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EDITED BY

Hao Li,
Shanghai Jiao Tong University, China

REVIEWED BY

Yumao Zhang,
Sun Yat-sen University, China
Runchen Fu,
Shandong First Medical University, China

*CORRESPONDENCE

Na Su
✉ zoya159@163.com

†These authors have contributed equally to this work and share first authorship

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Global research trends of home pharmaceutical care: a bibliometric analysis via CiteSpace

Qingfang Wu^{1,2†}, Xiaorong Feng^{1,3†}, Chao Shen^{1†}, Ying Liu¹, Shiwen Yang¹ and Na Su^{1,4*}

¹Department of Pharmacy, West China Hospital, Sichuan University, Chengdu, China, ²Department of Pharmacy, The First People's Hospital of Shuangliu District, West China (Airport) Hospital of Sichuan University, Chengdu, China, ³Department of Pharmacy, Shangjin Hospital, West China Hospital, Sichuan University, Chengdu, China, ⁴West China School of Pharmacy, Sichuan University, Chengdu, China

Background: This study aimed to systematically review the research on home pharmaceutical care and to identify emerging trends and research hotspots using bibliometric methods.

Methods: Publications related to home pharmaceutical care, published from inception to 6 February 2025, were extracted from the Web of Science Core Collection (WoSCC). The bibliometric tool CiteSpace was employed to analyze various metrics, including the number of publications, contributing countries, institutions, authors, keywords, cited references, and research trends in the field of home pharmaceutical care.

Results: A total of 812 relevant articles were retrieved from the WoSCC. The most prolific contributors were Hughes CM, Nishtala, PS, and Lapane KL. The United States emerged as the leading country in the field, with Queen's University Belfast identified as the most productive institution. The keyword with the highest frequency was "pharmaceutical care." The research hotspots in this field were centered around "polypharmacy," "medication reconciliation," and "drug-related problems."

Conclusion: This study utilized CiteSpace to analyze research trends and hotspots in the field of home pharmaceutical care. The findings suggest that "polypharmacy" and "care homes" are likely to become focal points of future research. Additionally, the development of research in developing countries lags behind that in developed countries. Therefore, it is crucial for developing countries to learn from the advances made by developed nations in this field, and to foster greater international collaboration and research efforts.

KEYWORDS

bibliometric analysis, CiteSpace, home pharmaceutical care, visualization analysis, family pharmacist

1 Introduction

Home pharmaceutical care plays a vital role in ensuring the safety and effectiveness of medication management for patients in a home setting. It encompasses several essential functions, including the provision of medications and medical supplies, the establishment and maintenance of comprehensive patient medication profiles, and the facilitation of

communication and consultation with other healthcare professionals. Additionally, home pharmaceutical care involves educating patients and caregivers on the correct application and storage of medications, regularly reviewing and evaluating patients' medication plans, and preventing and monitoring drug-related problems. Pharmacists also provide critical drug information to the healthcare team and offer disease management support when needed. This comprehensive approach is fundamental to optimizing therapeutic outcomes, minimizing risks, and enhancing the overall quality of life for patients receiving care at home (1, 2).

Developed countries, such as the United States and the United Kingdom, were early adopters of home pharmaceutical care services, whereas the development in this area has progressed more slowly in developing countries. The implementation of home pharmaceutical care varies across countries. For instance, in the United States, pharmacists are integrated into the patient-centered medical home (PCMH) model, whereas in China, home pharmaceutical services are provided through collaboration between hospital and community pharmacists. Despite the growing recognition of the importance of home pharmaceutical care, the research hotspots and emerging trends in this field remain somewhat unclear. Bibliometrics, a quantitative statistical analysis tool, is widely used to analyze and track research trends (3–5), while CiteSpace is a software application that facilitates visualization and analysis to reveal research trends and connections among hotspots (6–9). In this study, we reviewed previous research on home pharmaceutical care and conducted an analysis of the research hotspots using bibliometric methods. The findings may help elucidate the historical development of research in this field and suggest new directions for future studies.

