Respiratory Care in Focus: A Decadal Bibliometric Review of Research Dynamics

Cuidados Respiratórios em Foco: Uma Revisão Bibliométrica Decenal da Dinâmica de Pesquisa

Received: 2023-00-00 | Accepted: 2023-00-00 | Published: 2023-00-00

Marcio Sacramento de Oliveira
ORCID: https://orcid.org/0000-0003-2880-1603
Oswaldo Cruz Foundation, Brazil
E-mail: marcio.sacramento@icict.fiocruz.br

Lidiane dos Santos Carvalho
ORCID: https://orcid.org/0000-0002-2290-329X
Oswaldo Cruz Foundation, Brazil
E-mail: lidiane.carvalho@icict.fiocruz.br

Maria de Fátima Ebole de Santana
ORCID: https://orcid.org/0000-0002-2554-5125
Oswaldo Cruz Foundation, Brazil
E-mail: fatima.ebole@icict.fiocruz.br

ABSTRACT

This bibliometric review of respiratory care research dynamics comprehensively analyzes respiratory care's multidisciplinary nature and information science's role in managing respiratory diseases. The study analyzed 2,467 articles from digital repositories and databases, with Scopus emerging as the primary repository for respiratory care research. The United States, the United Kingdom, and Spain were the top producers of respiratory care studies. Massachusetts General Hospital, the University of Toronto, and Harvard Medical School had the highest production of papers. The study highlights the importance of using a broader range of keywords and multilingual search strategies to ensure a more representative analysis of the literature in respiratory care. The findings of this study serve as a resource for healthcare professionals and researchers in respiratory care and encourage continued emphasis on interdisciplinary research to advance this vital field.

Keywords: Information science; Bibliometric analysis; Interdisciplinary Research.
RESUMO

Esta revisão bibliométrica da dinâmica de pesquisa em cuidados respiratórios analisa de forma abrangente a natureza multidisciplinar dos cuidados respiratórios e o papel da ciência da informação no gerenciamento de doenças respiratórias. O estudo examinou 2.467 artigos de repositórios e bases de dados digitais, com o Scopus emergindo como o principal repositório para pesquisas em cuidados respiratórios. Os Estados Unidos, o Reino Unido e a Espanha foram os principais produtores de estudos sobre cuidados respiratórios. O Massachusetts General Hospital, a Universidade de Toronto e a Harvard Medical School tiveram a maior produção de artigos. O estudo destaca a importância de utilizar uma gama mais ampla de palavras-chave e estratégias de busca multilingues para garantir uma análise mais representativa da literatura em cuidados respiratórios. As conclusões deste estudo servem como um recurso para profissionais de saúde e investigadores em cuidados respiratórios e incentivam a ênfase contínua na investigação interdisciplinar para avançar neste campo vital.

Palavras-chave: Ciência da informação; Análise bibliométrica; Pesquisa interdisciplinar.
INTRODUCTION

Respiratory care is a healthcare discipline specializing in assessing, diagnosing, treating, managing, and caring for patients with breathing or other cardiopulmonary disorders (Hess, 2011). This field encompasses several vital aspects, such as patient assessment, pulmonary rehabilitation, airway management, mechanical ventilation, oxygen therapy, medication administration, disease prevention and control, and research and education. In summary, respiratory care is a multidisciplinary field requiring clinical skills, technological expertise, and patient education to care for individuals with respiratory diseases (Hess, 2011).

This study focuses on the intersection of information science and respiratory care, a crucial segment in healthcare that deals with the management of respiratory diseases. Information science is a field that primarily treats the analysis, collection, classification, manipulation, storage, retrieval, movement, dissemination, and protection of information. Practitioners in this field apply theories and techniques from many disciplines, including computer science, statistics, linguistics, and psychology (Borko, 1968). It underscores the importance of understanding respiratory care studies' scientific configurations for advancing research, improving patient outcomes, and shaping future healthcare practices.

Utilizing information science methods provides a unique opportunity to delve into the intricate network of data, offering valuable insights often overlooked by traditional methods.

