Chinese Health Insurance in Digital Era: A Bibliometric Research

Zhiyuan Hu, Xiaoping Qin, Kaiyan Chen, Yu-Ni Huang, Richard Szewei Wang, Tao-Hsin Tung, Yen-Ching Chuang, Bing-Long Wang

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Abstract

China has entered the era of digital healthcare, after years of healthcare system reform. In this new period of large-scale development in digital healthcare together with new stage of health insurance reform, it is necessary to conduct research on the history of development in digital healthcare and health insurance. A total of 411 high-quality literatures are collected from the China National Knowledge Infrastructure (CNKI) database in Chinese language, and VOSviewer software was used to conduct a scientometric analysis of them. The Number of articles in this field has increased notably from 2000 to 2022, and has increased annually. The use of health insurance in internet plus healthcare and telemedicine in the digital era in China is a hot topic and have a significant potential to improve health benefits for all. Digital technologies in health insurance researches have shifted from basic building-up, to bridging the development gap, reducing health inequalities, and handling the future aging society in China.

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Abstract

Background: China has entered the era of digital healthcare after years of healthcare system reform. The utilization of digital technologies in healthcare services is rapidly increasing, indicating the onset of a new period. The reform of health insurance has also entered a new phase.
Objectives: This study aims to investigate the evolution of healthcare insurance within the context of telemedicine and IPHC (Internet Plus Healthcare) during the digital healthcare era by employing scientometric methods to analyze publication pattern, influential keywords, and research hotspots. It seeks to understand how healthcare insurance has adapted to the growing integration of IPHC and telemedicine in healthcare services and the implications for policy and practice.
Methods: A total of 411 high-quality literatures are collected from the CNKI (China National Knowledge Infrastructure) database in Chinese language, and scientometric analysis is conducted, VOSviewer software was used to conduct a visualized analysis of keywords and hotspots in the literatures.
Results: The number of articles in this field has increased notably from 2000 to 2022, and has increased annually according to the curve of y=0.332exp (0.4002x) with $R^2=0.6788$. Sixty-two institutions and 811 authors have published Chinese language research articles in this field. The research included 290 keywords and formulated a total of 5 hot topics clusters of “telemedicine”, “IPHC”, “internet hospital”, “health insurance payments” and “health insurance system”.
Conclusions: Research in healthcare insurance's application of digital technologies has evolved from foundational studies to a broader scope. The emergence of internet hospitals has showcased the potential for integrating internet plus healthcare services into insurance payment systems. However, this development also highlights the necessity for enhanced inter-regional coordination mechanisms. The reform of health insurance payment is contingent upon ongoing advancements in digital technology and increased investment in electronic medical records and primary healthcare services. Future efforts should focus on integrating technology with administrative systems, advancing mobile healthcare solutions, and ensuring interoperability among various payment systems to improve efficiency and standardize healthcare services.

Keywords：telemedicine, health insurance, internet plus healthcare, bibliometric, VOSviewer

Introduction

Chinese government promulgated a policy document concerning the health insurance system in the

last few days of the year 1998[1, 2], and works on establishing the urban employee's basic health insurance system started in 1999 and was completed by the end of 1999, and amendment work continued for several years thereafter[3].From then on, China health insurance system in the current concept has established.

During the hit of the COVID-19 pandemic, Chinese government have published numerous policies concerning internet plus healthcare (IPHC) related health insurance services. The policies are mostly guidance documents related to health insurance payment for IPHC services, including online health services and telemedicine health services.

A document aiming at promoting the payment of IPHC in health insurance[4] released by China National Healthcare Security Administration in October, 2020 pointed out that local governments should design and manage the signing of IPHC services health insurance agreements. Other official arrangements include improving health insurance payment policies, expanding pilot projects, handling health insurance management, and strengthening supervision measures for newly included health insurance healthcare services among other measures.

As mentioned in a long-term planning official document published by China government in December, 2022, the importance of IPHC pricing and put appropriate services into the health insurance payment list was addressed[5].

IPHC is a novel application of the internet in the healthcare industry that includes health education, medical information queries, online disease consultations, electronic prescriptions, remote consultations, and various remote forms of healthcare services such as treatment and rehabilitation[6]. In China, internet plus health care is an emerging health service model with a cross-industry integration and application of information technologies, such as mobile internet, cloud computing, big data, and artificial intelligence[7].

Hence, this field of study is of cutting edge and of realities. The number of researches related to IPHC and telemedicine in 2020, especially in China, has burst considerably[8]. For example, according to reports in early 2020, the numbers of registrations and the users underwent a drastic exponential growth at the early hit of the COVID-19 pandemic, an internet healthcare platform named "WeDoctor" recorded nearly 80 million visits in early February, 2020, and offered nearly 1million times services. While "Ping An Good Doctor", another immense internet healthcare platform said it received over one billion visits, and the number of new users was increasing by several folds[9].