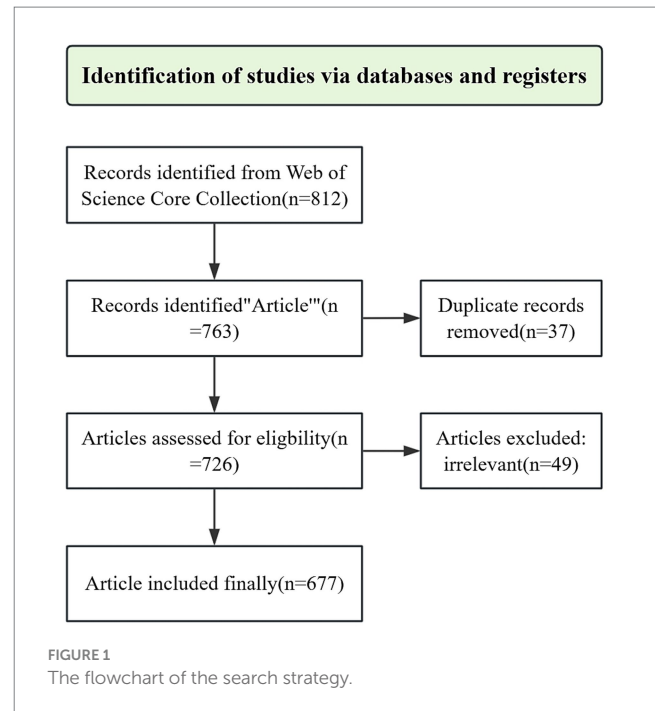
2 Methods

2.1 Search strategy and inclusion criteria

We performed a comprehensive search of the Web of Science Core Collection (WoSCC), which encompasses the Science Citation Index Expanded (SCI-EXPANDED) and the Social Sciences Citation Index (SSCI), to identify relevant publications from inception through 6 February 2025. The search strategy utilized the term “TS = home pharmaceutical care,” and was limited to articles published in English. To refine the selection, we applied exclusion criteria that eliminated case reports, conference papers, meeting abstracts, duplicate publications, articles lacking keywords or author information, and studies not directly related to the topic (Figure 1).

2.2 Bibliometrics and visualization analysis

We exported the selected articles in a plain text format, including full records and references. The data was then imported into CiteSpace 6.3.R1 for conversion and bibliometric analysis. The parameters in CiteSpace were set as follows: time slicing was configured from 1979 to 2025 with three-year intervals per slice; selection criteria were set to the top 10%; and pruning was performed using the pathfinder algorithm, with all other settings left at their default values. Additionally, we utilized CiteSpace to detect and extract keywords and references exhibiting citation bursts to forecast emerging trends in



home pharmaceutical care. We used the algorithm of Log Likelihood Ratio (LLR) to clustering keywords and references.

We generated co-citation maps for authors, institutions, countries, keywords, and references, as well as clusters of keywords and references via CiteSpace. In the co-citation maps, different nodes represent various elements (e.g., authors, institutions, references), with the size of each node proportional to its citation count and frequency. Links between nodes indicate mutual citation relationships, while centrality serves as a key indicator of a node's importance within the field. Nodes with higher centrality values are deemed more influential. The red areas in the tree rings of certain nodes highlight periods of citation or frequency bursts during the field's development. Different colored points and lines on the map allow us to identify specific years of occurrence or collaboration (10, 11).

To evaluate clustering, we used silhouette (S) values to assess the average contour value of clusters and modularity (Q) values to evaluate the significance of the clustering structure. A silhouette value greater than 0.7 indicates efficient and reliable clusters, while a modularity value exceeding 0.5 signifies a significant cluster structure (12). Additionally, Journal Citation Reports (JCRs) for 2023 were used to obtain journal impact factors. To ensure the accuracy and reliability of the data, two researchers (QW, SZ) independently performed data extraction and analysis management.

No informed consent or ethical approval was required for this study, as all data and information were derived from secondary sources available in the open-access database (WoSCC).

3 Results

3.1 Article distribution by publication year

After screening 812 publications from the Web of Science Core Collection (WoSCC), we included a total of 677 qualified publications

on home pharmaceutical care in our analysis. As illustrated in [Figure 2](#), these articles were published between 1979 and 2025, with an overall upward trend in annual publications over the past 40 years. This consistent growth indicates that the field of home pharmaceutical care holds significant potential for further development.

