


Advanced Practice Nursing: A Bibliometric and Visualization Analysis (1992–2023)

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Background: Advanced Practice Nurses (APNs) have become essential to healthcare systems, but the development of research related to APNs has been uneven. Understanding publication trends in this area can provide valuable insights into gaps in the literature and practice.

Objective: This study aimed to analyze the publication patterns of APNs in the field of nursing through bibliometric methods.

Methods: This study is a descriptive bibliometric study. Data were collected from the Web of Science database in January 2024 and analyzed using VOSviewer software.

Results: The search strategy identified 595 publications authored by 1843 researchers across 44 countries and published in 88 different journals spanning 1992 to 2023. Analysis reveals several key trends in APN research: (a) a significant growth in publications, particularly in the past three years; (b) predominant contributions from scholars in a select number of countries; (c) limited collaboration among countries, institutions, and authors; and (d) a focus on key themes such as APN education frameworks and clinical competencies.

Conclusion: The existing body of literature on APN within the nursing field remains limited. Future research should aim to focus on fostering greater international collaboration among researchers and encouraging the adoption of the APN role in developing countries. These efforts could significantly enhance healthcare services and improve patient health outcomes globally.

Keywords: bibliometric analysis, advanced practice nurse, nursing field, web of science, visualization analysis

Introduction

The concept of advanced practice nurse (APN) emerged in the mid-20th century, driven by social development and significant changes within the nursing profession.^{1,2} The International Council of Nurses (ICN) defines APN as

Nurses who have gained the expert knowledge base, complex decision-making skills, and clinical competencies needed to expand their nursing practice through additional education, characterized by the environment in which they are certified. It is recommended that an entry-level APN should earn a master's degree.

Characteristics of an APN, as outlined by the ICN, includes higher educational attainment than general professional nurses, specifically at the master's level or equivalent; competency in managing complex healthcare issues across high-risk and vulnerable populations; expertise in integrating evidence-based practice (EBP), education, leadership, and clinical management; and adherence to national or governmental regulations and policies that endorse APN practices.²

Over the years, the APN field has diversified into various roles, including Nurse Practitioners (NP), Clinical Nurse Specialists (CNS), Nurse Anaesthetists, and Midwife Nurses. Among these, CNS and NP stand out as the two primary types internationally recognized.^{3,4} These roles have significantly enhanced global health outcomes by managing healthcare costs, improving access to health services, and boosting patient satisfaction, particularly in community services and chronic disease management.^{5,6} A systematic review by Bryant-Lukosius et al⁷ highlighted the impact of

CNS-led transition care from hospital to home, demonstrating notable benefits such as improved health status in patients with heart failure, reduced hospital stays, lower rehospitalization rates and medical costs, and decreased mortality rates in post-cancer surgery patients.

Despite its growth, the development of APN has been inconsistent across countries due to varying rates and levels of progress. Sheer and Wong¹ utilized the Advanced Nursing Practice Self-Administered Questionnaire Critical Information Survey developed by Schober and Affara⁸ to assess APN development worldwide. Their research concluded that approximately 50 countries have either established or are in the process of developing APN roles. A critical determinant of APN development identified was the educational infrastructure for nursing within a country, specifically the availability of general nursing professionals and advanced nursing education at the bachelor's level, which facilitates further discipline advancement. Countries such as Australia, South Korea, and the United Kingdom offer favorable environments for APN growth, while regions like Africa, Latin America, and mainland China face challenges due to a shortage of nurses and underdeveloped nursing education systems. This disparity highlights the need for global collaboration in advancing APN roles, particularly in developing countries where the APN role is under-recognized.

Building on this, Heale and Rieck Buckley³ conducted an online survey through ICN's affiliated national nursing associations to gather insights on the role, title, educational requirements, and regulatory framework of APN in 2015. They identified that the primary obstacles to APN expansion relate to legislative and qualification issues within specific jurisdictions, presenting unique challenges to APN practice.⁹ Additionally, the COVID-19 pandemic has accelerated the recognition of APNs, particularly in telehealth, acute care, and public health response, highlighting their importance in the healthcare workforce during global crises.