Following the trail of history, telemedicine is an early prototype of China's IPHC, which was appeared in the 1990s when doctors in China began the communications with medical experts in other countries through emails about complex and difficult clinical cases. After that, with the increasing use of computers and telecommunications for remote medical consultations in various places, China National Healthcare Commission (NHC) issued regulations to specify the order and behavior of medical care in 1999 to regulate medical order and medical behavior and enable the development of healthcare and orderly telemedicine consultation work[6].

In addition, Chinese government has issued "*Healthy China 2030"* project in 2016[10], which first clearly stated its attitude regarding IPHC, proposing to standardize and promote telemedicine networks and IPHC services and to innovate IPHC services model.

There is still no literature using bibliometrics methods that covers this field of the utilization of healthcare insurance in IPHC and telemedicine, and the descriptive study and analysis in this article will contribute to a summary overview of this area

This study has three objectives, to observe the development of health insurance in telemedicine and IPHC and its related fields in the digital era by examining the publication patterns and key clusters of influential keywords in Chinese. We analyze the hotspots extracted from the quality articles based on the bibliometric methodology. We also link them with future comprehensive studies to illustrate the research frontiers and future roadmap of Chinese health insurance in telemedicine and IPHC enhancement in the digital era.

Method

The bibliometric overview of this study describes the landscape and core topics of research in the field through a perspective on health insurance in the progressing of digital healthcare in China from 2000 to 2022.

Bibliometrics is a method of information analysis which measures research trends and knowledge structures in a field of research to obtain quantifiable, objective data[11]. The method has been extensively used to quantitatively analyze academic literature to describe trending topics and contributions of scholars, journals, and countries and help researchers understand the current research trends, distribution, and core topics in a given field[12, 13]. VOSviewer has better visualization in network and cluster analysis than other software, and the scientometric graphs conform better to current academic research styles. VOSviewer was developed by Van Eck and Waltman and features a powerful bibliometric maps function that can clearly visualize the network of literature, keywords, authors, and so on[14]. Using VOSviewer, we drew diagrams for institutional co-operation, keyword co-occurrence, author co-operation, author co-citation, and the Chinese language data are all retrieved from CNKI database[15].

Sampling

All articles related to the fields of health insurance in telemedicine and IPHC published from 2000-2022, written in Chinese are included. The reason why the beginning year was set at 2000 is that China didn't formally establish its current concept of a health insurance system until the year of 1999[1, 2].

Set CNKI as the target database and retrieve data from "Chinese Journal Full-text Database" and "Academic Journals" (excluding dissertations, conferences, and newspapers). On April 5th,2023, select "Advanced Search" and set the search strategy "(Topic: telemedicine (exact) OR Topic: internet plus healthcare (exact)) AND (Topic: health insurance (exact) OR Topic: medical security (exact)) AND (year range 2000-2022)" to select literatures from the year range 2000-2022, resulting in 659 articles.

A total of 659 articles retrieved from searching were imported into Excel for manual checking, we exclude 6 duplicates papers and then exclude 238 papers of categories such as news report releases, editorial comments and short reports, the non-academic articles, and by time 4 papers not in the range of 2000-2022 to obtain a final selection of 411 articles. The 411 is the final number and entries has been manually checked to ensure the correspondence between the authors and their affiliations, especially when multiple authors are affiliated with the same institution, this step is crucial as it helps avoid the potential errors.

We then export the data and import into VOSviewer software for cluster analysis. Based on the clustering results, we analyze and summarize the articles.

