136/thoraxjnl-2020-215095
35. GBD 2021 Demographics Collaborators. Global age-sex-specific mortality, life expectancy, and population estimates in 204 countries and territories and 811 subnational locations, 1950–2021, and the impact of the COVID-19 pandemic: a comprehensive demographic analysis for the Global Burden of Disease Study 2021. *Lancet*. 2024;403:1989–2056. doi:10.1016/S0140-6736(24)00476-8
36. Gioia F, Walti LN, Orchanian-Cheff A, et al. Risk factors for COVID-19-associated pulmonary aspergillosis: a systematic review and meta-analysis. *Lancet Respir Med*. 2024;12:207–216. doi:10.1016/S2213-2600(23)00408-3
37. Vermeersch K, Gabrovska M, Aumann J, et al. Azithromycin during acute chronic obstructive pulmonary disease exacerbations requiring hospitalization (BACE). A multicenter, randomized, double-blind, placebo-controlled trial. *Am J Respir Crit Care Med*. 2019;200:857–868. doi:10.1164/rccm.201901-0094OC
38. Xu Z, Li F, Xin Y, et al. Prognostic risk prediction model for patients with acute exacerbation of chronic obstructive pulmonary disease (AECOPD): a systematic review and meta-analysis. *Respir Res*. 2024;25:410. doi:10.1186/s12931-024-03033-4
39. Loh CH, Peters SP, Lovings TM, et al. Suboptimal inspiratory flow rates are associated with chronic obstructive pulmonary disease and all-cause readmissions. *Ann Am Thorac Soc*. 2017;14:1305–1311. doi:10.1513/AnnalsATS.201611-903OC
40. Ahn JH, Chung JH, Shin KC, et al. Critical inhaler handling error is an independent risk factor for frequent exacerbations of chronic obstructive pulmonary disease: interim results of a single center prospective study. *Int J Chron Obstruct Pulmon Dis*. 2019;14:2767–2775. doi:10.2147/COPD.S234774
41. Chen J, Weldemichael L, Zeng S, et al. Actigraphy informs distinct patient-centered outcomes in Pre-COPD. *Respir Med*. 2021;187:106543. doi:10.1016/j.rmed.2021.106543
42. Zeng GS, Chen LC, Fan HZ, et al. The relationship between steps of 6MWT and COPD severity: a cross-sectional study. *Int J Chron Obstruct Pulmon Dis*. 2018;14:141–148. doi:10.2147/COPD.S188994
43. Rice VH, Heath L, Livingstone-Banks J, et al. Nursing interventions for smoking cessation. *Cochrane Database Syst Rev*. 2017;12:CD001188. doi:10.1002/14651858.CD001188.pub5
44. Calzetta L, Pistocchini E, Chetta A, et al. Experimental drugs in clinical trials for COPD: artificial intelligence via machine learning approach to predict the successful advance from early-stage development to approval. *Expert Opin Investig Drugs*. 2023;32:525–536. doi:10.1080/13543784.2023.2230138
45. Özçam M, Lynch SV. The gut-airway microbiome axis in health and respiratory diseases. *Nat Rev Microbiol*. 2024;22:492–506. doi:10.1038/s41579-024-01048-8
46. Yan Z, Chen B, Yang Y, et al. Multi-omics analyses of airway host-microbe interactions in chronic obstructive pulmonary disease identify potential therapeutic interventions. *Nat Microbiol*. 2022;7:1361–1375. doi:10.1038/s41564-022-01196-8
47. Buist AS, McBurnie MA, Vollmer WM, et al. International variation in the prevalence of COPD (the BOLD Study): a population-based prevalence study. *Lancet*. 2007;370:741–750. doi:10.1016/S0140-6736(07)61377-4
48. Johnson KM, Khakban A, Bryan S, et al. Healthcare system encounters before COPD diagnosis: a registry-based longitudinal cohort study. *Thorax*. 2020;75:108–115. doi:10.1136/thoraxjnl-2019-213554
49. Kim HY, Lee HS, Kim IH, et al. Comprehensive targeted metabolomic study in the lung, plasma, and urine of PPE/LPS-induced COPD mice model. *Int J Mol Sci*. 2022;23:2748. doi:10.3390/ijms23052748
50. McLean S, Hoogendoorn M, Hoogenveen RT, et al. Projecting the COPD population and costs in England and Scotland: 2011 to 2030. *Sci Rep*. 2016;6:31893. doi:10.1038/srep31893

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