Current research on APN encompasses various focus areas, including education and practice, employing diverse methodologies such as cross-sectional studies and scoping reviews to explore APN's roles in specific contexts.^{10–12} However, there is a gap in the literature: no studies have yet undertaken a systematic and bibliometric analysis to map out the research status and evolution trends of APN globally. This gap is critical given the increasing complexity of healthcare systems worldwide and the growing demand for interdisciplinary collaboration across healthcare roles. This study seeks to address this gap by conducting a comprehensive bibliometric analysis of relevant literature, utilizing keyword analysis and knowledge graph techniques. It aims to identify research priorities, hotspots, and collaboration patterns within the APN field, providing insights into the emerging trends in APN development and offering valuable guidance for future nursing research, policy, and clinical practice globally.

Materials and Methods

Design

This study employed bibliometric analysis to explore the structure and evolution of publications within the field of APN. Bibliometrics, introduced by Alan Pritchard in 1969, is a quantitative method for analyzing published literature, enabling the mapping of a field's development and structure.¹³ By applying this method, we examine existing knowledge and uncover emerging trends in APN research.^{14,15} Additionally, bibliometrics reveals collaboration patterns between authors and institutions within specific topics, helping to identify research gaps, new areas for exploration, and the contributions of various studies to a discipline.¹⁵

The specific aims of this study were to:

1. Visualize the volume of publications and citations within the field and track evolving trends over time.
2. Identify the countries, journals, and authors making the most significant contributions to APN research.
3. Provide the visual representation of the current collaboration network among researchers and identify the most frequently used author keywords.

Sample/Participants

The study analyzed 595 publications related to APN within the nursing field.

Data Collection

Our review process, depicted in Figure 1. Data was collected from the Web of Science (WoS) database in January 2024, a widely recognized source known for its high-quality publications across various disciplines and its suitability for bibliometric analysis.^{16,17} We selected WoS as the primary data source due to its comprehensive coverage of peer-reviewed literature and consistency in citation indexing. Similar methodologies are commonly used in bibliometric research.

To ensure the comprehensiveness of the data, we specifically utilized the Science Citation Index Expanded (SCI-EXPANDED) and the Social Sciences Citation Index (SSCI) for the search. The search strategy query was defined as follows: TS= (“Advanced Practice Nurse” OR “APN”) OR (“Clinical Nurse Specialist” OR “CNS”) OR (“Advanced Practice Registered Nurse” OR “APRN”) OR (“Advanced Practice Nurse” AND “Nurse Practitioner” AND “Clinical Nurse Specialist” AND “Advanced Practice Registered Nurse”), covering publications from the database’s inception to December 31, 2023. This search strategy included only articles and review papers while excluding non-relevant materials such as solicitation notices, abstracts, letters, meeting notices, and book catalogs. After deduplication, the search yielded 1560 journal papers (1464 articles and 96 review papers). The data underwent a rigorous screening process. Two authors, both experienced in bibliometric analysis, independently reviewed all articles. Discrepancies were resolved through consultation with a third author, ensuring accuracy and consistency. This process resulted in the inclusion of 595 studies for final analysis.

