



# The quality of life of patients with chronic obstructive pulmonary disease: a bibliometric analysis

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**Background:** The quality of life (QOL) of patients with chronic obstructive pulmonary disease (COPD) is garnering increasing attention. However, faced with thousands of relevant clinical literature, it is becoming increasingly difficult for researchers and institutions to identify impactful research. Bibliometrics can help researchers quickly and methodically analyze the impact and hot trends of clinical research, strengthen teamwork, and solve related challenges. Therefore, we used bibliometrics to analyze and visualize data on the QOL of patients with COPD over the past 31 years to understand the key authors, research areas, and future trends.

**Methods:** We searched the Web of Science Core Collection for literature published since the establishment of the database. The main subject terms used were “chronic obstructive pulmonary disease”, “quality of life” and their different combinations. Articles were selected and exported in plain text format along with citation information. Bibliometric analysis and data visualization were performed using the R package “bibliometrix” and by incorporating statistical indicators such as the number of publications, citations and outputs of core authors, author collaborations, major journals, major research countries and collaborations, and key research themes.

**Results:** The bibliometric analysis included 9,219 articles. Document type is unlimited. All publications were published between 1992 and 2022, and the number of published articles increased consistently each year over the past decade, with periodic fluctuations. The *European Respiratory Journal* and the *International Journal of Chronic Obstructive Pulmonary Disease* emerged as the most frequently cited journals within this domain. Key authors contributing to this field include Wedzicha JA, Jones PW, Singh D, Holland AE, and Wouters EFM. The United States and the United Kingdom exhibited a high volume of publications, high citation rates, and relatively intense international collaboration in related areas, followed by China, Spain, Canada, and Australia in these metrics. Notably, prominent topics within this field included emphysema, pulmonary rehabilitation, dyspnea, acute exacerbation, living status, and mortality, among others. Future research in this field will focus on microorganisms, particulate matter, family rehabilitation, and Tai Chi.

**Conclusions:** This bibliometric analysis highlights the growing importance of QOL research in the field of COPD, which can inform clinicians, researchers, and policymakers to prioritize areas for future investigation in order to develop comprehensive, patient-centered strategies. At the same time, it is suggested

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that researchers should pay more attention to the core authors, strengthen international collaboration and team exchanges, actively explore characteristic clinical featured treatment measures such as Tai Chi and family rehabilitation, carry out clinical research on the integration of traditional Chinese and Western medicine and self-management, focus more on the QOL, mental health and economic and social burden of patients, and ultimately enhance the well-being of individuals with chronic respiratory diseases.

**Keywords:** Chronic obstructive pulmonary disease (COPD); quality of life (QOL); bibliometrics

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## Introduction

Chronic obstructive pulmonary disease (COPD) is a highly prevalent and mostly preventable respiratory disease characterized by persistent respiratory symptoms and restricted lung airflow (1). The natural course of COPD is characterized by symptom exacerbation and quality-of-life reduction (2), and the development of COPD involves complex pathogenic processes primarily centred around airway inflammation, oxidative stress, mitochondrial dysfunction, ageing, and iron ion metabolism (3). Cigarette smoke and other harmful particles are the primary causative factors of COPD. COPD has a high clinical mortality and mutilation rate and is often accompanied by complications such as chronic pulmonary emphysema (4). COPD can progressively deteriorate lung function and lead to various respiratory symptoms such as coughing, sputum production, shortness of breath, and respiratory distress, which reduces patients' quality of life (QOL). These symptoms result in reduced exercise capacity and decreased social activity.

QOL is a comprehensive indicator for assessing the

health and well-being of individuals, which is affected by a variety of factors (5). Recent research indicates that QOL is a critical measure of the effectiveness of pulmonary rehabilitation in patients with COPD (6). QOL is particularly relevant for patients with the exacerbator chronic bronchitis and exacerbator emphysema phenotypes, who have shown to experience the poorest QOL (7). Interestingly, spirometry, traditionally a staple in COPD diagnosis and management, may not be necessary for including patients in palliative care research or clinical care. This is especially pertinent for those with poor QOL and a high risk of adverse outcomes (8). However, it is important to note that telemonitoring has not been effective in improving QOL for patients with moderate to severe COPD, underscoring the need for alternative management strategies (9). The recent guidelines further reinforce the importance of QOL, recommending it as a management goal for those with COPD (10).

Bibliometrics is a widely used method for analyzing knowledge carriers and evaluating scientific research quantitatively and qualitatively. Compared to a literature review, based on a large number of literature and targeted analysis, bibliometrics makes it possible to quickly identify the overview of specific research fields and development frontiers (11). With the advent of scientific databases such as Web of Science, literature research has become more accessible (12). Web of Science is one of the most reliable sources of comprehensive scholarly databases. It is considered the most extensive and important bibliometric analysis database in most fields (13,14).

Clinical research is essential for the development of new medical treatments, diagnostic tools, and preventive measures. As the scientific literature continues to grow, it is becoming increasingly difficult for researchers and institutions to identify impactful research. Bibliometrics can

### Highlight box

#### Key findings

- Statistics on the key countries (USA, UK, etc.) and authors (Wedzicha JA, etc.) in the field of quality of life of chronic obstructive pulmonary disease (COPD) patients.

#### What is known and what is new?

- The research on quality of life of COPD is growing.
- The study can help the relevant population to understand the current urgent, hot issues (dyspnea, mortality, etc.).