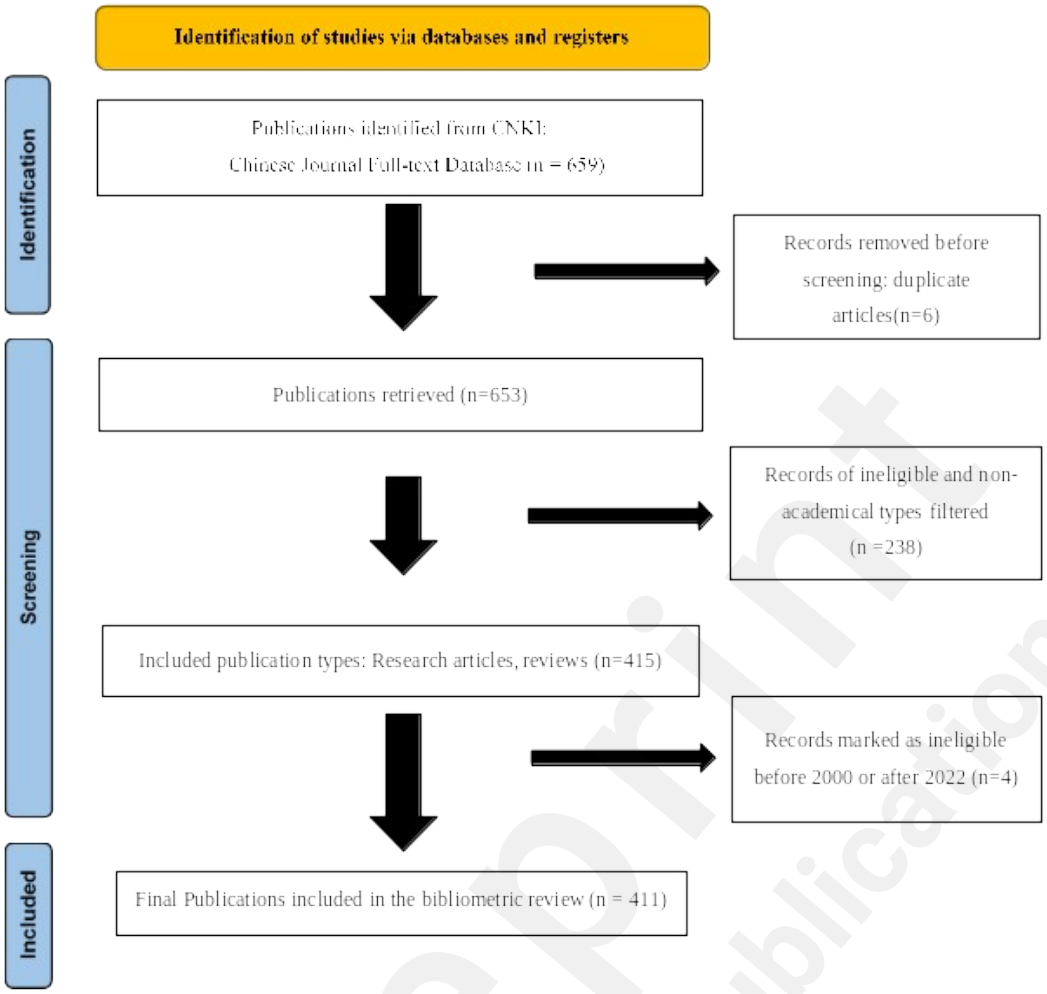

Figure 1. The flowchart for data collection.

Results

Publication trends

According to the publication year of the research literature, it can be observed that between 2000 and 2015, the number of articles published in the field of internet plus healthcare, remote medical services, and health insurance services was below ten papers each year, and the accelerating growth started at 2015. Since the number of publications reached 14 in 2015, from 2017 to 2019, the number of articles published in this field remained stable on a plateau of around 30 to 40. In 2020, the number of publications in this research field increased rapidly to nearly 100 papers, around 90 a year, and remain a high number about 80-90 papers in 2020 and 2021. Index regression predicts that there will be still a number of Chinese literatures published in this field in the near future, while the R-squared of the regression model is 0.6788, indicating the curve explains the variables relatively well.

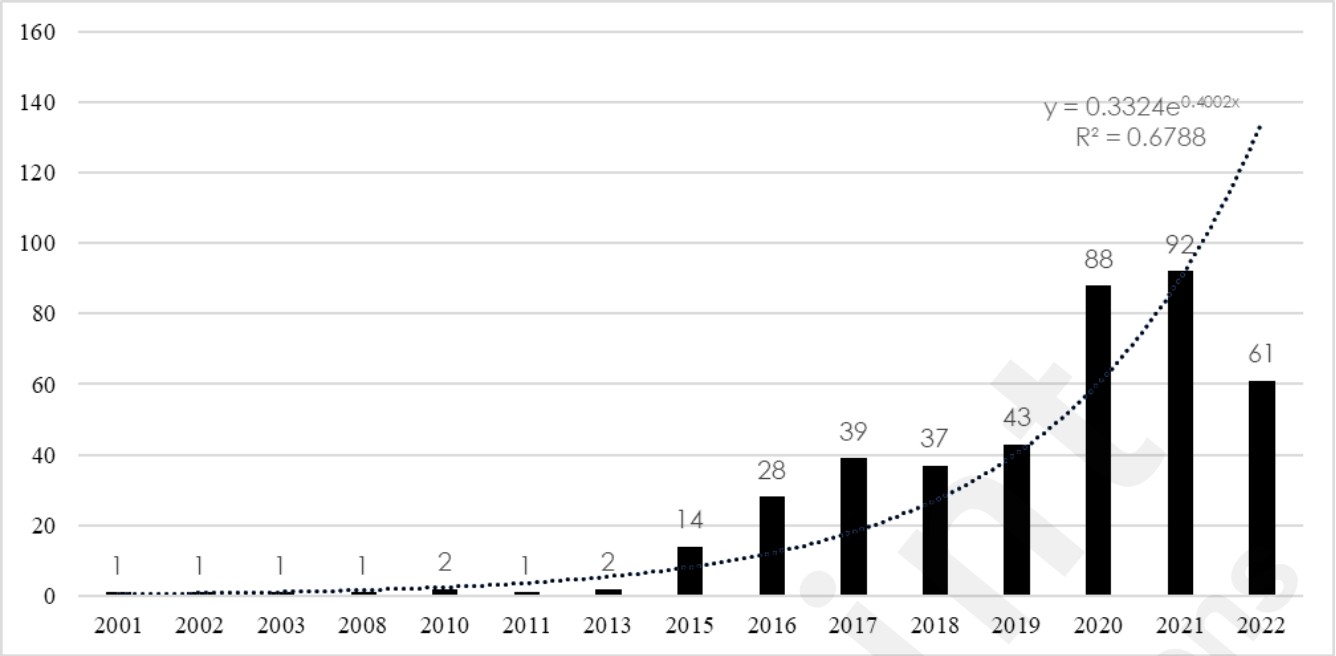

Figure 2. The number of cumulative publications. (2000-2022) and model fitting curve. ($R^2=0.6788$)