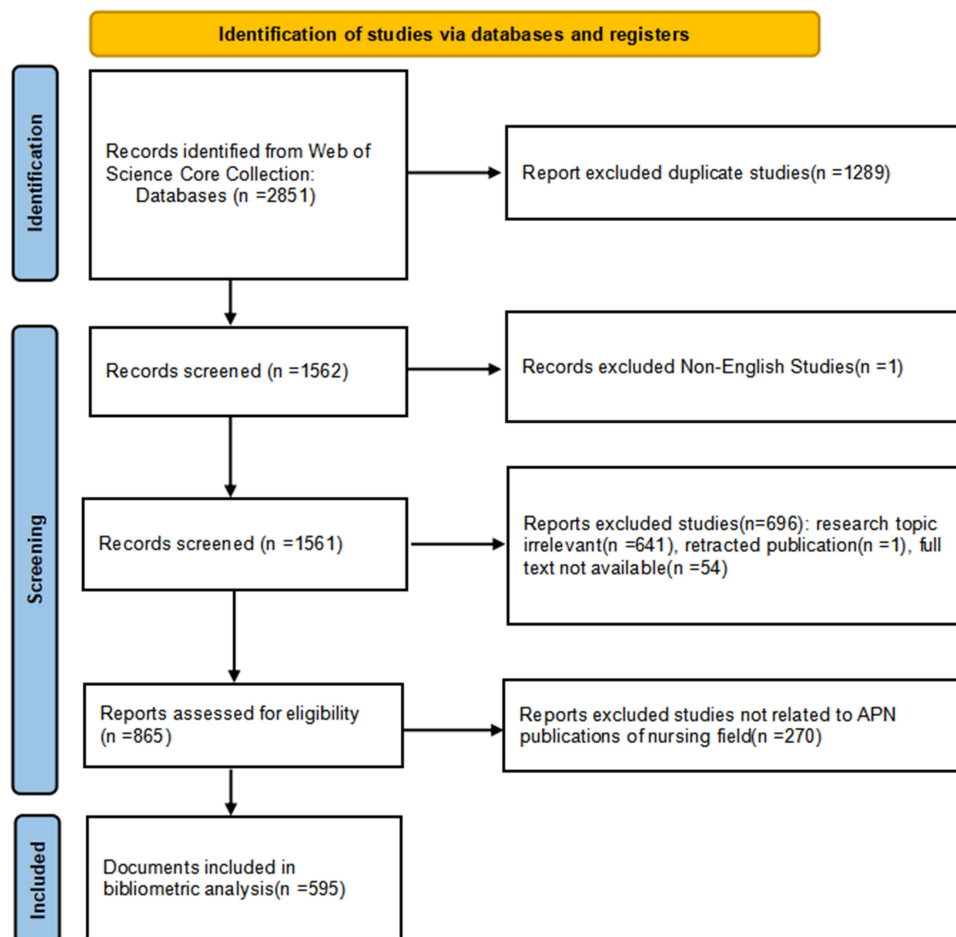


Figure 1 Selection process of the articles for bibliometric analysis using the PRISMA flow diagram method.

Data Analysis

The collected data were exported from WoS with all relevant bibliographic information, including citation counts, abstracts, keywords, and references. The exported data were formatted for analysis. VOSviewer, a widely used software for bibliometric analysis, was employed to visualize scientific knowledge graphs and analyze research trends.^{18,19}

VOSviewer generates visual maps based on literature coupling and co-citation principles. The attributes of the maps (eg, node size, density, color, and distance) provide insights into the structure of research. The node size represents publication frequency, indicating the prominence of topics or authors, while the distance between nodes reflects the strength of relationships. The closer the nodes, the stronger their connection. Colors distinguish clusters in the keyword analysis, revealing thematic groupings. The Total Link Strength (TLS) value quantifies the strength of connections, providing a more robust understanding of the collaboration network.²⁰

Moreover, network analysis within VOSviewer explores the connections between authors, countries, and institutions. Each item is represented by a circle, where the size indicates the frequency of its occurrence. The strength of relationships is illustrated by the thickness of connecting lines.¹⁹

Results

Summary Information on the Retrieved Articles

This search strategy yielded 595 articles authored by 1,843 researchers from 44 countries, spanning the years 1992 to 2023. The literature comprises both original and review articles, all published in English across 88 journals. On average, each article has been cited about 13.6 times, corresponding to an annual publication rate of approximately 18.6 articles.

Trends and Growth Patterns in Field Publications

Figure 2 illustrates the publication trends in the APN field within nursing, highlighting a clear year-over-year growth. The trend began in 1992 with a single APN article. Over the next four years, there was a modest increase, culminating in 12 articles by 1996. However, the number dropped to three articles in 2001. A steady rise followed, reaching 33 articles by 2012. The publication counts then stabilized, averaging around this number until 2020, when it dipped to 26 articles. Notably, there was a significant surge in APN publications, peaking at 51 articles in 2023. This upswing suggests an increasing and sustained interest of nursing scholars in APN research.