#### What is the implication, and what should change now?

- Family rehabilitation for patients with COPD could be a future direction.

help analyze the impact and hot trends of clinical research, strengthen teamwork, and gradually become one of the solutions to solve related challenges.

Given the growing focus on the QOL of patients with COPD, this area is garnering increasing attention. A thorough analysis of the related literature could yield more profound insights into research themes, active researchers, and research institutions. It could also guide practitioners and patients in making informed treatment decisions. There are many bibliometric studies on COPD, including mitochondria and the progress of COPD research (15). Still, there are few bibliometric studies on patients' QOL with COPD.

Data visualization is a useful tool for visualizing bibliometric results. Thus, we conducted a bibliometric study based on the Web of Science database to characterize the research situation regarding the QOL of patients with COPD over the past 31 years. We completed a visual analysis of the research personnel, hotspots, and other related factors to gain a macroscopic understanding of the current development status of this field. These findings will provide valuable references for future research into the QOL of patients with COPD.

## Methods

### *Literature search*

We searched the Web of Science Core Collection database for literature published since the database's inception. The main subject terms used were "chronic obstructive pulmonary disease" and "quality of life", including the abbreviated forms "COPD" and "QOL", respectively, and they were connected with the operator "OR" and the operator "AND". Document type: unlimited. Articles were exported in plain text format along with their citation information. The data retrieval took place on December 25, 2022.

### *Statistical analysis*

For bibliometric and data visualization, quantitative and visual analyses were conducted using the R package "bibliometrix" (16) (<https://www.bibliometrix.org/>; The R Foundation for Statistical Computing, Vienna, Austria). This package can be used for analysis of authors, journal sources, literature status, publishing countries, institutions, citation and time series relationships, etc. Statistical indicators include the number of publications, citations

and outputs of core authors, author collaborations, major journals, major research countries and collaborations, and key research themes. During the keyword analysis process, to avoid the frequency impact of related vocabulary, the two categories of terms, "chronic obstructive pulmonary disease" and "quality of life", were removed since they constituted the search content.

## Results

### *Retrieval overview*

A total of 9,220 documents were retrieved using the Web of Science platform. One document published in 2023 was excluded, resulting in a total of 9,219 documents being included in the analysis. The main period of publication of the retrieved documents was from 1992 to 2022, with some earlier journals included. Subsequent analyses were conducted using a timeline-based approach, with the base period being from 1992 to 2022. The results of this retrieval included 1,168 journals, with an annual growth rate of 13% in the number of articles published, an average citation frequency of 35.46 times per document, and a total of 32,508 authors (*Table 1*).

### *Distribution of publication volume by decade*

*Figure 1* depicts the distribution of the number of articles published in the research field of QOL in patients with COPD for patients with COPD across different years. In the initial phase [1992–2001], there were 478 publications, representing an average of fewer than 100 manuscripts annually. In the subsequent phase [2002–2012], the cumulative number of publications increased to 2,728, indicating a significant growth in publication volume. In the final phase [2013–2022], the total number of articles was 5,961, with a peak value of 675 manuscripts in 2020. Although the annual publication volume growth rate was slightly slower during this phase, it fluctuated consistently around the peak value.

### *Distribution of core authors in the field*

Globally, 32,508 authors published articles in this field, but only 9,098 published more than 1 article, with 527 having published more than 10. The top 30 authors, based on publication quantity, were considered to be the core authors in this analysis.

**Table 1** Overview of literature search results

Item	Result
General statistics	
Timeline	1992–2022
Journal source, n	1,168
Number of documents, n	9,219
Annual growth rate (%)	13
Average number of years of publication, n	8.21
Average number of citations per article, n	35.46
Total number of references, n	175,178
Literature content, n	
Amplified keywords	7,985
Keywords provided by the author	8,806
Authorship statistics, n	
Number of authors	32,508
Number of authors who published single-author literature	348
Author collaboration	
Single-author literature, n	450
Average number of coauthors per article, n	6.6
Percentage of international cooperation (%)	22.76

### Analysis of citations among the core authors

As detailed in *Table 2*, the h-index, g-index, m-index, and other relevant metrics were calculated for the past 31 years. While Ambrosino N had the highest publication quantity, Wedzicha JA and Jones PW had the highest total citation counts in the field. Wedzicha JA also had the highest h-index, while Wouters EFM had the highest g-index.

Wedzicha JA is a researcher at the London School of Medicine, whose article published in the *New England Journal of Medicine* in 2010 (17) has been cited 1,846 times. The article describes a large-scale administrative cohort study with 2,138 participants and a maximum follow-up period of 3 years. The study found that although acute exacerbations become more frequent and severe as COPD progresses, their incidence rates appear to have a distinct susceptibility phenotype, which is of great significance for developing treatments preventing COPD exacerbation and ameliorating the severity of various diseases.

The article by Jones PW published in 1992 (18), which was cited the most number of times in this field (2,167

times), provides a self-assessment scale for chronic airflow limitation health status, namely the St. George's Respiratory Questionnaire (SGRQ), which is now well-known in the field. The questionnaire includes three aspects—symptoms, activities, and the impact on daily life—which form the foundation for research on the QOL of patients with COPD. Subsequently, in 2009, Jones PW published the COPD Assessment Test (19), cited 1,782 times, further promoting the development of the field.