Analysis of the Journals

Table 1 shows that journals concerning health insurance focus more on this research field; China Health Insurance Journal takes 6.8% in this field. Secondly, journals that explore digital medicine take the lead. China Digital Medicine takes 4.8%, followed by other general medical and health policy research journals. Regarding distribution, core journals included in Chinese core journals indexed by Peking University or CSSCI (Chinese Social Sciences Citation Index), both of which are top core collections of Chinese language journals, enjoy widespread prevalence. The top 5 journals are all core Chinese journals.

Table 1. The Number of Articles in The Top 10 Publishing Journals and Their Percentage in Total 411 Publications

Rank	Journal	Number of articles	Percentage (in n=411)
1	China Health Insurance	28	6.8%
2	China Digital Medicine	20	4.8%
3	Health Economics Research	17	4.1%
4	Chinese Hospitals	15	3.6%
5	China Social Security	14	3.4%
6	Journal of Medical Informatics	11	2.6%
7	Chinese Journal of Health Informatics and Management	11	2.6%
8	China Health	9	2.1%
9	Modern Hospital	8	1.9%
10	Chinese health service management	8	1.9%

Analysis of citation numbers of articles

The research field is in its phase of initiation, so the top cited paper among them is a paper analyzing

the basis of this field. The article concerning definitions come first, occupying the core status in this field, received 201 citations. Then the latter research the modules currently established, problems facing, and future development trends. They all tried to form some theories and models needed in this field systematically.

Table 2. Top Cited 10 Chinese Articles According to CNKI

Rank	Title	Journal	Authors	Citations
1	Internet + Medical Mode Contents and System Architecture	Chinese hospital management	Zhu Jinsong	201
2	Research on Development Policy of Integration of Medical Care and Pension and Institutional Pension Service for the Elderly	Medicine and Society	Ma Lili, Chen Na, Tang Shaoliang	194
3	The Status Quo of Internet Medical-Based on The Analysis And Investigation on Three Hospitals	Chinese Journal of health policy	Wang Anqi, Zheng Xueqian	138
4	Analysis on the Development Model of Internet Hospitals in China	Health Economics Research	Zhang Mengqian，Wang Yancui ， Qian Zhenguang ， Wang Dandan	59
5	Practice and Exploration of Medical Association in Remote Areas	Modern Hospital Management	Sun Xizhuo, Gong Fangfang, Gu Xiaodong, Su Qian, Cai Yutong	55
6	Problems and Countermeasures for "Internet + Healthcare" in China	Administration Reform	Luan Yunbo,Tian Zhendu	52
7	Problems and Countermeasures for Medical Service Supply in Elderly Care Institutions from the Perspective of Medical-Old-Age Combination	Chinese Journal of Gerontology	Fan Qingmei, Chen Le, Wu Meng, Wu Jiankang, Li Jiamin	45
8	Analysis on Problems and Countermeasures of Mobile Health Service in China	Medicine and Philosophy	Yang Xiaoli, Feng Xinwei	45
9	Study on Regulation System and Related	Chinese Journal of Health	Meng Qun, Yin Xin, Dong	44

	Mechanism of Internet Based Medicine	Informatics and Management	Kenan	
10	Analysis on Service Mode and Application Status for Network Medical Treatment in China	Chinese Journal of Health Informatics and Management	Liu Ning, Chen Min	42

Analysis of Authors

The analysis of the author cooperation network revealed that 811 authors had explored health insurance in IPHC and telemedicine, of whom nine have acquired more than 12 total link strengths, namely TLS, reflecting the strength of cooperation in bibliographical analysis. Xu Hong and Lyu Dawei, who discussed the prospect of IPHC in Changjiang river delta cooperative development, are the most active authors in this field. The latter active authors also gained over 10 TLS.