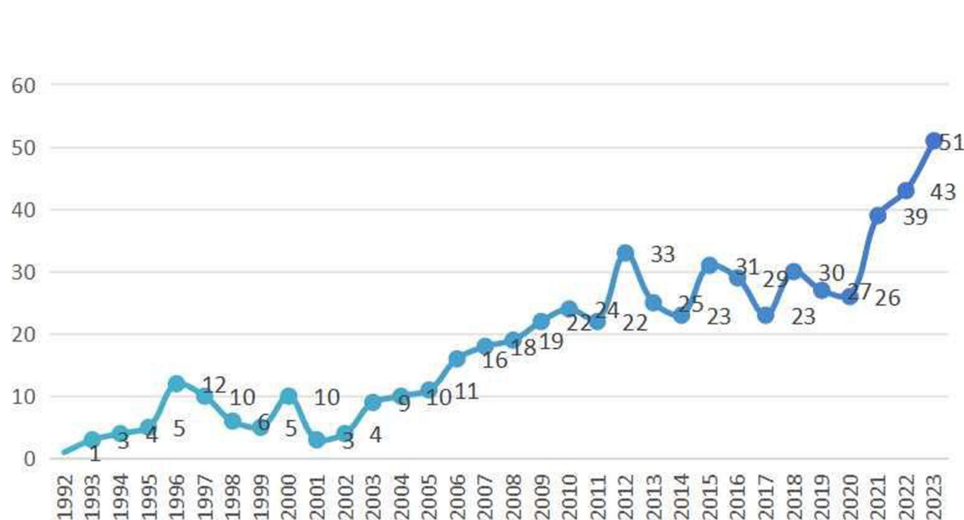


Figure 2 The distribution of the studies by years.

Thematic Analysis of APN Research Trends

A deeper analysis of research themes shows a shift in focus over time. Early research (1992–2005) concentrated on defining APN roles and their integration into healthcare systems. Between 2006 and 2015, studies expanded to include education, scope of practice, and regulatory policies. More recent research (2016–2023) has increasingly emphasized leadership, evidence-based practice (EBP), and interprofessional collaboration. Regionally, developed countries such as the US, Canada, and the UK have led research in competency frameworks and policy implementation, whereas developing nations have primarily focused on APN role adoption and regulatory challenges. This evolution highlights the dynamic nature of APN research across different global contexts.

Citation Impact and Core Journals

A total of 88 journals have published 595 articles on APN, averaging 6.8 articles per journal. [Table 1](#) lists the top 10 journals by document count, all within the nursing discipline. Leading the chart, Clinical Nurse Specialist, Journal of Advanced Nursing, and Journal of the American Association of Nurse Practitioners have published 143, 35, and 25 articles, respectively. Among these, Journal of Clinical Nursing has the highest impact factor (4.1) across 24 articles. Additionally, the Journal of Advanced Nursing stands out with the highest citation impact, averaging 37.11 citations per article across 35 documents. To further assess scholarly influence, an h-index analysis of these journals could be conducted in future research.

Geographical Disparities and International Collaboration

Authors from 44 different countries contributed to the analyzed publications. [Table 2](#) displays the top 10 countries by publication count. The United States leads APN research with 387 publications, followed by Canada (47), the United

Table 1 Top 10 Journals Publishing Documents on APN in Nursing

Rank	Source	Number of Publications	Count of Citations	Average Citation
1	Clinical Nurse Specialist	143	972	6.8
2	Journal of Advanced Nursing	35	1299	37.1
3	Journal of the American Association of Nurse Practitioners	25	270	10.8
4	Journal of Clinical Nursing	24	579	24.1
5	Journal of the American Academy of Nurse Practitioners	20	359	17.9
6	International Nursing Review	18	175	9.7
7	Journal of Professional Nursing	17	229	13.5
8	International Journal of Nursing Studies	14	241	17.2
9	Journal of Nursing Administration	13	181	13.9
10	Archives of Psychiatric Nursing	12	116	9.7

Table 2 Top 10 Countries in Publishing Documents on APN in Nursing

Rank	Country	Number of Publications	Count of Citations	Average Citation
1	United States of America	387	4462	11.5
2	Canada	47	1037	22.1
3	England	33	638	19.3
4	Australia	30	687	22.9
5	Finland	21	265	12.6
6	Singapore	16	111	6.9
7	Ireland	14	171	12.2
8	People's Republic of China	14	402	28.7
9	Switzerland	13	69	5.3
10	Norway	10	236	23.6

Kingdom (33), Australia (30), and Finland (21), collectively accounting for 87.06% of total contributions. However, developing nations remain underrepresented in APN research. Potential barriers include limited funding, restricted access to high-impact journals, and slower adoption of APN roles due to regulatory challenges. Strategies such as international mentorship programs and collaborative research initiatives could help address these disparities.

Figure 3 presents an overlay visual map showcasing international collaborations among countries with more than five publications. The map reveals that the US and UK have led APN research for over a decade, whereas emerging contributors like Singapore and Switzerland have only entered the field post-2012. Strengthening collaboration between developed and developing countries could accelerate APN role adoption in underrepresented regions.