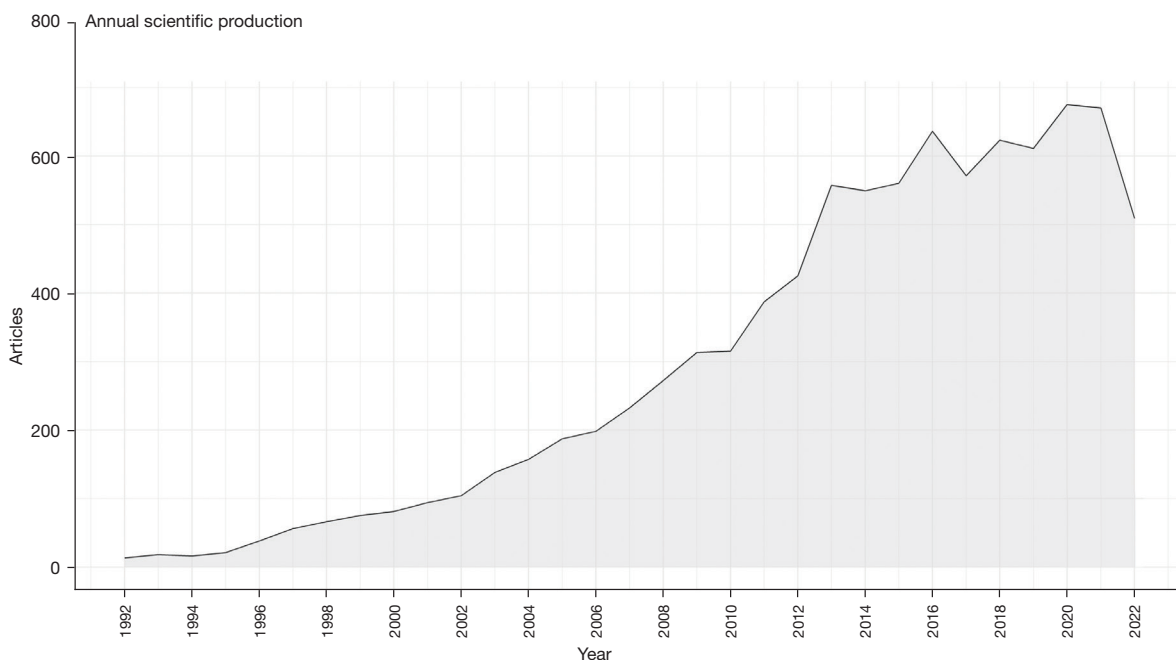
### Annual production output of core authors

As shown in *Figure 2*, the production output of core authors appears sustainable, with most conducting research in the early stages of this field. In addition, individuals such as Singh D from the University of Manchester in the United Kingdom and Holland AE from the University of Lethbridge in Australia, despite having only published their first articles in 2009, have many citations (*Table 2*). Indeed, Singh D and Holland AE are considered emerging talents. Singh D's most cited papers include the systematic review of the leading causes of death of COPD nationwide in 2012 (20) and the international guidelines introducing the global strategy for COPD, published in 2017 (21), for which he was a contributor. Meanwhile, Holland AE's 2010 article (22) identified the minimum clinically significant difference of the six-minute walk distance in patients with COPD as 25 m, providing a basis for clinical practice. Furthermore, his most cited paper proposed an updated definition of pulmonary rehabilitation (23).

### Author collaboration network

As shown in *Figure 3*, the author collaboration network can be primarily segmented into five clusters, and the specific centrality analysis for each author in the author collaboration network can be found in *Table 3*. The ten authors ranked by betweenness centrality from high to low, respectively, were Casaburi R, Wouters EFM, Jones PW, Vestbo J, Make B, Maltais F, Troosters T, Spruit MA, Bourbeau J, and Agusti A. Meanwhile, the top ten authors ranked by closeness centrality, respectively, were Wouters EFM, Maltais F, Make B, Casaburi R, Troosters T, Vestbo J, Agusti A, Bourbeau J, Sciruba FC, and Jones PW. Finally, the top ten authors ranked by PageRank, respectively, were Wouters EFM, Martinez FJ, Criner GJ, Spruit MA, Vestbo J, Wedzicha JA, Casaburi R, Agusti A, Troosters T, and Anzueto A.

Wouters EFM was centrally located in the author collaboration network flow within the field. The network



**Figure 1** The distribution of annual article publications from 1992 to 2022.

centrality evaluation metrics include betweenness centrality, closeness centrality, and PageRank. Betweenness centrality characterizes the influence of a node on information flow within the network, with higher betweenness values indicating a more significant impact and importance of the node. Closeness centrality measures a node's ability to influence other nodes in the network through the network itself. A greater closeness centrality value indicates that the node is more centrally located within the network. PageRank indicates a node's importance. Wouters EFM excelled in all three metrics, pointing to this author's prominence in the author collaboration network.

### Journal distribution

By analyzing the sources of journals, we discovered that the *European Respiratory Journal*, the *International Journal of Chronic Obstructive Pulmonary Disease*, and *Respiratory Medicine* had the highest number of published articles (Table 4).

The publication trends over the years can be observed in Figure 4. It is evident that in the past decade, the *European Respiratory Journal* and the *International Journal of Chronic Obstructive Pulmonary Disease* demonstrated a rapid increase in the number of related publications. On the other hand, other journals have shown a relatively stable growth rate in terms of publications.