Table 3. Top Chinese authors ranking according to TLS

Rank	Author	Total Link Strength
1	Xu Hong	16
2	Lyu Dawei	16
3	Zheng Xueqian	14
4	Luo Li	14
5	Wang Weijun	14
6	Liu Qian	14
7	Gong Fangfang	13
8	Sun Xizhuo	13
9	Liang Zhigang	12

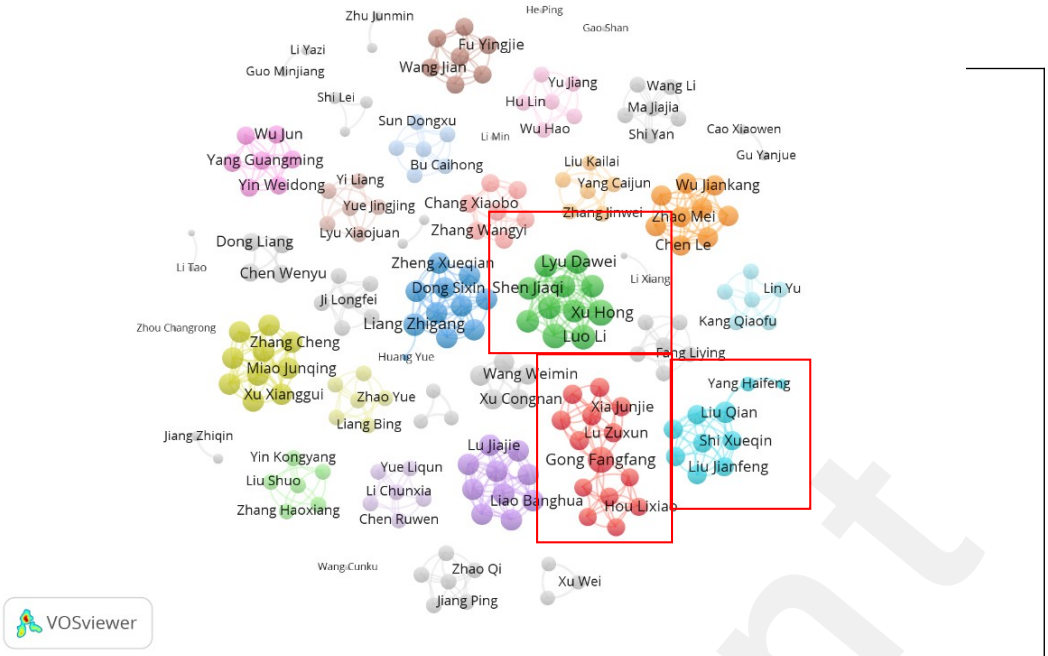

Figure 3. Co-authorship analysis of authors.

Analysis of Institutions

There were 62 institutions finally included with a minimum limitation of more than 3 publications, whose publications were analyzed by VOSviewer. Moreover, School of Health Policy & Management, Nanjing Medical University (TLS = 6 times) and other ten institutions were the top institutions with highest TLS in VOSviewer counting, showing in the table 4 below.

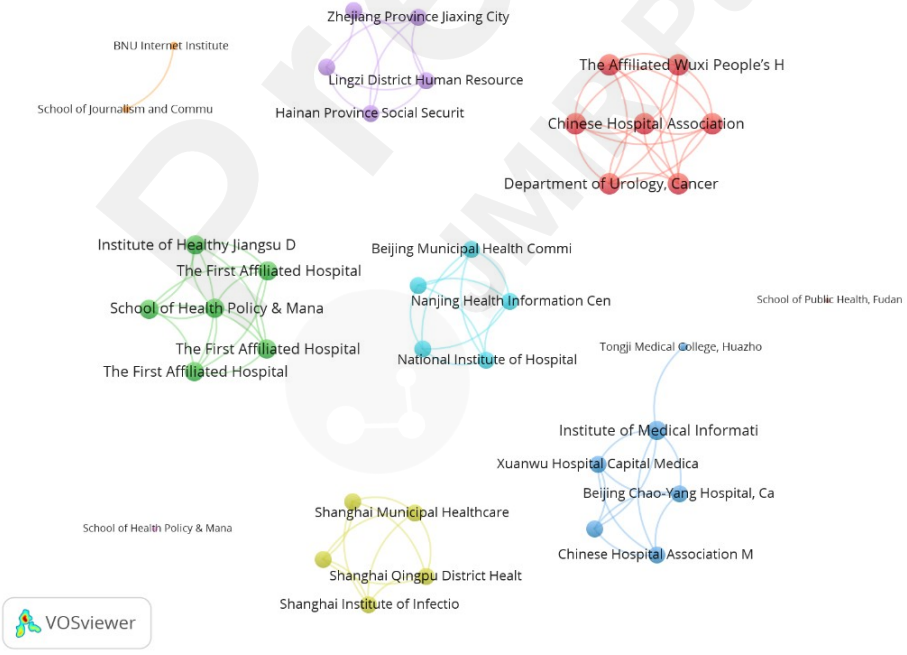

Figure 4. Institution co-occurrence of publications.