Institutional and Authorship Networks

Researchers affiliated with 843 distinct institutions contributed to the analyzed publications. The University of Eastern Finland led with 15 papers, while McMaster University had 14 articles and 627 citations, making it one of the most influential institutions. Beyond these, no single institution demonstrated significant dominance in APN research.

The authorship analysis included 595 documents from 1,843 contributors, averaging 3.1 authors per article. Notably, 23 of the 595 documents (about 3.9%) were single-authored. Table 3 lists the top 10 most active authors. Figure 4 presents the author collaboration network, illustrating 12 clusters, with the largest cluster comprising six authors. We identified 41 researchers with more than three publications, yet collaboration remains limited, as only three clusters contained five or more authors. This indicates a need for greater interdisciplinary and cross-institutional research efforts in APN studies.

Keyword Co-Occurrence and Emerging Research Areas

The analysis identified 1,277 unique author keywords. Figure 5 presents a network visualization of the top 50 keywords, each occurring more than six times. Beyond specific research topics, frequently mentioned keywords include “education”, “evidence-based practice”, “nursing education”, “qualitative research”, “outcomes”, “leadership”, “scope of practice”, and ‘competencies’. The consistent occurrence of these keywords underscores their central role in APN

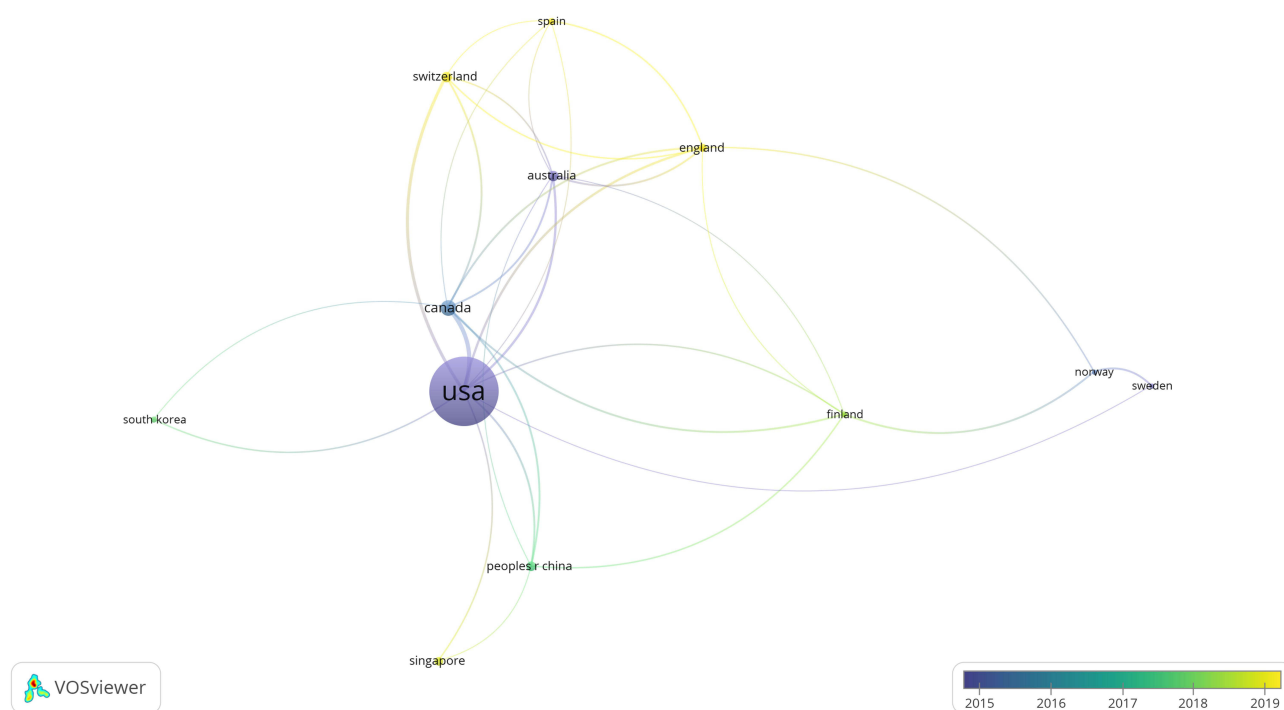


Figure 3 An overlay visualization map of the countries.