### Geographic distribution

As can be seen in Figure 5, the country with the highest citation frequency was Bangladesh, followed by Iceland and then the United Kingdom, Denmark, and the Netherlands. According to the statistics on the number of publications by country (Figures 6, 7), the United States had the highest number of publications and growth rate, followed by the United Kingdom, with China's publication volume ranking third. In 2019, China ranked eighth, indicating that China's publication growth rate has increased rapidly, and some international cooperation has been initiated. However, it is clear that China still lacks highly regarded research and has relatively few citations.

### Research focus emphasis on topic distribution

Regarding research direction and focus, the prominent themes in this field (Figure 8) were found to include pulmonary rehabilitation, dyspnea, mortality, health-related QOL, health status, and emphysema, among others. More recently emerging topics encompassed microbiome, particulate matter, home-based telerehabilitation, Tai Chi, blood eosinophils, frailty, and pharmaceutical care, among others.

In the hierarchical clustering diagram in Figure 9,

**Table 2** Publication and citation data of the core authors

Authors	h-index	g-index	m-index	Total citations	Year published	Total publications
Ambrosino N	19	38	0.70	1,480	1996	121
Bourbeau J	41	75	1.64	10,339	1998	97
Brooks D	32	67	1.45	4,580	2001	90
Casaburi R	25	55	0.96	7,950	1997	87
Criner GJ	34	85	1.31	7,331	1997	82
Decramer M	38	62	1.46	9,760	1997	82
Dransfield MT	20	44	1.05	2,204	2004	82
Goldstein R	23	51	1.05	3,630	2001	75
Goldstein RS	30	49	0.97	5,234	1992	74
Han MK	21	45	1.50	2,177	2009	71
Hanania NA	21	43	1.05	1,900	2003	65
Holland AE	24	65	1.71	4,763	2009	64
Janssen DJA	23	51	1.53	3,357	2008	62
Jones PW	46	82	1.48	15,590	1992	57
Kerstjens HAM	23	43	0.74	1,896	1992	57
Make BJ	23	45	0.92	2,659	1998	55
Maltais F	38	82	1.58	7,721	1999	55
Martinez FJ	30	74	1.20	7,507	1998	54
Mcdonald CF	20	40	0.71	1,642	1995	52
Miravittles M	41	80	1.78	6,715	2000	51
Roche N	24	57	1.26	4,526	2004	51
Rutten-van Molken MPMH	22	49	0.88	3,358	1998	49
Singh D	22	55	1.57	11,533	2009	49
Singh SJ	22	46	0.88	4,431	1998	48
Spruit Ma	36	81	1.71	6,713	2002	46
Troosters T	37	64	1.42	8,493	1997	46
Van der Molen T	24	48	1.14	2,353	2002	45
Wedzicha JA	51	82	1.82	16,700	1995	45
Windisch W	19	38	0.73	1,510	1997	45
Wouters EFM	40	96	1.48	9,262	1996	44

the keywords in this field are clustered into two major categories. One category (in red) is COPD and includes *population, symptoms, prevalence, anxiety, and depression*, among others; the other category (in blue) is related to COPD and includes clinical terms such as *double-blind, efficacy, randomized controlled trial, tiotropium, obstructive*

*pulmonary disease, patients with COPD, airflow limitation, exacerbations, exercise capacity, lung function, chronic bronchitis, airflow obstruction, and acute exacerbations*; and disease-related terms including *risk factors, health status, mortality, risk, quality of life, lung disease, association, validation, burden, health, diagnosis, validity, impact, questionnaire*; and diagnosis-

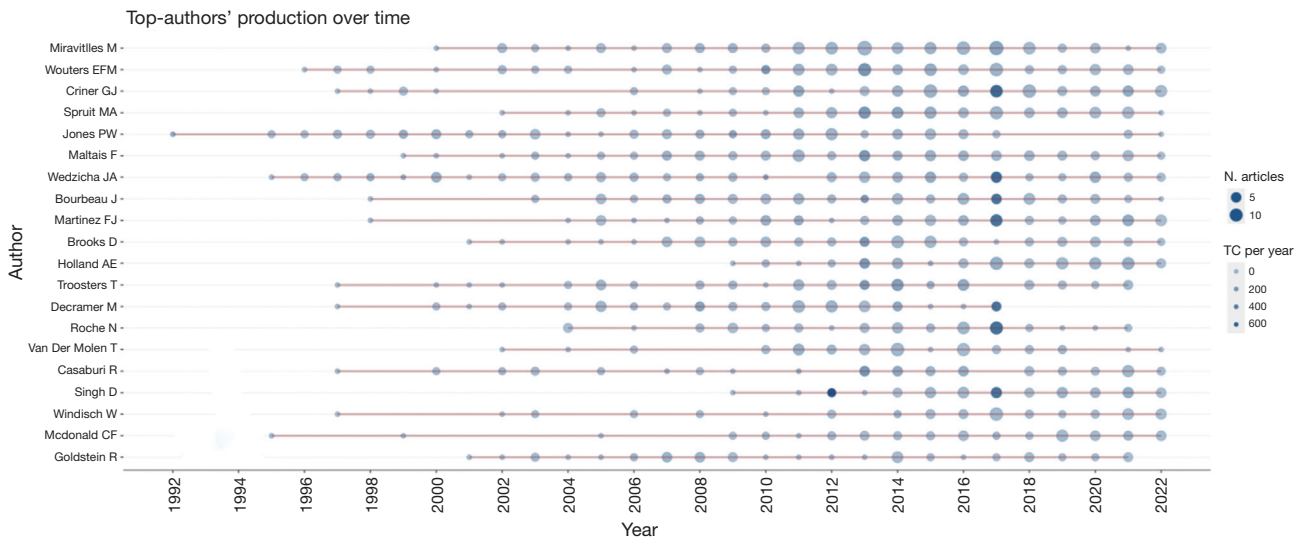


Figure 2 The annual productivity of the core authors. N., number; TC, total citations.

