

Original Paper

CiteSpace Visual Analysis of Community Pharmacy Services in China: Bridging Local Insights and Global Trends

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Abstract

Purpose: This research traces the history of pharmacy services research in Chinese pharmacies over the past twenty years and attempts to identify key trends and hotspots consistent with global practices.

Methodology: From January 2002 to December 2022, we leveraged databases such as CNKI, VIP, and Wanfang and deployed CiteSpace 5.8.R3 to visualize publication trends, authorship, and institutional contributions within the field. Results: Our synthesis highlights critical developments in drug safety monitoring, prescription management, pharmacoeconomics, and public health education and highlights the leadership of respected researchers and institutions. Conclusion: The “Internet+” paradigm is identified as an important catalyst for pharmacy services innovation, with implications that extend beyond China and suggest models for international adaptation and strategy development.

Keywords

Pharmacy services, CiteSpace software, Visual analysis

1. Introduction

As an important complement to healthcare organizations, social pharmacies are another important provider of pharmacy services and play an important role beyond hospital pharmacies. In social pharmacies, the strength or weakness of the pharmacy service has a decisive influence on the quality of life and health protection of consumers. As a pharmaceutical sales terminal, social pharmacies offer patients a convenient and efficient option for medication treatment. With the continuous development of drug and healthcare system reform, consumers are increasingly concerned about the quality of pharmacy services provided by social pharmacies (He, Lv, & Xie, 2017). Currently, most social pharmacies in China are still based on traditional outpatient pharmacies, which are mainly responsible

for the daily drug treatment and supply of patients. Pharmacy services in social pharmacies differ from clinical pharmacy services in hospitals in that they are directly aimed at the consumer group, and therefore when purchasing medicines, consumers pay more attention to receiving high-quality and satisfactory services, such as advice on decision-making drug use and advice on drug use methods. In addition, due to the late start, social pharmacy in China is still in the early stages of exploration and there are many problems. In today's new historical period and situation, accelerating the transformation of the pharmacy service model, promoting the high-quality development of pharmacy services in social pharmacies, and improving the level of pharmacy services in all aspects are crucial to the standardization management of drug operationalization and promoting the development of the Retail (Jiang & Jing, 2021). With the continuous improvement of the socio-economic level, people's quality of life has improved significantly and their health care requirements have become more and more high. Therefore, in order to better meet consumers' needs and expectations, social pharmacies should strive to improve the quality and standard of their pharmacy services.

In recent years, scholars have conducted extensive and in-depth research on pharmacy services, and although analyzes from various perspectives have been included (Yan, 2018; Zhang et al., 2021), a systematic discussion is lacking. Although most social pharmacies in China currently operate under a traditional outpatient model, they still face the challenge of providing comprehensive pharmacy services that are of high quality and meet consumer needs. Given this background, this study uses CiteSpace software and adopts a scientific knowledge mapping approach to systematically analyze the literature on pharmacy services in domestic pharmacies to reveal their research trends, distribution, hotspots and limitations. This is of great importance for optimizing the pharmacy service model and promoting high-quality development of the industry. Our analysis shows that in recent years, domestic pharmacy service research has mainly focused on the transparency of drug instructions, the quality of drug advice and the effectiveness of drug advice, which are particularly important for improving pharmacy services and promoting the progress of the industry. Using a CiteSpace analysis, this study reveals the advances and challenges within pharmacy services in China and provides insights that contribute to the international discourse on optimizing pharmacy practice and advancing the sector's quality standards.

2. Information and Methods

2.1 Literature Sources

In order to search the literature related to pharmacy services, we used two subject terms "pharmacy + pharmacy services" and "social pharmacy + pharmacy services" and searched in China Knowledge Network, Wipro database and Wanfang database. The collected literature was categorized according to its content and then sorted in a certain way. The type of literature we limited was journal literature, the language used was Chinese, and the search period spanned from January 1, 2002 to December 31, 2021. These documents were categorized and organized according to the class classification method of the

fourth edition of the Chinese Graphic Law. In order to compensate for the lack of subject search function in the VIP database, we used title or keyword search. For the literature not included in the above scope, we obtained the relevant information by manual reading or manual review. After screening, we exported the screened documents in Refworks-citespace format and added "download_" in front of the file name to ensure that they met the inclusion criteria". They could be reordered, labeled, etc. if necessary. The literature screening criteria we used were: for studies related to pharmacy pharmacy services; 2) the article was available from January 2002 to December 2021; and 3) the language I used was Chinese. The exclusion criteria included 1) duplicate publications to ensure the accuracy and reliability of the information; and 2) various types of literature, including but not limited to call for papers, conference abstracts, guidelines, short reviews, and conference announcements, were available.