3.2 Cooperation networks among authors, institutions and countries

The visualization of the authors' cooperation network is depicted in [Figure 3](#), with the top three most prolific authors being Hughes, CM (7 articles), Nishtala, PS (5 articles), and Lapane, KL (5 articles). [Figure 4](#) illustrates the distribution of publications by institution, where the Queen's University Belfast emerges as the most productive, with 18 publications, followed by the University of London (14 articles) and the University of Sydney (13 articles). The cooperation network among countries is presented in [Figure 5](#), highlighting that the United States leads with 200 articles, followed by the United Kingdom with 100 articles, and Australia with 55 articles. Notably, the publication count for the United Kingdom includes contributions from England, Scotland, Northern Ireland, and Wales, as manually calculated ([Table 1](#)). The United States demonstrates the highest centrality in the network (centrality = 0.46).

3.3 Keywords analysis with cooperation network, clusters, and citation burst

Keyword analysis reveals research hotspots in home pharmaceutical care. [Figure 6](#) shows the keyword network with “pharmaceutical care” (104 records) “care” (81 records), and “management” (45 records) as the top three keywords ([Table 2](#)). Clustering identified 19 keyword groups ([Figure 7](#)), with the top clusters being #0 polypharmacy, #1 medication reconciliation, #2 drug-related problems. The clustering reliability was high

($Q = 0.7035$ $S = 0.8909$). [Table 3](#) lists the top 10 keywords with the strongest citation bursts including “pharmaceutical services” (strength = 10.86, 1992–2008) and “health care” (strength = 7.43, 1992–2005).

3.4 Co-citation analysis on authors, journals

[Supplementary Figures 1, 2](#) display author and journal co-citation networks. The World Health Organization (WHO) was the most cited author (86 records). Among journals, *Journal of the American Geriatrics Society* (IF2023 = 4.3, 170 records) ranked first, followed by *Journal of the American Medical Association (JAMA)* (IF2023 = 63.1, 150 records) and *PLOS ONE* (IF2023 = 2.9, 147 records) ([Supplementary Table 1](#)).

3.5 References analysis with co-citation, clusters, and citation burst

Visualization analysis of references can also aid in identifying key research hotspots within this field. As illustrated in [Supplementary Figure 3](#), the top three most co-cited references are authored by Alldred DP (2016), Moher D (2015), and Masnoon N (2017). We conducted cluster analysis ([Supplementary Figure 4](#)) and burst analysis ([Table 4](#)) on the cited literature, with the article by Alldred DP exhibiting the highest burst strength of 4.97. The most frequent co-cited reference (written by Alldred DP in 2016) was about that pharmacist-led interventions to optimize prescribing for elders in care homes had some function of identifying and solving some drug related problems, as well as improving drug appropriateness (13). There were three references (written by Masnoon N in 2017, Schluter PJ in 2016, Abbott RA in 2020) were the research hotspots with high citation burst in recent years ([Table 4](#)), which mainly researched into polypharmacy, COVID-19 and old people (14–16).