Table 3 Top 10 Authors in Publishing Documents on APN in Nursing

Rank	Author	Number of Publications	Count of Citations	Average Citation
1	Jokiniemi, Krista	14	165	11.8
2	Kilpatrick, Kelley	11	116	10.5
3	Bryant-Lukosius, Denise	8	119	14.9
4	Duffield, Christine	8	400	50.0
5	Fagerstrom, Lisbeth	8	228	28.5
6	Zhou, Wentao	8	53	6.6
7	Pietila, Anna-Maija	6	113	18.8
8	Doody, Owen	6	49	8.2
9	Carter, Nancy	5	88	17.6
10	Dicenso, Alba	5	123	24.6

discourse. Additionally, the rise of terms such as “advanced practice regulation” and “interprofessional collaboration” in recent years signals emerging research frontiers in the field.

Discussion

The goal of this study was to examine international research publications on APN in the nursing field, covering the period from 1992 to 2023. We observed a steady increase in publications focused on APN since 2012, a trend linked to the previously ambiguous role of APN and challenges in recognition and acceptance as senior nursing positions. Scholars like Gordon, Lorilla and Lehman²¹ in the United States have been pivotal in clarifying the APN role and advocating for legal recognition. This aligns with findings from a systematic review by Jokiniemi et al.²² Post-2020, the growth rate of publications on APN surged significantly, partly due to the COVID-19 outbreak in late 2019, which underscored the critical role of APN professionals in healthcare systems and their importance in achieving sustainable development goals

**Figure 4** The co-author-author collaboration overlay map.

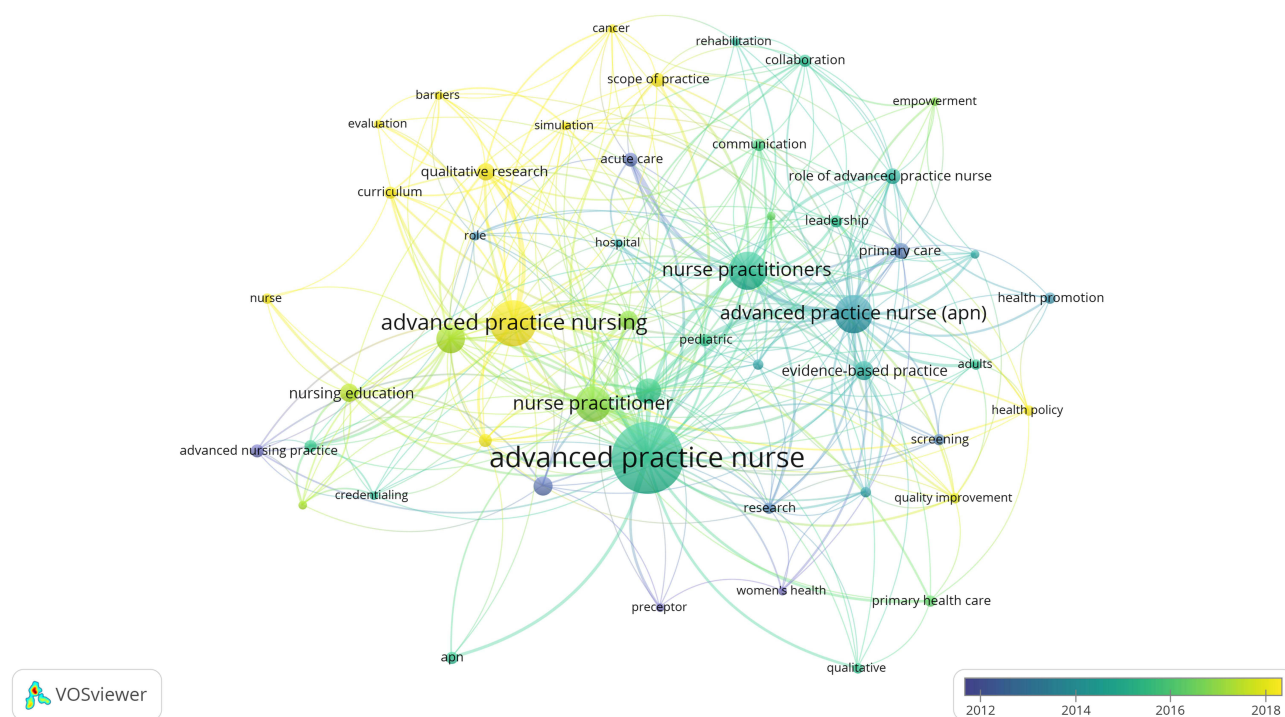


Figure 5 Author keyword analysis overlay map.