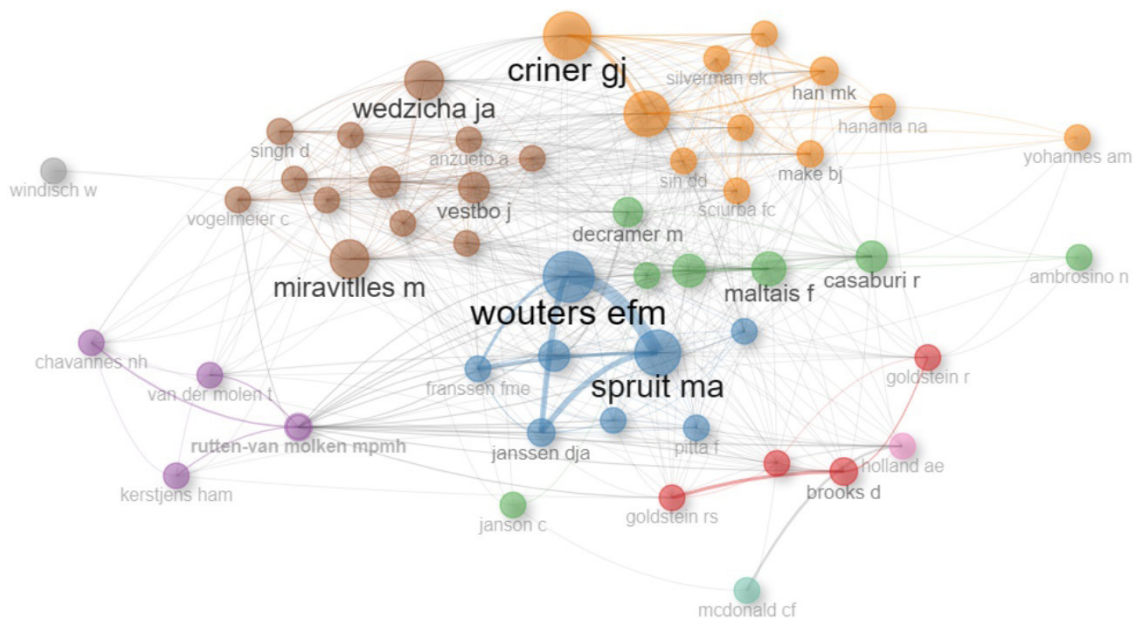


Figure 3 Diagram of the author collaboration network.

related terms such as *therapy, trial, rehabilitation, quality of life, predictors, care, management, outcomes, physical activity, and survival.*

**Discussion**

This bibliometric analysis revealed several key insights

into the research landscape on the QOL of patients with COPD over the past 31 years. From 1992 to 2022, research attention into the QOL of patients with COPD continuously increased, as did the number of publications, indicating a growing clinical importance placed on improving the QOL of COPD patients. This aligns with the recognition that QOL is a critical measure of

**Table 3** Centrality analysis of the author collaboration network

Author	Cluster	Betweenness	Closeness	Page rank
Wouters EFM	2	65.30209527	0.017241379	0.044246472
Maltais F	3	30.90897597	0.016666667	0.024512158
Make B	4	32.70100334	0.016393443	0.017484864
Casaburi R	3	77.95935501	0.016129032	0.029757157
Troosters T	5	29.71578959	0.016129032	0.025962661
Vestbo J	1	35.6721977	0.015625	0.031588742
Agusti A	1	20.79515482	0.015625	0.026127421
Bourbeau J	3	27.51163965	0.015151515	0.023983412
Scirba FC	4	9.887290347	0.015151515	0.022428244
Jones PW	1	40.7717786	0.014925373	0.019819148
Celli BR	1	4.294106224	0.014492754	0.021634421
Spruit MA	2	28.52995969	0.014492754	0.040404626
Criner GJ	4	11.98873446	0.014492754	0.04088033
Martinez FJ	4	13.69448736	0.014492754	0.042924307
Make BJ	4	16.2196204	0.014492754	0.023741393
Wedzicha JA	1	8.350585899	0.014285714	0.030605146
Anzueto A	1	4.506640434	0.014285714	0.025090296
Rabe KF	1	19.02128295	0.014285714	0.017669959
Wise RA	4	6.357542892	0.014285714	0.018731487
Miravittles M	1	6.886963076	0.014084507	0.017514374

**Table 4** Ten most relevant sources

Rank	Journal	Articles
1	<i>European Respiratory Journal</i>	727
2	<i>International Journal of Chronic Obstructive Pulmonary Disease</i>	575
3	<i>Respiratory Medicine</i>	407
4	<i>Chest</i>	350
5	<i>American Journal of Respiratory and Critical Care Medicine</i>	279
6	<i>COPD-Journal of Chronic Obstructive Pulmonary Disease</i>	195
7	<i>Thorax</i>	177
8	<i>Respirology</i>	174
9	<i>Cochrane Database of Systematic Reviews</i>	150
10	<i>BioMed Central Pulmonary Medicine</i>	139