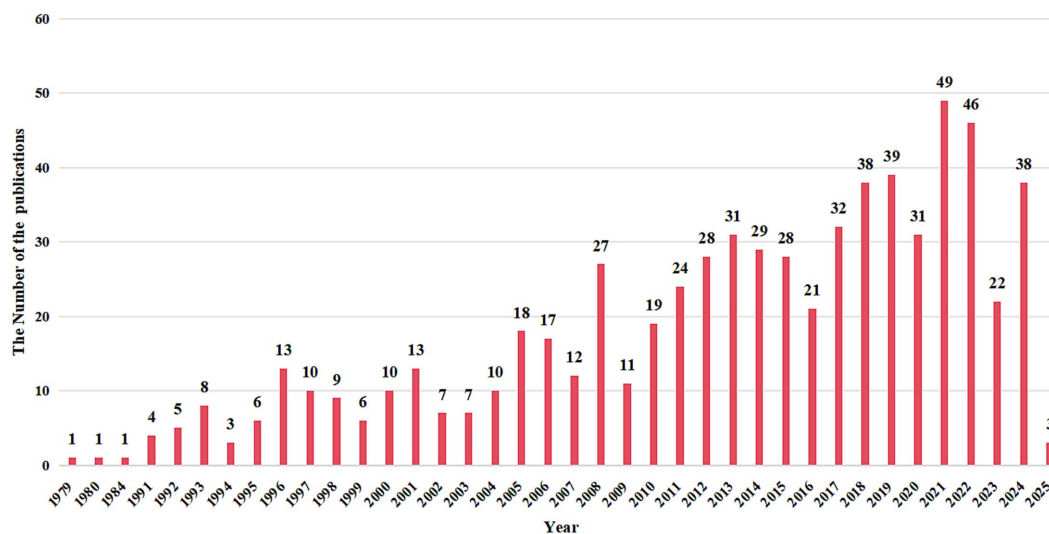
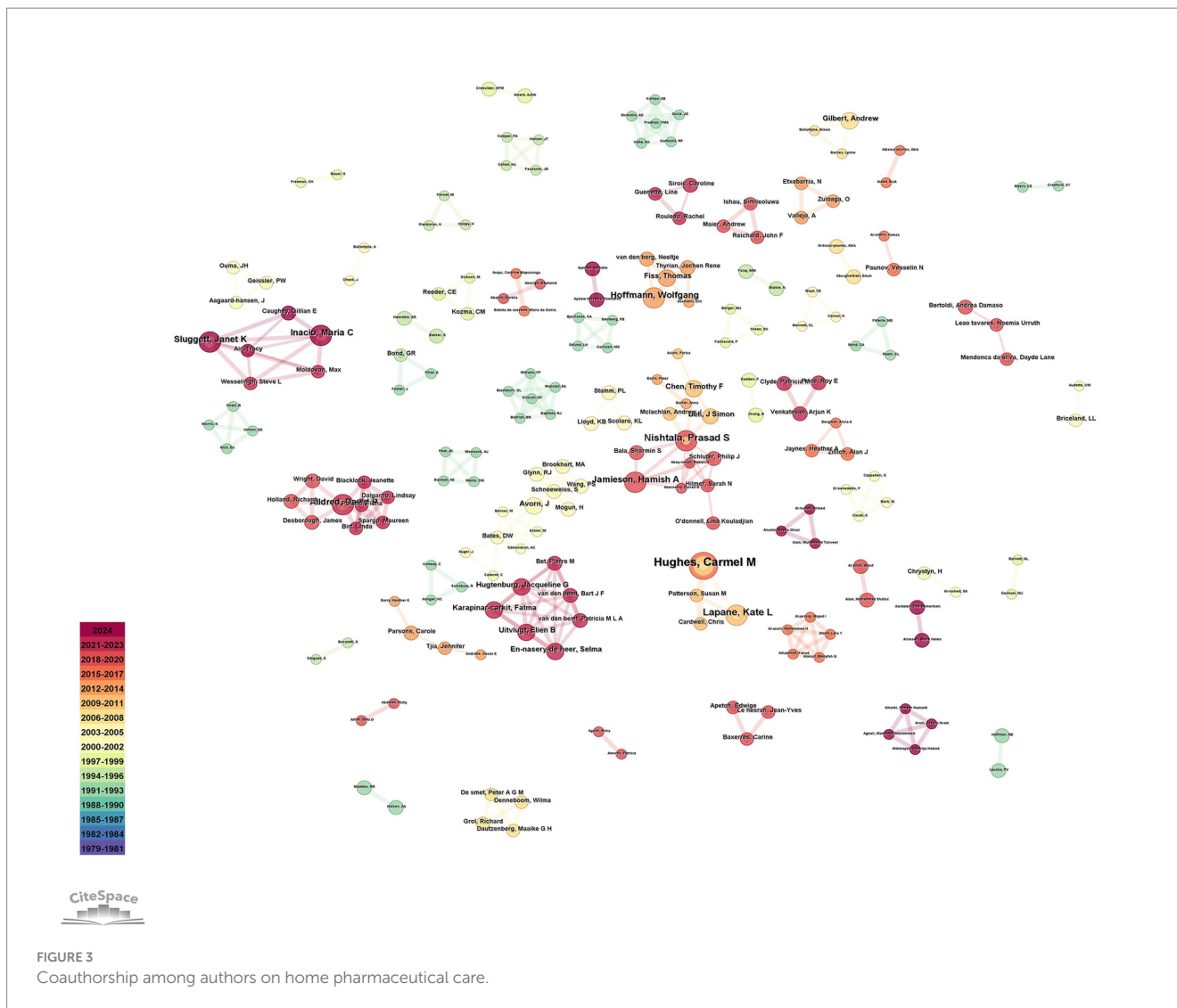


FIGURE 2
The trend of the number of publications over the years.