2.2 Analysis Methods

As a data source, we constructed a knowledge map of the research field of digital resource construction in university libraries in China by using relevant articles in CiteSpace 5.8 as a data source. The time interval is set from January 1, 2002 to December 31, 2022, the time slice is 1, and the settings of model, threshold, and cut are the system defaults. Co-occurrence analysis is performed on the corresponding nodes of authors, institutions and keywords, and visualization maps are drawn, and the results are finally analyzed in depth with professional knowledge. In order to ensure the directionality and semantic specification of the results, we integrated the synonyms of keywords and institutions in the literature. Finally, the mutation degree of the keywords was analyzed in depth using the mutation word detection function of CiteSpace software to explore the hotspots of current research and future trends.

In this study, the annual distribution statistics of the number of articles issued in 597 journal literatures on pharmacy pharmacy services, spanning from January 2002 to December 2022, were conducted, and the specific results are presented in Figure 1. As a whole, there is still a large gap between the quality of pharmacy services in China's pharmacies and that of foreign countries, and this gap will become larger and larger with the passage of time, which needs to attract our sufficient attention. Since 2002, the number of articles published in the study of pharmacy pharmacy services in China has shown a trend of rapid fluctuation and increase until it reached a peak in 2008, with a total of 45 articles published; during this three-year period, new papers appeared every year, but the overall trend of growth was shown. Since 2009, the number of articles has shown a fluctuating trend of change, while the number of articles published has steadily climbed year by year over the past three years.

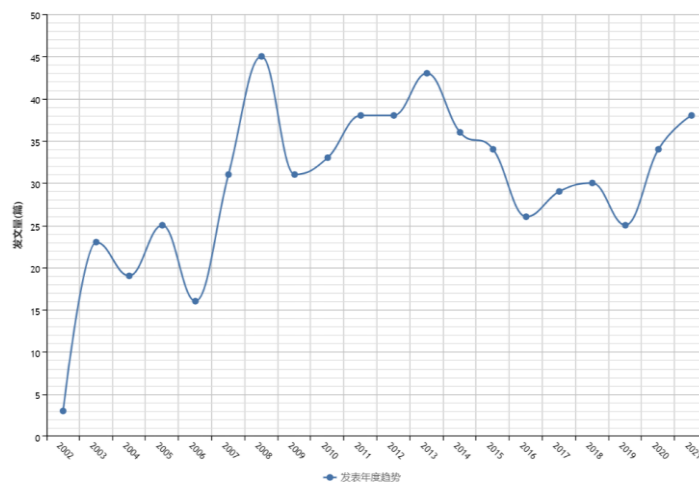


Figure 1. The Number of Published Articles about Pharmacy Pharmaceutical Care

2.3 Authors

This paper contains a total of 579 journal documents, with the issuing authors as the network nodes, using CiteSpace 5.8.R3 software to construct a network graph of author cooperation (see Figure 2 for details). In this graph, the frequency of authors' posting is closely related to the size of nodes, which determines the frequency of posting; the edge length represents the length of the article at the time of publication, and the shorter it is indicates that the paper has been cited fewer times or does not have enough time to update its own information. The strength of cooperation between authors can be reflected by the connectivity between nodes, and the connection becomes stronger as the coarseness of the connectivity increases. Although authors such as Fang Yu, Yang Shimin, and Huang Taikang have relatively large collaborative networks, collaboration among other authors is relatively sparse. In addition, the high percentage of co-authorship by authors is also an important factor in forming this pattern. The following is a list of the top ten authors in Table 1, with Li Chaohui, Yang Shimin and Fang Yu in the top three, respectively.