The justification for using multiple metrics lies in the challenge that a single indicator rarely provides comprehensive information about a specific author or article. No singular indicator can offer all the desired information. The assessment based on diverse indicators proves valuable in evaluating different facets of performance across various temporal intervals.

The study aims to analyze the progression of respiratory care research and the current landscape. The study seeks to uncover predominant research themes, key publications, and trends in collaboration and knowledge distribution within respiratory care by conducting a detailed analysis of the research's quantity, nature, and influence, besides uncovering underlying patterns, themes, and collaborative efforts within respiratory care. For such, this research employs information science techniques, including analysis, collection, and classification.
This will provide an insightful overview of the field's development and future directions.

METHODS

This is an exploratory, descriptive study with a quantitative approach, whose methodology involved conducting a thorough bibliometric analysis (“How to Conduct a Bibliometric Analysis,” 2021) of articles published between 2013 and 2022. We have been focusing on papers that contain the term "respiratory care", in the following fields: title, abstract, and keywords, in three digital databases: Scopus, Web of Science, and PubMed, taking into account that they are consolidated and structured multidisciplinary bases that enable the standardized survey and analysis of different aspects of the data (Academy, 2020). The analysis covered metrics such as publication frequency, citation counts, betweenness centrality, co-authorship networks, and thematic evolution over ten years.

Betweenness centrality is a key measure in network theory that quantifies the significance of a node in a network based on its role as a bridge on the shortest paths between other nodes. This concept is crucial in understanding the flow of information or resources in various networks, including social, transportation, and communication networks. The betweenness centrality of a node is calculated by determining the number of times it appears on the shortest paths between pairs of nodes in the network. This metric is particularly useful in identifying influential nodes critical in connecting different network parts (Newman, 2010).

The purpose of this approach was to gain a comprehensive understanding of the research trends and factors that have influenced them, as well as to identify potential areas for future investigation in the field of respiratory care. The bibliographic coupling method specific to the VantagePoint® v16, a tool recognized for its capacity in text mining, was used. This facilitates analyses and refinements of data in studies encompassing various themes within the subfield of Information Science. This tool carried out the following steps: harmonious integration of data from the Scopus and Web of Science digital databases, identification, and removal of records presenting duplicates.

During the treatment phase, a key aspect was creating and applying specific thesauri. These thesauri were designed to establish a standardized terminology for countries, research institutions, authors, and keywords.
The thesauri Medical Subject Headings (Mesh) semantic type was used to aggregate the keywords.

RESULTS AND DISCUSSION

After removing duplicates, the total number of articles retrieved from digital repositories and databases was 2,467. The repository with the most significant publications was Scopus, with 2,106 articles, followed by PubMed (920) and Web of Science (664). Scopus's dominance as the primary repository for these articles can be attributed to its comprehensive coverage of scientific literature and interdisciplinary focus. This aligns with similar trends observed in other healthcare-related bibliometric studies, where Scopus often emerges as the leading source due to its extensive indexing of diverse journals. The significant representation of articles from PubMed and Web of Science further underscores the multidisciplinary nature of respiratory care research, bridging the gap between clinical, biomedical, and healthcare policy research.

Regarding geographic distribution, the United States, the United Kingdom, and Spain produced 611, 190, and 152 studies, respectively. The United States has traditionally been a leader in medical research, supported by its substantial research funding, robust academic infrastructure, and numerous leading healthcare institutions (Akhavan et al., 2016; Gu, 2004; “How to Conduct a Bibliometric Analysis,” 2021).

The institutions with the highest production of papers on respiratory care are Massachusetts General Hospital (37), University of Toronto (26), and Harvard Medical School, Boston, MA, United States (25) (Figure 1). The concentration of publications from these institutions suggests a high level of expertise, resources, and focus on respiratory care within these organizations. This could be attributed to several factors, including funding availability, collaborative Networks, and the presence of specialized research centers. The high output from these institutions not only underscores their influence in shaping the field of respiratory care but also suggests the potential for these centers to drive future innovations and advancements in the field.
According to the Mesh semantic type, the most frequent keywords are groups in Therapeutic or Preventive Procedure in 21.93% (541) of the articles, Disease or Syndrome in 19.70% (486), and Health Care Activity in 8.03% (198) (Figure 2). These findings reflect the dynamic nature of respiratory care, emphasizing the treatment and management of respiratory disorders and the importance of preventive measures and overall healthcare activities in this domain (Figure 3).
Figure 2. Top 10 Mesh Semantic Type for Keywords to articles in the Scopus, Web of Science, and PubMed, from 2013 to 2022.