Table 4. Number of TLS and Institution Co-occurrence of Publications

Rank	Institution	Total Link Strength
1	School of Health Policy & Management, Nanjing Medical University	6
2	Chinese Hospital Association	6
3	Peking University Health Science Center	6
4	Department of Urology, Cancer Hospital Chinese Academy of Medical Sciences	6
5	Beijing Municipal Health Commission	6
6	Nantong University Medical School	6
7	The Second Hospital of Dalian Medical University, Department of Neurosurgery	6
8	Institute of Healthy Jiangsu Development, Nanjing Medical University	6
9	Shanghai Municipal Healthcare Security Bureau	6
10	Shanghai Institute of Infectious Disease and Biosecurity, School of Public Health of Fudan University	6
11	Chinese Hospital Association Medical Legality Specialized Committee	6

Analysis of Co-occurrence of keywords in Chinese

Through keywords co-occurrence analysis, identifying trending research fields and directions is an important indicator for monitoring the development of a discipline. The mapping of keywords is shown in the image, where the size of the node represents the frequency of the keyword occurrence, and the lines between the nodes reflect the co-occurrence relationship between multiple keywords. According to the mapping image generated by VOSviewer, the current hot topics of Chinese literature research in this field can be visually described.

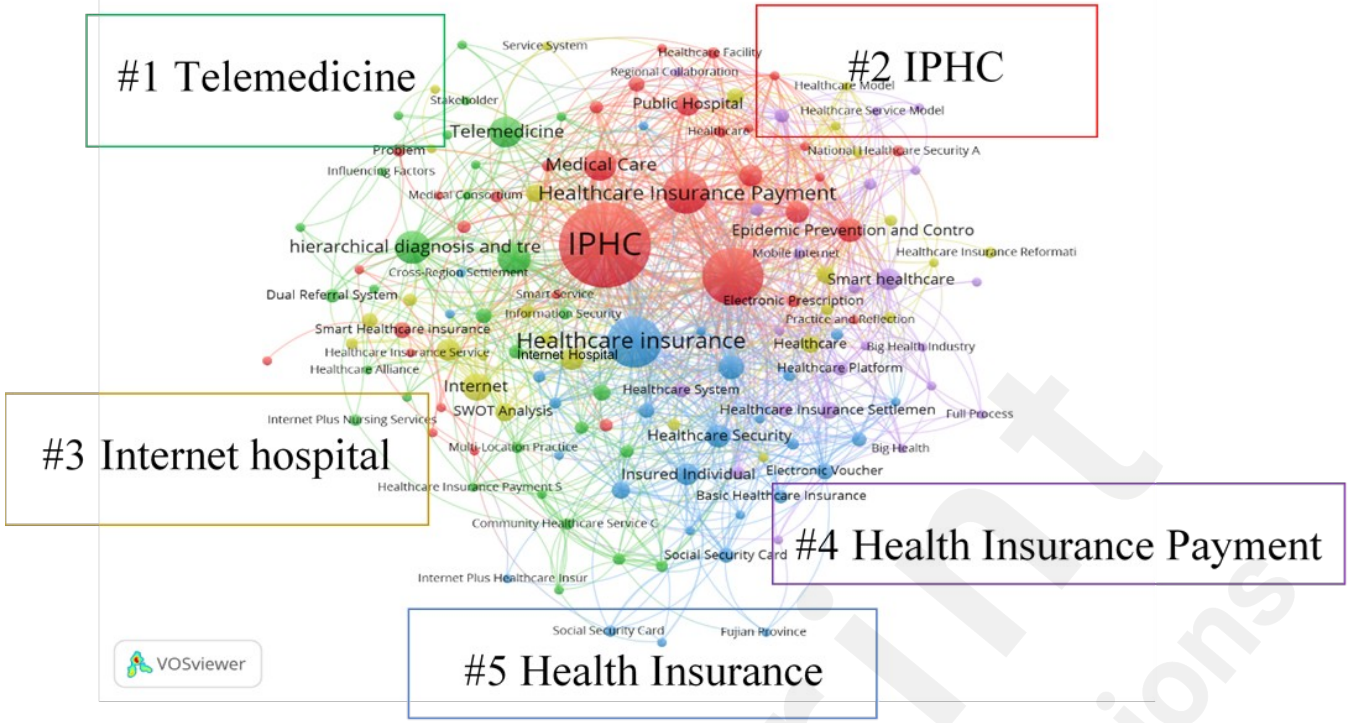

Figure 5. Keywords co-occurrences analysis visualization.

Table 5. Main Keyword Translation into English and Their TLS

Cluster	Keyword	Total Link Strength
#1 Telemedicine	hierarchical diagnosis and treatment	109
	telemedicine	102
	healthcare alliance	81
#2 IPHC	internet healthcare	129
	healthcare service	68
	healthcare insurance fund	79
#3 Internet hospital	internet hospital	179
	smart healthcare insurance	29
	big data	56
#4 Insurance Payment	online payment	72
	healthcare	31
	smart healthcare	29
#5 Health Insurance	national health security administration	41
	insured individual	53
	social security card	41

This study analyzed 290 Chinese-language keywords that appeared at least ten times across included publications using VOSviewer. The results were grouped into five clusters: "Telemedicine," "Internet hospital," " Internet Plus Healthcare (IPHC), "Health Insurance Payment, "and "Health Insurance system." These clusters provided insight into the most prominent topics related to the use of health insurance in IPHC and telemedicine.