Table 1. Top 10 Authors in the Number of Studies Related to Pharmacy Pharmaceutical Care

No.	Author	Intensity	Frequency
1	Wong Tai Hong	10	8
2	Li Chao Hui	9	13
3	Yang Shimin	14	11
4	Chen Yuwen	6	6
5	Fang Yu	17	11
6	Zhou Yue	8	7
7	Ni Yongbing	2	7
8	Wu Hai Man	0	6

9	Yang Yaming	5	6
10	Zhu Wenjing	6	5



Figure 2. Collaboration Network of Authors of Pharmacy Pharmaceutical Care Related Studies

2.4 Issuing Organization

This study collected 579 journal articles on pharmacy pharmacy services, spanning from January 2002 to December 2021, and mapped the collaborative network of issuing organizations using CiteSpace 5.8.R3 software with issuing organizations as network nodes (see Figure 3 for details). The size of the nodes reflects the size of the issuing organization, while the size of the nodes reflects the frequency of issuing, and the larger nodes represent an increase in the frequency of issuing; the intensity of cooperation between organizations can be measured by the connecting lines between the nodes, and the connection between the organizations is determined by the degree of closeness represented by the thicker connecting lines. China Pharmaceutical University, Shenyang Pharmaceutical University and State Drug Administration Licensed Pharmacist Qualification Center ranked the highest in this cooperation network, and the number of their published papers reached 42, 38 and 20, respectively, as shown in Table 2.



Figure 3. Collaboration Network of Institutions of Pharmacy Pharmaceutical Care Related Studies

Table 2. Top 10 Institutions in the Number of Studies Related to Pharmacy Pharmaceutical Care

No.	Number publications	Author's organization
1	42	China Pharmaceutical University
2	38	Shenyang Pharmaceutical University
3	20	State Drug Administration Licensed Pharmacist Qualification Center
4	17	Sichuan University
5	11	Fudan University
6	11	Huazhong University of Science and Technology
7	10	Zhejiang Medical College
8	10	Jiangsu Pharmaceutical Vocational College
9	8	Liaoning University of Traditional Chinese Medicine
10	7	Guangdong Food and Drug Vocational College

2.5 Keyword Co-occurrence

Through the analysis of keyword co-occurrence, we can deeply explore the themes and hotspots in the field of scientific research, as well as monitor the evolutionary trend of the research frontiers in a certain field of knowledge (Yu et al., 2017). Keywords play an important role in the dissemination of scientific information, and their in-depth analysis helps to understand the current status of the development of the discipline and predict future trends. Citespace software was used to analyze the keywords of Node types, which were set as Keyword, with the time range of 2002-2022 and the time slice time of 1 year, and the keywords with the top 10 frequency of occurrence were analyzed, and the specific analysis results are detailed in Table 3. The visualization tools were used to make the relationship diagram and cluster diagram between the keywords, as well as the relationship diagrams between the core authors and their collaborations, etc. were visually described. We constructed a knowledge graph for retrieving keywords in the literature, and the details are shown in Figure 4. The nodes represent the co-occurrence frequency of the keywords in the graph, and the size of the nodes reflects the co-occurrence frequency of the keywords, which increases as the nodes increase in size; the co-occurrence intensity between the keywords can be expressed by the connecting lines between the nodes. In the research field of pharmacy pharmacy services, in addition to pharmacy services, social pharmacy and social pharmacy, keywords such as licensed pharmacist, consumer, pharmacist and GPP are also at the center of much attention.

In social pharmacy, pharmacy service is crucial, so practitioners need to continuously improve their responsibility and professional skills in order to timely and accurately meet the needs of different consumers regarding the route of administration, dosage, efficacy and contraindications through effective communication (Qin, Maung, Li, & Zheng, n.d.). In recent years, due to the state's attention to the pharmaceutical industry and the people's increasing awareness of self-protection, the public awareness of drug safety has been gradually strengthened, and people are more concerned about the

safety and effectiveness of drugs. With the continuous promotion of China's medical reform, social pharmacies have gradually emerged as the backbone of the drug retail market. In order to ensure the safety, rationality and economy of public medication and safeguard the interests of patients, it is imperative to strengthen the professional education of social pharmacy practitioners. As the main body providing professional pharmacy services, the level of pharmacy service competence of licensed pharmacists is a prerequisite for ensuring the provision of high-quality pharmacy services.