Figure 3. Correlation Map of Top 50 Mesh Semantic Type for Keywords to articles in the Scopus, Web of Science, and PubMed, from 2013 to 2022.

It is important to note that this study has some limitations. Using the keyword "respiratory care" may exclude relevant research that does not explicitly use this term. This approach may overlook significant studies that use related or specific sub-field terminologies, such as "mechanical ventilation" or "pulmonary rehabilitation." Additionally, the linguistic and terminological variation in the global scientific literature
could result in missing substantial studies published in languages other than English or using regional terminologies. The field of respiratory care is continuously evolving, with the emergence of new terms, which suggests that research based on a fixed set of keywords may not adequately reflect emergent trends. This limitation directly impacts the thematic analysis, potentially omitting emerging research areas and complicating interdisciplinary comparisons. Therefore, future methods should consider employing a broader range of keywords, multilingual search strategies, and periodic updates of search terms to ensure a more representative analysis of the literature in respiratory care.

**Figure 4:** The authors' distribution of scientific productivity in Respiratory care with eight or more articles published from 2013 to 2022.

Dean R. Hess is the most prolific, having authored 14 articles, representing 0.57% of the total publications. Shawna L. Strickland follows closely with 11 articles, contributing 0.45% to the scholarly discourse. Andrew G. Miller and James K. Stoller share the spotlight, each with ten articles, constituting 0.41% of the collective output. The trio of Alan H. Daniels, Frits M. E. Franssen, and Michele Vitacca have each authored nine articles, making substantial contributions at 0.36% each. David Orlikowski, Karsten J. Roberts, Martijn A. Spruit, and Emiel F. M. Wouters round out the list with eight articles showcasing their noteworthy impact on academic conversations at 0.32% (Figure 4).
Três importantes clusters podem ser formados no mapa da rede de coautoría, formado pelos 50 principais autores, liderados por Dean R. Hess, Shawna L. Strickland e Frits M. E. Franssen (Figura 5).

**Figure 5.** The top 50 authors constituted the scientific collaboration network on respiratory care from 2013 to 2022.

Regarding betweenness centrality and its impact on the scientific network (Figure 6), the top 10 authors with higher centrality measurements are displayed. Various indices are proposed to measure centrality, evaluating a node's involvement in the network structure based on four dimensions. Freeman (1980) demonstrated how betweenness centrality for undirected graphs is derived from a matrix of pairwise dependencies. In terms of bibliometrics, an author's influence on the network of researchers regarding a subject grows if they share scientific information with many co-authors.

Analyzing the centrality scores distributed within the top 50 authors, Shawna L. Strickland stands out with a significant contribution of (35844,07), securing a central and influential role in the scientific production network. Following closely is Dean R. Hess, holding a noteworthy 24757,33, emphasizing his position in mobilizing the scientific production community (Figure 6). This analysis underscores the centrality of these researchers in intermediating the scientific production network, highlighting the significance of their diverse contributions.
The citation index, a crucial metric for evaluating the impact of scientific articles, is vital in understanding research influence. A scientific article's citation index indicates the frequency of citations by other researchers, with a higher count signifying greater visibility and impact. Researchers, institutions, and journals frequently use citation metrics to evaluate scholarly output productivity and influence (Garfield, 1979; Cronin, 1984).

In respiratory care studies, highly cited articles within this research's scope include those by Calaway et al. (2015), Stone et al. (2020), and Neumar et al. (2015), with 1,108, 976, and 619 citations, respectively.