and universal health coverage.²³ Furthermore, the 11th ICN NP/APN Network Conference, themed “Envisioning APN Beyond 2020: Wider Reach, Bigger Impact”²⁴ highlighted the need for APN advancement. ICN Chief Executive Officer Howard Catton emphasized the urgency for governments to invest in APN roles to enhance healthcare system efficiency in the post-pandemic era.²⁵

Regional Disparities in APN Research

This study’s analysis indicated that the bulk of research on APN within the nursing field originates from developed countries, notably the United States, Canada, the United Kingdom, Australia, and Finland. This aligns with the observations by Sheer and Wong,¹ who noted these regions as significant contributors to APN research. Conversely, there appears to be a lack of focus on APN research in developing countries. Despite APN’s potential to positively impact global healthcare,^{15,26} only a limited number of institutions contribute substantially to this area, underscoring a global gap in recognizing APN’s value in nursing practice.

The limited research output from developing countries may be attributed to various factors, including resource constraints, a lack of nursing education infrastructure, and insufficient governmental support. Many developing nations struggle with workforce shortages, and the establishment of APN roles requires significant investment in training, policy development, and regulatory frameworks.²⁷ Addressing these challenges necessitates targeted strategies, such as international partnerships to develop APN programs, increased funding for APN research, and policies that support the professional advancement of APNs in these regions.²⁸

APN Research in Nursing Journals

Moreover, this study underscores that APN research predominantly features in nursing-specific journals, with the top 10 identified journals all dedicated to the nursing discipline. Notably, the *Clinical Nurse Specialist* and the *Journal of Advanced Nursing* emerged as the leading publishers of APN-related research. Classified under the “Nursing” category, which is part of the “Advanced Professional Nursing” subject area, these journals boast high impact factors, indicating

the high quality of their publications.²⁹ Analysis of the literature in these journals reveals a focus on empirical research and a keen interest in evaluating the APN role implementation.³⁰

Therefore, the prominence of APN research in such esteemed nursing journals may not only boost researcher enthusiasm but also positively influence the caliber of future research in the field.

Research Collaboration and Its Impact

This study revealed a limited degree of research collaboration among authors in the field of APN. Van Raan³¹ has shown that international collaborations, as measured by citation impact, tend to enhance the quality of research outcomes more significantly than efforts lacking such cooperation. Collaborative research, by pooling specific skills and data, not only boosts labor efficiency and the quality of findings but also facilitates scientific progress, knowledge generation, and breakthroughs.^{23,32} Despite the high rate of international research cooperation typically observed in the nursing specialty,³³ our analysis indicates that international collaboration in the APN domain is relatively scarce. This may be due to the unequal global advancement of APN within the nursing field.

The study suggests that developed countries engage in cooperative efforts with developing nations to offer APN training and practice. Such initiatives could accelerate the advancement of local APN capabilities. Moreover, we identified Jokiniemi, Krista, Kilpatrick, Kelley and Bryant-Lukosius, Denise as leading figures in this area. These prominent authors should provide guidance to emerging researchers. Their insights could be invaluable in understanding the field's dynamics and fostering robust partnerships to amplify collaborative efforts.

Influence of Leading Institutions and Journals

The analysis of networks across countries and institutions reveals that the United States leads in research output in the field of APN, with the University of Eastern Finland emerging as the most productive and influential institution. This prominence is attributed to the well-developed nursing education systems in these countries and governmental support for APN, recognizing its potential to address service gaps, particularly outside of rural and remote areas.³⁴ Despite this, the study identifies a notable lack of collaboration among the 44 contributing countries and 843 institutions. According to Pedro Sastre Fullana et al, the global disparity in the number of senior nursing practitioners not only creates confusion about the APN role but may also hinder its development and the realization of its benefits for vulnerable patient populations and the broader nursing sector.³⁵ To uncover the most effective APN practices, it's crucial to undertake expansive, multi-center, and international studies that encourage collaboration across countries and institutions. Such research can yield valuable insights and potentially redefine clinical practice standards.³⁶ Therefore, it is recommended that researchers, scholars and practitioners engage in large-scale, transnational research efforts to facilitate these outcomes.