Table 3. Top 10 High-frequency Keywords in Studies Related to Pharmacy Pharmaceutical Care

Frequency	Emergent value	Intensity	Centrality	Keywords
174		147	0.48	Pharmacy Services
119		108	0.30	Licensed Pharmacists
116		127	0.35	Social Pharmacy
63	5.59	66	0.16	Social Pharmacy
49	3.41	45	0.07	Pharmacy
24	3.11	34	0.06	Consumers
22		29	0.06	Countermeasures
20		20	0.03	Pharmacists
19	5.01	22	0.04	Online Pharmacy
15	5.58	15	0.02	GPP

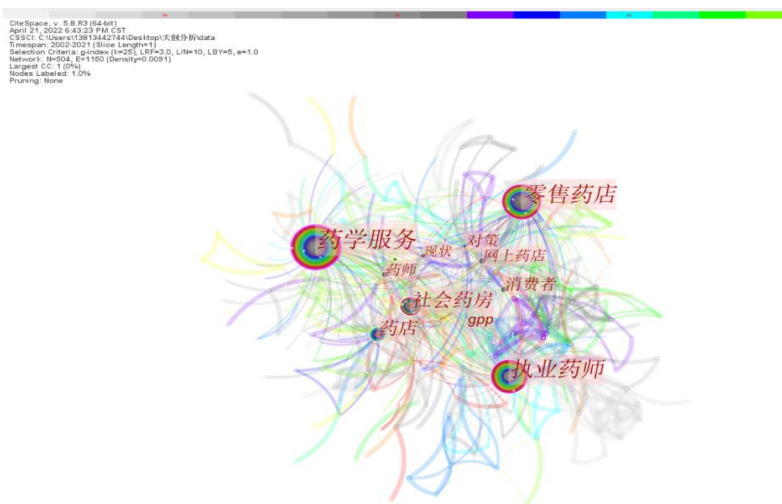


Figure 4. Keywords Co-occurrence Map of Studies Related to Pharmacy Pharmaceutical Care

2.6 Keyword Clustering

Cluster analysis of keywords is to cluster closely related keywords together, which can reflect the current hotspot of research in a certain field. In order to more clearly reflect the pharmacy to carry out

pharmacy services focus on research content, this paper used CiteSpace to carry out keyword clustering analysis, obtained 10 clusters as shown in Figure 5. In the figure, # represents the clusters, 0 represents the largest cluster, 1 represents the second largest cluster, and so on. The current major research areas can be categorized into the following types: #0 Pharmacy, #1 Retail Pharmacy, #2 Licensed Pharmacists, #3 Social Pharmacy, #4 Current Situation, #5 Chronic Disease Management, #6 Single-pharmacy, #7 Countermeasures, #8 Chain Pharmacies, #9 Internet+. The main keywords contained in each research direction are shown in Table 4.

Patients with chronic diseases such as hypertension and diabetes mellitus are distributed in different age groups and need to take medication for a long time. Sometimes patients take their own medication without following the doctor's instructions because they cannot go to the hospital for follow-up in time (Huang et al., 2020). This condition can cause or exacerbate adverse drug events and even delay life-saving treatment. The development of chronic disease pharmacy service in social pharmacy is that the pharmacist in social pharmacy carries out comprehensive, active and efficient pharmacy service for patients with chronic disease, so that patients with chronic disease can get better therapeutic effect, and then promote the recovery of patients. In June 2018, China Pharmaceutical Business Association also promulgated the "Code of Practice for Chronic Disease Drug Service in the Operation of Social Pharmacies". It stipulates that social pharmacies are required to operate chronic disease treatment drugs and pharmacy services.