Callaway et al. (2015) extensively review post-cardiac arrest care guidelines, mainly on respiratory care. Systematic reviews in 2015 assess ventilator management and oxygenation strategies, recommending Paco2 maintenance within a normal range. Normocarbia is suggested, but personalized treatment may be necessary. The guidelines stress preventing hypoxia, prioritizing it over potential hyperoxia risks, and advocate adjusting oxygen levels based on oxyhemoglobin saturation.

Stone et al. (2020), in the article “Efficacy of Tocilizumab in Patients Hospitalized with Covid-19,” present compelling findings on Tocilizumab's benefits. The study reveals reduced mortality rates among treated COVID-19 patients and improved clinical outcomes, emphasizing Tocilizumab as a valuable therapeutic option. Subgroup effects exploration provides nuanced insights, highlighting the drug's efficacy across diverse
patient populations and positioning Tocilizumab as a promising intervention for severe COVID-19.


It is important to note that this study has some limitations. Using the keyword "respiratory care" may exclude relevant research that does not explicitly use this term. This approach may overlook significant studies that use related or specific sub-field terminologies, such as "mechanical ventilation" or "pulmonary rehabilitation." Additionally, the linguistic and terminological variation in the global scientific literature could result in missing substantial studies published in languages other than English or using regional terminologies. The field of respiratory care is continuously evolving, with the emergence of new terms, which suggests that research based on a fixed set of keywords may not adequately reflect emergent trends. This limitation directly impacts the thematic analysis, potentially omitting emerging research areas and complicating interdisciplinary comparisons. Therefore, future methods should consider employing a broader range of keywords, multilingual search strategies, and periodic updates of search terms to ensure a more representative analysis of the literature in respiratory care.

CONCLUSION

This study conducted a comprehensive bibliometric analysis of respiratory care articles published from 2013 to 2022, focusing on three significant digital databases: Scopus, Web of Science, and PubMed. The top authors, led by Dean R. Hess and Shawna L. Strickland, were identified, highlighting their significant contributions to critical care and respiratory health. Institutions like Massachusetts General Hospital and the University of Toronto dominated paper production, indicating high expertise and resources. This trend suggests collaborative efforts and specialized research environments, possibly fostering innovation and advancements in respiratory care.
The geographical distribution, with the United States leading, reaffirms your traditional position in medical research in respiratory care. This underscores the continued influence of the U.S. in driving research initiatives and contributing significantly to the global body of knowledge in respiratory care.

Despite these insights, the study acknowledged limitations, such as the potential exclusion of relevant research using a specific keyword and linguistic variations. It emphasized the evolving nature of the field, suggesting the need for broader keywords, multilingual search strategies, and periodic updates for a more representative analysis.

This analysis indicates that the trends in respiratory care research reveal several noteworthy patterns. A Thematic Evolution and Focus on Critical Care over the ten years suggests a sustained focus on critical care within respiratory care research. Identifying top authors, particularly Dean R. Hess, highlights significant contributions to urgent care and respiratory health. This trend implies an ongoing commitment to understanding and advancing critical care practices in the respiratory field.

In respiratory care studies, the highly cited articles within this research scope extensively review post-cardiac arrest care guidelines, emphasizing respiratory care, highlighting the significant benefits of Tocilizumab in COVID-19 Patients, and underscoring key respiratory care considerations, enhancing emergency patient outcomes with evidence-based recommendations.

The emphasis on the evolving nature of the field suggests a need for methodological refinement, including the use of broader keywords, multilingual search strategies, and periodic updates. This indicates a recognition of the dynamic and diverse nature of research in respiratory care.

The intersection of information science and respiratory care has provided a unique perspective, allowing for a detailed understanding of the research trends, key players, and thematic focuses in respiratory care. This study serves as a resource for healthcare professionals and researchers in respiratory care. It sets a foundation for future investigations, encouraging a continued emphasis on interdisciplinary research to advance this vital field.

In conclusion, the findings provide valuable insights into respiratory care research trends, influential authors, and institutional contributions, laying the groundwork for future studies to adopt more comprehensive methodologies.
REFERENCES