4 Discussion

4.1 Current status of the development of home pharmacy services

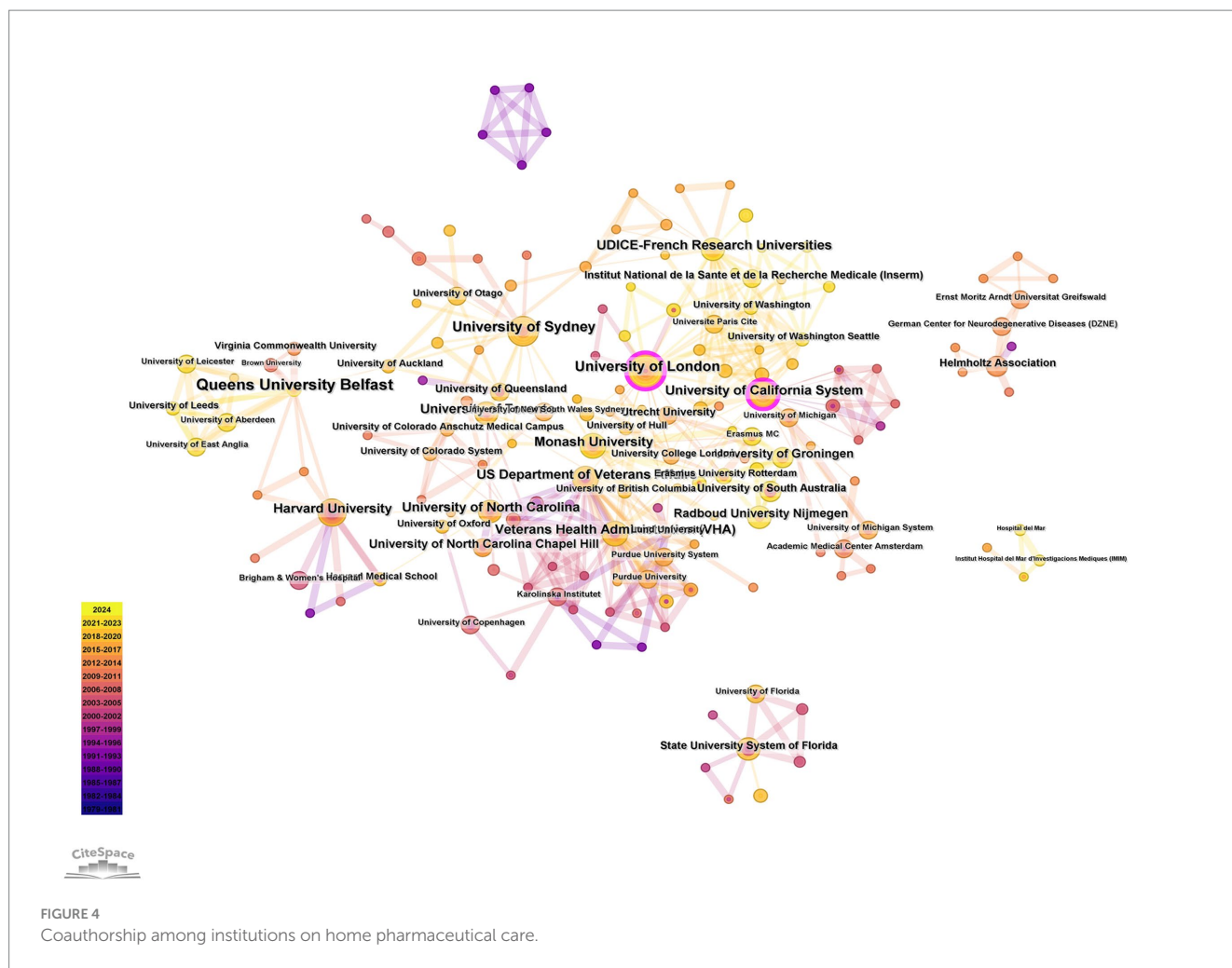
Over the past four decades, a growing body of research has focused on home pharmaceutical care, leading to a surge of contributions in this emerging field. Nine of the top 10 most productive countries were developed nations, with the United States demonstrating the strongest scholarly influence (centrality = 0.46). These findings underscore significant disparities in the advancement of home pharmaceutical care services between developed and developing economies. Family pharmacist services in foreign countries are mainly undertaken by community pharmacists, providing patients with a variety of medical and health-related items of pharmacy services, such as anticoagulation management, pain management, body quality management, drug counseling and so on, and a lot of studies have found that community pharmacists through home pharmaceutical services can improve patients' medication adherence and therapeutic effects, reduce the expenditure of drug costs, and reduce the readmission rate of discharged patients, and so

on. In UK, Pharmacists conduct home visits within 3 days of discharge to optimize medication use, collaborating with GPs in team meetings to develop personalized treatment plans. This model reduces hospital readmissions by 22% through improved medication adherence (NHS England, 2023). Some developing countries, on the other hand, are following the example of developed countries (e.g., conducting contracted teams of family pharmacists), but have not developed a system. But it's worth mentioning, in recent years, several studies have shown that home pharmaceutical care can significantly reduce the number of medications and interactions in patients with overuse of multiple medications and high healthcare utilization in the developing countries (17).