In November 2018, the National Health Commission and the State Administration of Traditional Chinese Medicine jointly issued the Opinions on Accelerating the High-quality Development of Pharmacy Services, stating that the "Internet + pharmacy services" model should be actively promoted (Luo et al., 2020). Internet technology can build an online-offline (O2O) model of pharmacy services for patients with chronic diseases. At the same time, this model also helps to increase the number of patients and licensed pharmacists to communicate with each other and bring the distance between patients and licensed pharmacists closer (Li, Qiu, & Wang, 2020).

Table 4. Keywords in Different Research Fields

No.	Cluster number	Cluster content
1	0#Pharmacy Services	Pharmacy services; Rational medication use; Pharmacovigilance; Social pharmacy; Practice room management; Licensed pharmacists; Service quality; Transaction costs; Third party surveys.
2	1#Social Pharmacy	Social pharmacy; Resident pharmacist; Professional ethics; Separation of medicines; Duplicate medication, practicing pharmacist; Professional ethics; Practice level; Separation of medicines; Duplicate medication.
3	2#Practicing pharmacist	Licensed pharmacists; Pharmacy services; Role positioning; Credit regulation; Irreplaceable; Social pharmacy; Good pharmacy work

		standard; Classification management system; Development status analysis; Enterprise management level
4	3#Social Pharmacy	Social pharmacy, China Association of Over-the-Counter Drugs, healthcare, Good Pharmacy Practice, quality of healthcare services, pharmacy services, Good Pharmacy Practice (gpp), quality of healthcare services, U.S. healthcare reform, number of doses administered
5	4#Online Pharmacy	online pharmacies, chemical raw materials, social pharmacy practitioners, hospital resources, specialties, chemical raw materials, outdoor advertising, physician prescriptions, pharmaceutical companies, cephalosporin antibiotics
6	5#Disease management	Chronic disease management, chronic patients, business model, e-prescribing, retail chains, social pharmacy, licensed pharmacists, community health service stations, publicly-funded healthcare, satisfaction level
7	6#Single Pharmacy	Single-unit pharmacy, retail chain enterprise, merger and reorganization, pharmaceutical retail market, licensed pharmacist, pharmaceutical chain, Sinopharm Holdings, Sinopharm stock, online pharmacy
8	7#Countermeasures	Countermeasures, multi-dimensionalization, pharmacy services, directly-managed pharmacy, directly-managed pharmacy, chain pharmacy, Shihezi City, problems, multi-dimensionalization;...
9	8#Chain drugstores	Chain drugstores, innovative development, pharmaceutical circulation, pharmacy salesperson, Beijing residents, pharmacy services, analyzing the current situation, countermeasure research, pharmaceutical circulation
10	9#Internet+	Internet+, grassroots status, problems and dilemmas, practicing pharmacists, reasonable suggestions , electronic prescriptions, consumer satisfaction, semi-structured interviews, questionnaire surveys, social pharmacies

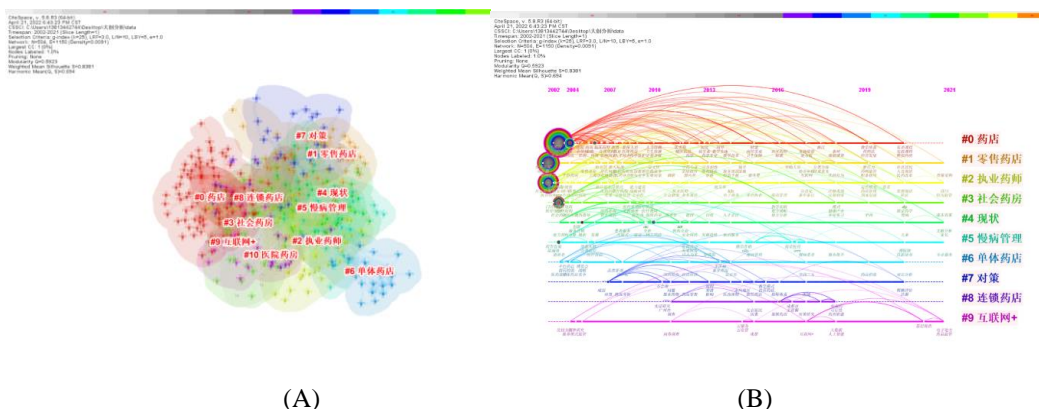


Figure 5. Map of Key Words Clustering (A) Keywords Clustering Network Based on CiteSpace; (B) Top 10 Clustering Timeline View. The Horizontal Axis Represents Time, and #0-#9 Represents Keywords