Primary findings from Co-occurrence of keywords

Based on the five clusters of keywords, the hot spots in the field are：

Cluster 1: The primary keyword is "telemedicine"; and also includes "remote consultation", “hierarchical diagnosis and treatment”, “healthcare alliance”, etc., focusing on the doctor-to-doctor (D2D) telemedicine services. Also, it includes topics like the interaction between different healthcare service providers under remote conditions, remote pathological analysis, remote consultation, and other telemedicine services based on new-style intelligent communication technology[16]. There are more stakeholders in this type of healthcare service, demanding that health insurance policies be more detailed to take into account real-world situations.

Cluster 2: The primary keyword is "Internet plus healthcare"(IPHC). Also, it includes keywords such as " Internet healthcare ", " Healthcare service ", "health management", "health insurance reimbursement", " health insurance fund ". In 2019, the National Healthcare Security Administration (NHSA) officially launched the national unified healthcare security digitalization platform construction[17]. In 2021, the system was gradually implemented, and the number of designated medical institutions covered by the basic medical cross-provincial and inter-regional settlement insurance platform is increasing[17]. The construction of digitalized hospitals has better promoted the development of internet health insurance operations.

Cluster 3: The primary keyword is "internet hospital”. Also, it includes keywords such as "healthcare service", "online healthcare", "smart healthcare insurance", “electronic prescriptions”, and “smart healthcare”. It mainly focuses on providing health management services for chronic disease patients online, especially under the lockdown policies for epidemic prevention and control[18]. And as the impact of the COVID-19 epidemic, healthcare service units in various regions have embraced the internet and provided online consultation and diagnosis services. Some researchers also involved health insurance payment[17]. In the future, similar methods can be used to provide elderly-focused healthcare services for the definite aging population[19].

Cluster 4: The primary keyword is "health insurance payments", and it also includes “online payments”, “health insurance payment reform”, “insured population”, and “health insurance files”. The research and analyses are mainly policy-oriented, focusing on reducing the burden regarding health insurance funds and developing reasonable healthcare service prices, and the comparison on different actual implementations of online insurance payments in different provinces and municipalities, as well as the future development of smart insurance[20].

Cluster 5: The primary keyword is "health insurance system", and involves keywords such as "medical service prices", "health insurance funds", and keywords such as "National Healthcare Security Administration", and “designated hospitals for health insurance”. The researches and analyses mainly focus on the systematic constructions for health insurance services the modernization and innovation of health insurance system from a macro view in the new digital era[21], and the necessary adjustments and changes required for the system to adapt to the new pattern of healthcare services landscape through the digital era.

Discussions

In our study, we found in the digital era, China's healthcare service system is facing the need for payment mechanism and policy adjustments to support and optimize the hierarchical healthcare system. The practice of internet hospitals, as a part of IPHC, has demonstrated the potential of insurance payment in online healthcare services, but it has also revealed challenges in regional integration and inter-regional coordination. Insurance payment reform, as a key lever for driving systemic change, relies on the advancement of digitalization and informatization, as well as continuous investment in electronic medical records, information technology, and primary healthcare services. Future research and policy-making will focus on addressing the integration of technologies

with administrative systems, promoting the development of mobile healthcare, and exploring the interoperability between healthcare insurance payment systems to achieve efficiency and standardization in healthcare services.

According to the research, there has been significant development in areas of health insurance in IPHC and telemedicine research over the past two decades. The number of relevant publications has steadily increased year by year, and more than 60 researching institutions and over 800 authors in China have published academic research papers in this field. Since 2017, the number of papers in this field has risen sharply, from around 30 papers each year to around 90 papers each year, which means that in the near coming years, more and more research will focus on the use of health insurance in IPHC and telemedicine, especially in improving the health insurance implementational methods and measures, and future patching policies regarding digital healthcare services.

In the founding stage of the research field, the most highly cited paper was an analysis of its theoretical basis, with 201 citations, occupying the top spot, which focused on established modules, current challenges, and future development trends, striving to systematically develop theories and models required for the field.

Among 62 institutions, over 10 of them gain 6 TLS and are at the top.

There were 62 institutions with a minimum of more than three publications, amongst them,11 institutions with six total link strengths were the top academic institutions. These research institutions include universities, hospitals, and associations in the healthcare industry. They demonstrate that this research field has received widespread attention in Chinese academic fields and reflects the importance of research in this field within China. Different types of institutions engage in academic discussions from their specific perspectives.

Through bibliometric and visualization analysis, we gain a deeper understanding of the overall situation in the field, including the important Chinese authors and publishing institutions, as well as their collaborative relationships and academic influence. This information provides researchers with transparent channels for selectively obtaining advanced and valuable research results. Co-occurrence analysis can also depict research trends and hotspots[22], providing researchers with helping research topic inspiration funding agencies develop more effective funding plans.

Analysis of Research focus

Keywords are essential in a research article and contain the most important information[23].