Bibliometric analyses reveal the following key factors contributing to lagging development in developing countries:

a Late Initiation of Services

The earliest literature on home pharmaceutical care dates to 1979 (United States), whereas developing countries, such as China (the highest contributor in publication volume), published their first research only in 2011.



b Deficiencies in Pharmacist Training Systems

Developing countries lack standardized training frameworks comparable to those in developed nations. Most community pharmacists in these regions cannot independently deliver home pharmaceutical care. For instance: Training systems in developing countries prioritize complex clinical education. In contrast, U.S. institutions implement experiential residency programs where pharmacy students lead transitional care for inpatients and outpatients, including medication reconciliation, discharge counseling, and post-discharge follow-ups. Such training equips graduates with patient communication skills and medication management expertise (18).

c Inadequate Compensation Mechanisms

Community pharmacists in developed nations receive remuneration through government subsidies (e.g., NHS funding), medicare payment system, or third-party platforms. Conversely, most developing countries do not charge for home pharmaceutical services, resulting in limited financial incentives for pharmacists to transition into this field.

d Shortage of Pharmacists

The scarcity of qualified professionals further exacerbates disparities. In China, for example, as of April 2016, China had 413,774 licensed pharmacists, with only 277,967 registered practitioners—a pharmacist-to-population ratio of 1:4,643. This ratio is substantially lower than in developed nations (e.g., the ratio of USA is 1:1,200), and fewer than 15% of licensed pharmacists practice in community settings, where demand for home pharmaceutical services is highest.

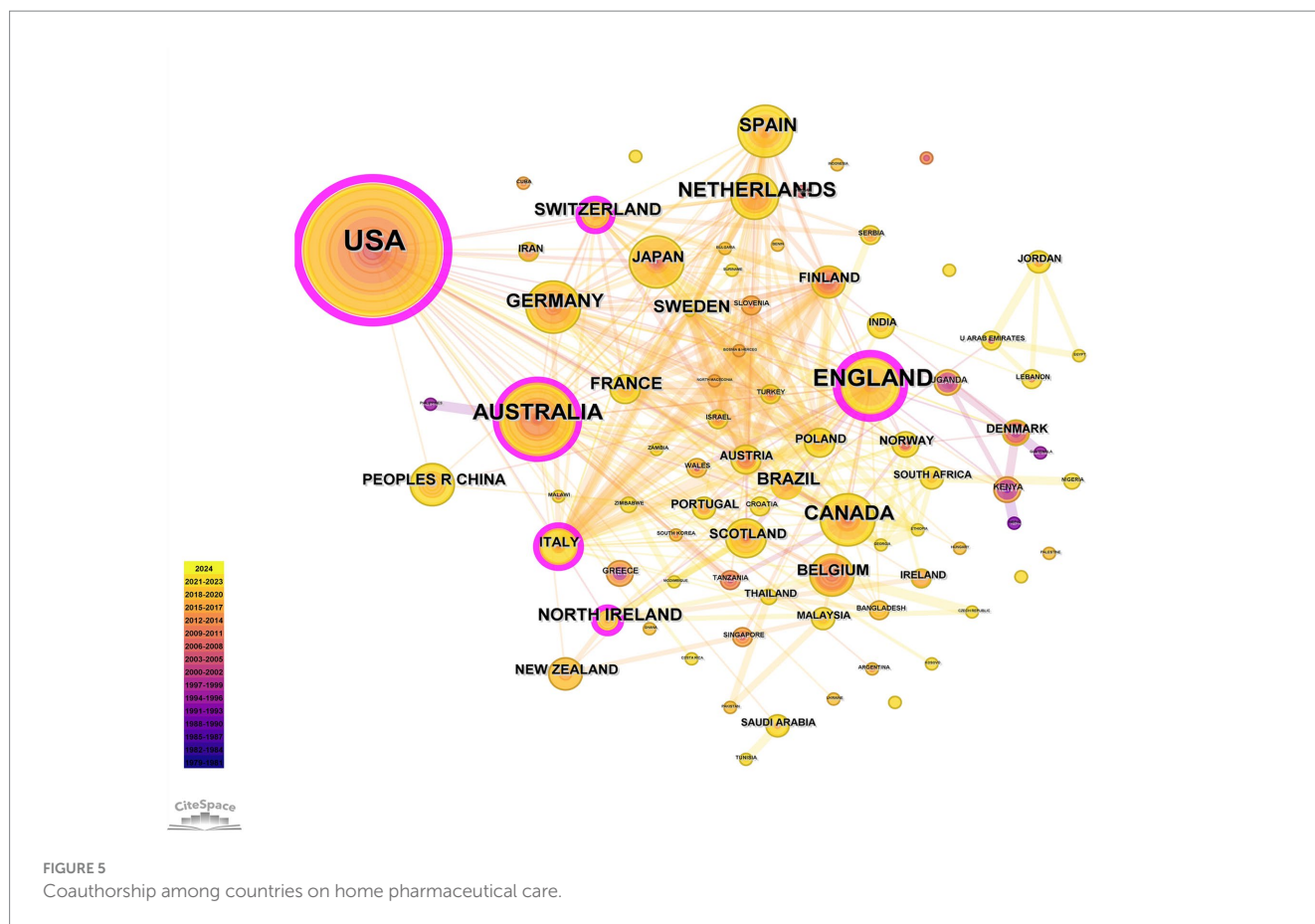
In conclusion, the combined effects of delayed initiation, insufficient training, inadequate incentives, and workforce shortages have resulted in marked gaps in both the quantity and quality of home pharmaceutical care services between developing and developed economies. Addressing these systemic challenges requires policy reforms, standardized training frameworks, and sustainable reimbursement models to align with global best practices.