Thematic Analysis: Education, Leadership, and Competencies

The education and development of APN have been pivotal themes in nursing, extensively discussed in the literature. The research underscores their impact on various aspects of nursing practice, such as care quality, patient satisfaction, management of chronic conditions, accessibility to primary care, caregiver retention and cost-effectiveness.^{6,11} Developing a comprehensive education and training model for APN is crucial to enhance clinical nursing quality.³⁷ This development is particularly challenging as APN education necessitates clinical mentors to supervise at least 500 hours of clinical practice, where mentors' behavior and teaching skills significantly influence student learning.³⁸ Therefore, to address this challenge, Cynthia Arslanian-Engoren et al have integrated the National Association of Clinical Nurse Specialist core competencies³⁸ and the consensus model of APRN education from 2008 into the revised APN curriculum.³⁹ This integration aims to align with the Doctor of Nursing Practice (DNP) program, fostering an effective and high-quality curriculum. Consequently, there is growing emphasis on refining APN education methods and content to meet these comprehensive goals.^{11,40,41} Moreover, defining the competencies required by APNs has emerged as a critical research focus. Developed countries with advanced APN roles concentrate on core competencies including quality management, safety, leadership, education, research, advocacy, communication, and collaboration.^{42–44} Recent studies have contributed to establishing validated APN competency standards, clarifying and standardizing APN core competencies, and further developing educational program curricula.^{42,45}

Evidence-Based Practice in APN Research

This study notably discovered that a significant portion of APN research in nursing is dedicated to topics related to EBP. This trend aligns with the healthcare sector's emphasis on improving quality indicators, patient satisfaction, and reducing costs. APNs are expected and tasked with integrating EBP into their practice, which research indicates leads to notable improvements in patient outcomes. These improvements encompass enhanced health status for individuals with chronic diseases, shorter hospital stays, lower readmission rates, and decreased mortality rates among cancer patients. These findings echo the research of Asma Taha et al and are consistent with Kring (2008) and Taha, Ballou, and Lama (2014).^{46,47} The effectiveness of APNs in this regard is attributed to their proficiency in EBP, enabling them to identify and implement optimal solutions for patient care issues. This capability not only boosts patient health outcomes but also contributes to cost savings and economic benefits, resonating with the ICN's theme for this year.

Policy Implications

Our findings have several implications for nursing regulations, healthcare policies, and international nursing standards. Countries with emerging APN roles can benefit from lessons learned in developed nations where APN implementation has been successful. Policy initiatives should focus on standardizing APN competencies, ensuring proper regulatory frameworks, and integrating APN roles into healthcare systems to enhance patient care quality.⁴⁸ Governments and academic institutions should prioritize policies that facilitate APN training and practice expansion, particularly in regions with underdeveloped APN roles.

Limitations

This study's reliance on the WoS database, while offering a structured and comprehensive dataset, may have led to the omission of relevant publications from other databases, including Scopus and PubMed. Additionally, the exclusion of non-English literature could contribute to the underrepresentation of research from non-English-speaking regions, particularly developing countries where APN roles are still emerging. Despite these limitations, WoS remains a widely recognized and authoritative source for bibliometric analysis, and the overall trends identified in this study are unlikely to be significantly altered. Future research could integrate multiple databases to provide a more comprehensive global perspective on APN research.

Conclusion

This study highlights the significant growth of APN research from 1992 to 2023, particularly post-2012, with a surge after 2020. While developed countries dominate APN research, contributions from developing nations remain limited due to resource constraints, policy gaps, and a lack of APN education frameworks. Addressing these disparities requires targeted initiatives such as capacity-building programs, policy support, and international collaborations.

Key research themes include APN education, competencies, and evidence-based practice. Future studies should focus on comparative APN implementation across healthcare systems, innovative training methods, and emerging fields like digital health and pandemic response. Strengthening global research collaboration is essential to advancing APN, and efforts should be made to establish international competency frameworks and cross-border partnerships.

These findings underscore the need for policymakers, educators, and researchers to expand APN roles, particularly in underrepresented regions, to enhance healthcare access and patient outcomes. By fostering collaboration and standardizing competencies, APN can continue to evolve as a crucial component of global healthcare.

Data Sharing Statement

All the data used in this study are available from the corresponding author Qian Cao.

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 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.

Disclosure

The authors declare no conflicts of interest in this work.

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