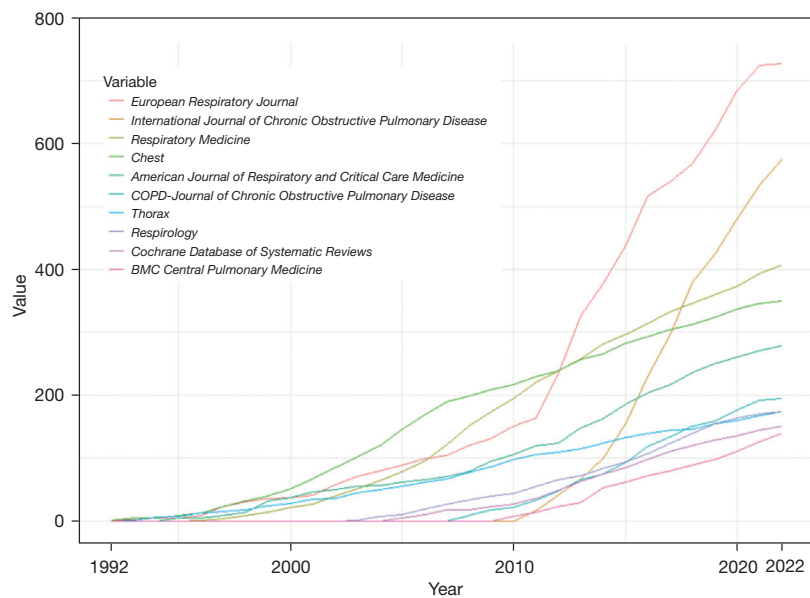


Figure 4 Yearly journal publication statistics.

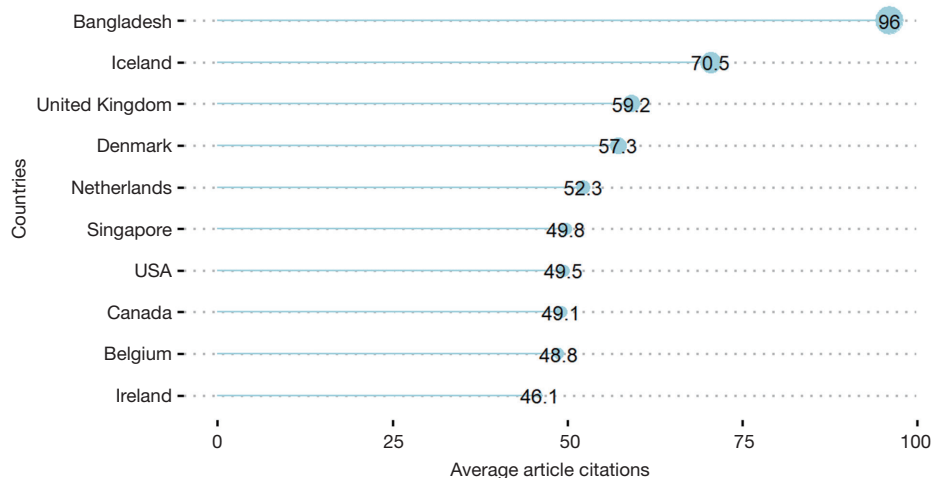


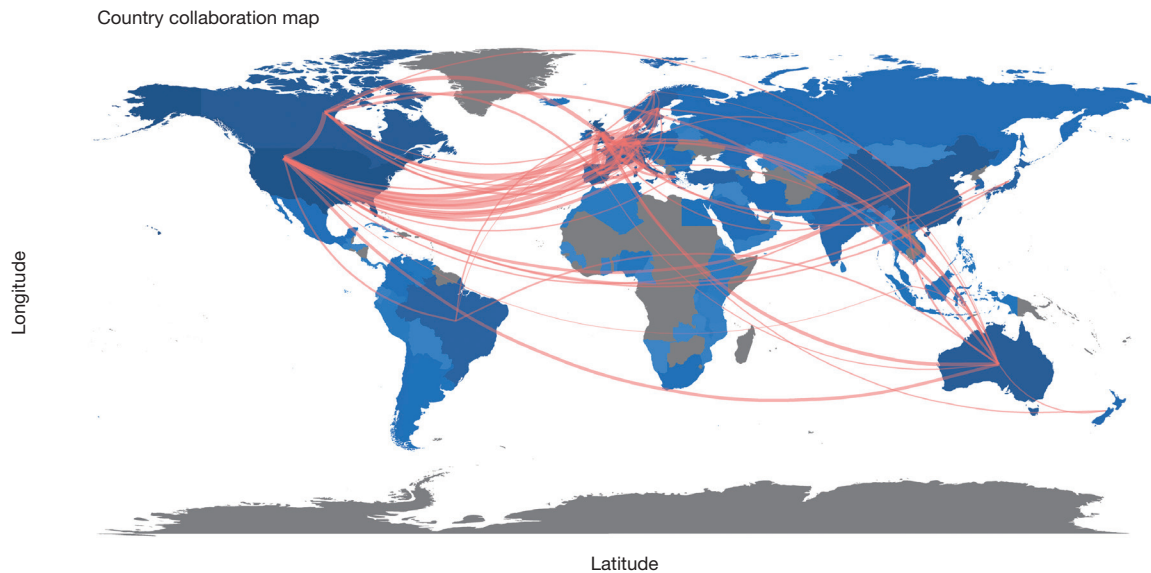
Figure 5 Citation rates of articles from various countries.

the effectiveness of pulmonary rehabilitation and other COPD management strategies. As COPD is a debilitating and progressive disease, the sustained research interest underscores the need for more effective treatments to alleviate the symptoms and burden experienced by patients.