4.2 Research hotspots

Based on the visualization results by CiteSpace, we summarized the hot research on home pharmaceutical care.

4.2.1 Medication reconciliation

Medication reconciliation aims to ensure patient medical safety to the maximum extent, achieve the accuracy and



continuity of drug treatment, and reduce clinical medication errors and adverse drug events (ADEs). An important task of home pharmaceutical care is medication reconciliation to prevent harm from medications as much as possible. Many scholars have demonstrated that implementing medication reconciliation by pharmacists at all medical care periods is an effective strategy for preventing adverse drug events (19–21). Medication reconciliation participated by pharmacists in primary health care indicates to be efficacious to reduce the number of patients with potentially inappropriate medications (PIMs), which might improve the quality of pharmacotherapy in old people (22). As in many sectors of healthcare, pharmacists play important roles in the home pharmaceutical care of discharged patients. Completion of medication reconciliation by community pharmacists and primary care pharmacists has been prioritized (23). Pharmacists help patients to reduce the readmission rate and medical costs of health care by effective medication reconciliation (24, 25). Michaelsen et al. (26) conducted a retrospective study of differences in medication continuation after discharge and found that 20%–87% of patients were of vary difference in medication use after discharge and the most common reasons are medication omissions and differences in administration method/frequency/dose. It is apparently essential to carry out home pharmaceutical care for discharged patients to ensure the effectiveness and safety of patient medication.

4.2.2 Polypharmacy

Polypharmacy is usually defined as the simultaneous medication therapy with five or more drugs. Polypharmacy is associated with multiple adverse outcomes, including mortality, falls, adverse drug reactions, prolonged hospitalization, and readmission. Natali et al. (27) revealed a high prevalence of polypharmacy in long-term care facilities, with up to 91%, 74%, and 65% of residents taking more than 5, 9, and 10 medications, respectively. Polypharmacy is common in older populations with multiple diseases, accompanied by the use of one or more drugs to treat each disease. Leelakanok et al. (28) found that multidrug therapy is associated with an increase in mortality, and proposed the necessity of achieving the best balance between risk and benefit in healthcare through drug prescription. Compared with usual care, home pharmaceutical care for polypharmacy patients reduced the probability of receiving ≥ 10 medications and the mean number of PIMs (29). Greater professional autonomy medication review can optimize pharmaceutical care. As the role of home pharmaceutical care is expanding in many countries, this role shows what more could be achieved with pharmacists.