2.7 Keyword Emergence

The emergent words are the keywords that appear more frequently in a shorter period of time, and the higher the degree of emergence (Strength), the higher the degree of frontier of the research. The red color in the emergence bar represents the active period of the emergent words. The analysis of keyword emergence shows that: social pharmacy, GPP, online pharmacy are the top 3 in terms of emergence strength. In 2003, the Chinese Association of Nonprescription Drugs released the Good Pharmacy Practice (GPP) at the First Annual Self-medication Conference. Along with the popularization and implementation of GPP in China and the further advancement of the new healthcare reform in China, the development of pharmacy services in pharmacies has gained more affirmation and support. At the same time, domestic e-commerce is booming, online drug transaction policies are improving, and the number of online pharmacies in China is also on a continuous growth trend. Most of the online pharmacies are able to provide pharmacy services, but there are still inadequate laws and regulations and insufficient standardization of pharmacy services (Zhu & Liang, 2021; Zhang et al., 2021). Social pharmacy is a part of China's new healthcare system, also constantly completing the self-breakthrough and innovation, but its level of pharmacy service still has some problems. Therefore, the analysis of pharmacy service status and countermeasures of pharmacy is one of the hotspots of current research.

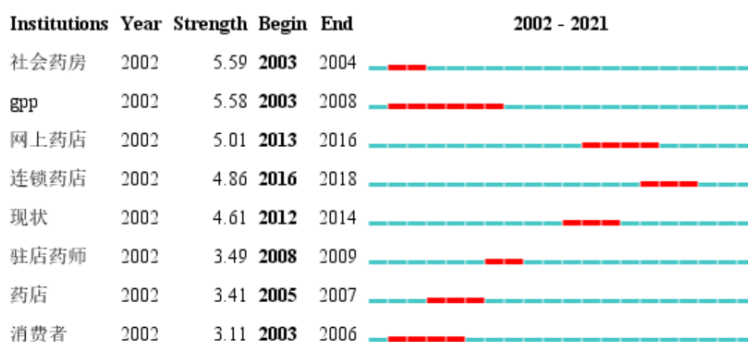


Figure 6. Keywords Burst in the Researches Related to Pharmacy Pharmaceutical Care

3. Conclusion

In this study, we used Citespace software to conduct a comprehensive visualization and analysis of the literature on pharmacy services research in domestic pharmacies. We reviewed the pharmaceutical information literature in the China Knowledge Network and Wanfang database, and conducted detailed statistics and analysis in multiple dimensions such as time distribution, subject area and grant funding. Through quantitative analysis of the number of publications, exploration of author and institutional collaboration networks, and trend analysis of keywords, we accurately identified the hotspots and development paths of pharmacy services research.

Our analysis highlights the lack of high-quality research papers on pharmacy services in China while identifying the outstanding contributions of Prof. Chaohui Li and China Pharmaceutical University in terms of the number of publications. Despite the accumulation of authors and institutions in terms of the number of publications, a stable cooperation network has not yet been formed and the density of cooperation is low. As for research topics, the areas of practicing pharmacists, chronic disease management, pharmacy services in the Internet+ era, drug wholesaling practices (GPP), online pharmacy operations, and consumer behavior have received significant attention. The literature focuses mainly on the types of journal articles, conference proceedings and patents, reflecting the diverse and interdisciplinary nature of pharmacy services research. Citespace's visual analysis strengthens our understanding of the current status and potential development trends of these research areas.

Finally, our bibliometric and visual analysis of research on pharmacy services in China, conducted via Citespace, provides important insights into the development of the field and current gaps. While the study's findings highlight the significant contributions of Chinese scientists and institutions, they also underscore the global need for improved research quality and collaboration. The research areas such as chronic disease management and the emerging field of digital pharmacy services are in line with international healthcare trends. These findings provide a strategic framework for advancing pharmacy services on a global scale and underpin the potential for international collaborations and policy development.

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