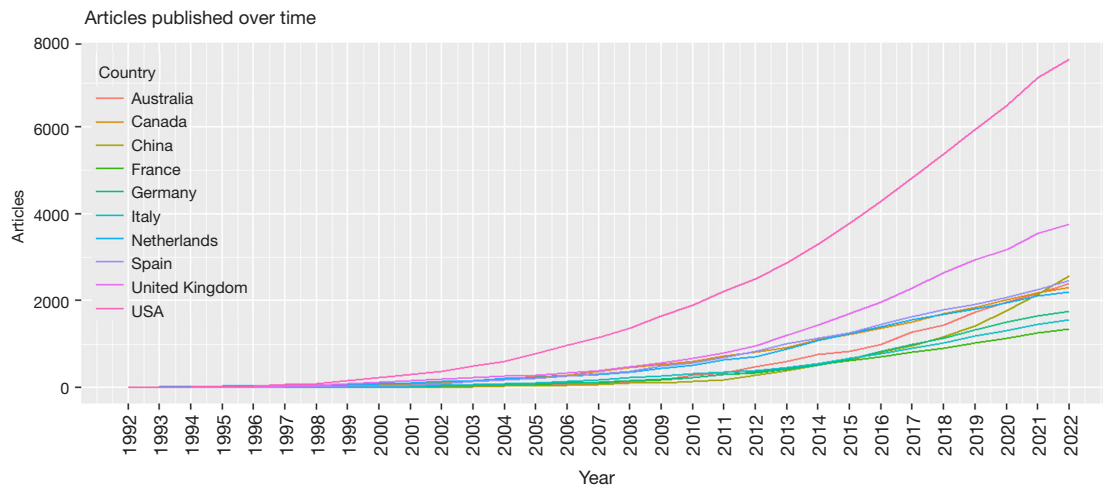
An analysis of the journals revealed that the *European Respiratory Journal* and the *International Journal of Chronic Obstructive Pulmonary Disease* had an exceptionally high number of publications and exhibited higher growth rates than the other journals, making them the top journals in this field. Their increasing publication volumes over the past

decade likely reflect the field’s expansion and the journals’ status as preferred venues for disseminating cutting-edge findings.

The identification of key authors, such as Wedzicha JA, Jones PW, Singh D, Holland AE, and Wouters EFM, provides insights into the thought leaders driving research progress in this domain. Wedzicha JA and Jones PW, who have a long publication history and an extensive number of citations, were frequently cited by senior researchers. Moreover, Singh D and Holland AE began their research later but have garnered a significant number of citations



**Figure 6** International collaboration diagram.



**Figure 7** The number of articles published by various countries from 1992 to 2022.

and contributed substantially to clinical research, emerging as rising stars in the field. Network centrality analysis indicated Wouters EFM to be a core member of the industry collaboration network.

The geographic distribution analysis revealed the dominance of developed nations, particularly the United States and the United Kingdom, in terms of publication volume, citation rates, and international collaboration. This likely reflects these countries' more significant research funding, infrastructure, and clinical expertise. Additionally, the rapid growth in publication output from China and

other countries suggests an increasing global recognition of the importance of COPD QOL research. Strengthening international collaborations and knowledge exchange could further accelerate progress in this field.

The thematic analysis highlighted several areas of focus, including pulmonary rehabilitation, dyspnea, mortality, health-related QOL, and emphysema. These align with the clinical priorities for COPD management, where improving patients' symptoms, functional status, and overall well-being are paramount. Emerging topics, such as microbiology, particulate matter, home-based rehabilitation, and Tai Chi,