4.2.3 Special populations

Some special populations, such as elderly patients, women and persons with multiple chronic diseases, are at higher risk of PIMs (30). These special patients require more home pharmaceutical care. PIM is an important public health problem, particularly among

TABLE 1 The top 10 of the most active authors, institutions and countries.

Rank	Categories	Records
Author		
1	Hughes, CM	7
2	Nishtala, PS	5
3	Lapane, KL	5
4	Inacio, MC	4
5	Alldred, DP	4
6	Hoffmann, Wolfgang	4
7	Jamieson, HA	4
8	Sluggett, JK	4
9	Chen, TF	3
10	Uitvlugt, Elien B	3
Institution		
1	Queen's University Belfast	18
2	The University of London	14
3	The University of Sydney	13
4	Harvard University	12
5	University of California System The University of Queensland	11
6	Veterans Health Administration (VHA)	11
7	Monash University	11
8	US Department of Veterans Affairs	11
9	University of Toronto	10
10	UDICE-French Research Universities	10
Country		
1	USA	200
2	UK	100
3	AUSTRALIA	55
4	NETHERLANDS	42
5	CANADA	36
6	GERMANY	33
7	SPAIN	32
8	BRAZIL	32
9	SWITZERLAND	20
10	CHINA	20

The records of the UK in the article, it should be noted, was the sum of publications of England, Scotland, Northern Ireland and Welsh by manual calculation.

older people over 65 years (31). Wimmer et al. (32) found that the increased hospitalization rates are closely related to the worse medication adherence of patients and complexity of medication regimens. Another study found that elderly patients with less complex medication regimens may voluntarily discontinue medication when they feel no improvement in their self-perception. Jerry et al. discovered, by monitoring 18 participating sanatoriums and almost 30,000 individuals during the observation period, a great number of ADEs and PIMs emerged. Some errors can be prevented during the ordering stage and errors during monitoring stages are the most common. The other errors in transcription, allocation, and administration are relatively rare to

find. Psychoactive drugs and anticoagulants are the most common drugs associated with preventable adverse drug events (33). Alqenae et al. (34) found that adverse drug events after discharge have a significant potential risk. The most common factor is organizational coordination among workers in various functions. The 2019 American Geriatrics Society Beers Criteria lists PIMs to be avoided in older adults (35). The criteria's new list released by this standard emphasizes the importance of selecting drugs based on patients' renal function, including drugs that should be avoided or drugs that require dosage adjustments, as well as selecting drugs with no interactions documented to be associated with harms in older adults (36).

TABLE 4 Top 10 references with the strongest citation bursts.

References	Year	Strength	Begin	End	1979–2025
Holland R, 2008, BRIT J CLIN PHARMACO, V65, P303, DOI 10.1111/j.1365-2125.2007.03071.x	2008	3.56	2011	2013	
Forsetlund L, 2011, BMC GERIATR, V11, P0, DOI 10.1186/1471-2318-11-16	2011	3.52	2011	2016	
Kaur S, 2009, DRUG AGING, V26, P1013, DOI 10.2165/11318890-000000000-00000	2009	3.11	2011	2013	
Gillespie U, 2009, ARCH INTERN MED, V169, P894, DOI 10.1001/archinternmed.2009.71	2009	3.11	2011	2013	
Moher D, 2015, SYST REV-LONDON, V4, P0, DOI 10.1186/2046-4053-4-1	2015	3.82	2015	2019	
Allred DP, 2013, COCHRANE DB SYST REV, V0, P0, DOI 10.1002/14651858.CD009095.pub2	2013	3.04	2014	2019	
Allred DP, 2016, COCHRANE DB SYST REV, V0, P0, DOI 10.1002/14651858.CD009095.pub3	2016	4.97	2017	2022	
Frankenthal D, 2014, J AM GERIATR SOC, V62, P1658, DOI 10.1111/jgs.12993	2014	3.23	2017	2019	
Masnoon N, 2017, BMC GERIATR, V17, P0, DOI 10.1186/s12877-017-0621-2	2017	3.27	2020	2022	
Fick DM, 2019, J AM GERIATR SOC, V67, P674, DOI 10.1111/jgs.15767	2019	3.09	2020	2025	

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Author contributions

QW: Formal analysis, Writing – original draft. XF: Writing – review & editing. CS: Data curation, Writing – original draft. YL: Writing – review & editing. Software. SY: Writing – review & editing. Validation. NS: Conceptualization, Investigation, Software, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmed.2025.1489720/full#supplementary-material>

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