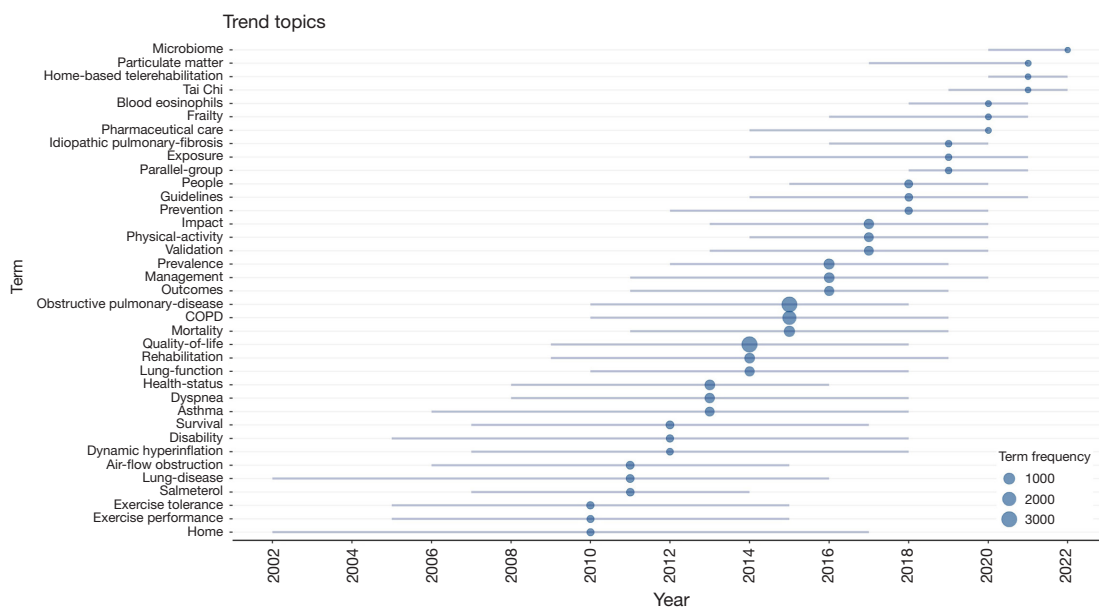


Figure 8 Topic distribution chart. COPD, chronic obstructive pulmonary disease.

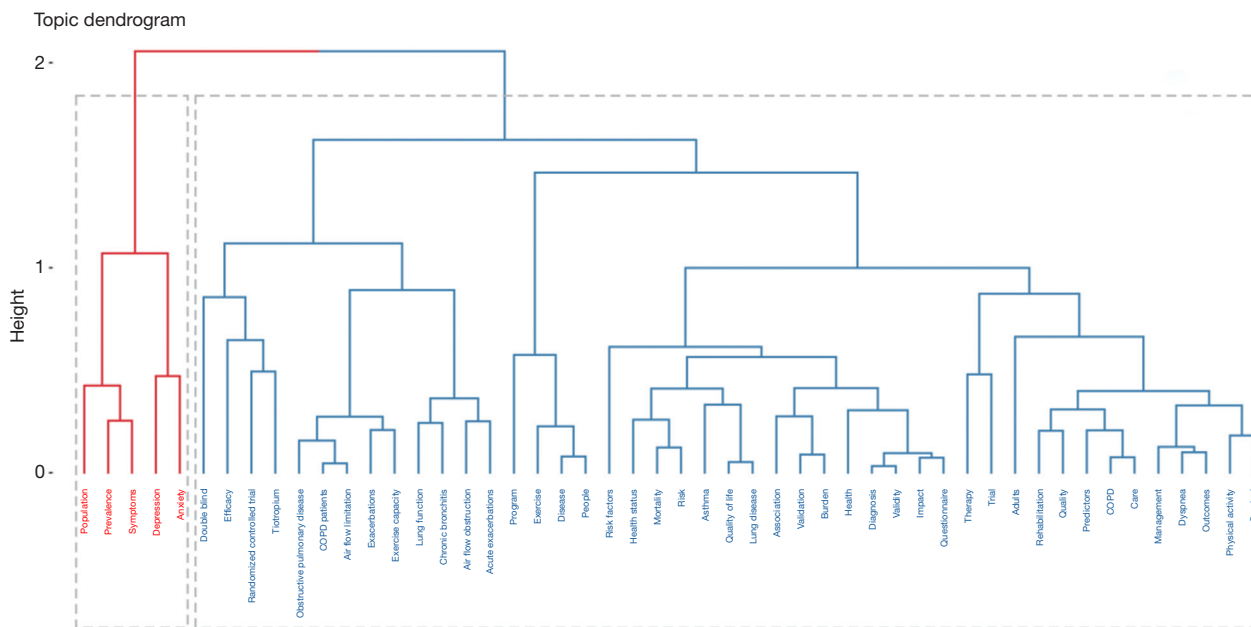


Figure 9 Hierarchical clustering diagram of keywords. COPD, chronic obstructive pulmonary disease.

suggest potential future research directions that could yield novel therapeutic approaches.

The management of long-term health problems such as COPD has added a heavy burden to medical services. Self-management is underutilized in the current clinical care of COPD (24). However, through the analysis of key

research topics, it can be seen that home rehabilitation, self-management, and Tai Chi exercise are better choices for daily care of COPD, which can not only improve the QOL of patients, reduce the economic and social burden of patients, but also reduce the pressure on the health system.

In addition, the anticipation of dyspnea itself can

have a significant impact on the patient's mood and behaviour (25), and psychological distress is prevalent in patients with COPD and is associated with a more severe course of the disease, which can also increase the burden on patients, caregivers, and the healthcare system when psychological problems are not treated (26). Therefore, more attention needs to be paid to the psychological changes caused by COPD and the impact on relatives and caregivers in the process of family rehabilitation and self-management.

## Conclusions

This bibliometric analysis highlights the growing importance of QOL research in the field of COPD, which can inform clinicians, researchers, and policymakers to prioritize areas for future investigation in order to develop comprehensive, patient-centered strategies. At the same time, it is suggested that researchers should pay more attention to the core authors, strengthen international collaboration and team exchanges, actively explore characteristic clinical featured treatment measures such as Tai Chi and family rehabilitation, carry out clinical research on the integration of traditional Chinese and Western medicine and self-management, focus more on the QOL, mental health and economic and social burden of patients, and ultimately enhance the well-being of individuals with chronic respiratory diseases.

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## Footnote

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*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-24-591/coif>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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