Based on the analysis for clusters of keywords in the literature[24], this article focuses on different aspects and levels of research directions that health insurance needs to promote in implementing IPHC, as well as the problems and possible solutions reflected in the actual healthcare service practice[25]. From the integration of healthcare services and medical treatment to the connection between health insurance systems, based on the interconnection of information platforms[26], the key conflicts encountered in healthcare service practice are gradually being resolved and improved[27]. There are a total of five clusters, and based on the research results, the main research frontiers involved in these five clusters will be discussed below.

Cluster 1: The primary keyword is "telemedicine". In the way of construction of a telemedicine service system between institutions in a medical treatment combination, which involves multi-party participation such as bidirectional referral and online consultation[28], the mechanism of health insurance payment needs to be strengthened and improved. Furthermore, to improve the hierarchical healthcare system, some kind of mixed health insurance payment model should be explored[29]. In the context of combining remote healthcare services with health insurance, the current emerging problems such as the barriers in the building of the cross-provincial systems need to be clearly defined, and policies need to be adjusted and improved accordingly[30].

Cluster 2: The primary keyword is "Internet plus healthcare"(IPHC). The development of IPHC requires continuous advancement in medical digitalization[31], strong modern digital technologies

such as artificial intelligence, digital twins, big data management, and remote services to realize many healthcare services that are currently only in their infancy, such as smart healthcare, which are the forefronts of current research[32]. The platform construction of electronic medical records and electronic prescriptions has docked with intelligent healthcare security platforms. However, in certain specific implementation, there are still many practical issues such as technology advancing ahead of management models[33]. Advancing creatively through a combination of technology and policies is necessary to solve many potential new problems and conflicts. In the future, IPHC will remain an important theme for China's medical and health reform and development[34], and there will inevitably be more academic studies on policies and management for this topic.

Cluster 3: The primary keyword is "internet hospital". Some internet hospitals have connected with local health insurance individual account payment channels to achieve health insurance reimbursement[35]. The policy enables follow-up services for chronic diseases to be included in the health insurance payment scope, accomplishing a series of closely matched services such as online remote consultation[19], online prescription, and health insurance payment for medication purchase[18]. Health management can also benefit, such as improving medication compliance and strengthening awareness of chronic disease treatment and community health management[36]. The inclusion of internet follow-up services in health insurance payment emphasizes the homogenization of offline and online diagnosis and treatment behaviors[37], providing a basis for health insurance pricing through the use of advanced technological assessments and other means[20], and requires further research, which is a hot topic.

Cluster 4: The primary keyword is "health insurance payments". The use of health insurance in internet medical payment is increasing, but there are also problems and difficulties arising. For example, there are significant problems in the integration of regional health insurance, internet medical platforms, and local health insurance systems, as well as communication and coordination issues such as cross-regional medical treatment and settlement[38]. As one of the main directions for the future development of internet healthcare services, the use of mobile healthcare through smartphones is also a current research hotspot[39].

Cluster 5: As the most powerful lever to drive the entire medical system reform, healthcare payment reform is crucially supported by digital and information-based payment systems, so the IPHC with health insurance stands the important position[40]. "Electronic medical records" for referral purposes and more sophisticated information technology can accelerate the implementation of payment reform[41]. Vigorous development of primary care-based internet healthcare[42], increasing the proportion of health insurance expenditures in this area, among other measures. Research frontiers include problems with interoperability between internet healthcare systems, hospital internal management platforms[43], electronic medical record systems, imaging and inspection platforms[44], and other related issues.

Strength and limitations

To the best of our knowledge，there is still no bibliometric analysis article concerning this field of research on the use of health insurance in IPHC services, together with telemedicine. It is of noticeable significance to discuss these issues and it is now necessary for us to study the research topic, and identify hotspots. The method of bibliometrics and visual analysis, enable us sorting out the research focuses in the literature publications in recent years as well as their correlation and differentiation.

However, this study inevitably has some limitations. We only retrieved the literature and reviews on research topics related to this field are all from China CNKI. Although CNKI plays a significant role in academic research and literature analysis in China, there are some obvious limitations to its application in international research fields, studies need to consider these limitations and comprehensively integrate database resources according to the specific needs of the research, to

ensure comprehensive research evaluation and analysis. Therefore, we may have missed some publications due to database limitation, and articles related to other languages may not have been included.
Bibliometric methods provide an overall insight into a specific research landscape, but researchers and policymakers should be aware of the feature of not detailed enough for the evaluation or decision-making, this article provides no enough in-depth research on the influential articles and authors in this field. Balanced approaches that integrate bibliometrics research with other assessment methods can provide the thorough understanding of research impact and trends.

Future directions

Recently, many previously ignored issues have been discussed at the frontiers of research, and numerous real-world problems of internet healthcare services, which previously limited by the scale of services, have been pointed out and discussed. Starting from the post-pandemic era, the demand for remote or internet plus healthcare services will continue to grow. The deepening support of policies for IPHC services can meet the demand for health insurance management, mobile insurance payment and cost reduction. Future research hotspots are developing, such as “how to apply online live broadcasting, new media, artificial intelligence technology”, etc., into the IPHC services. Other hotspots include the chronic disease management and primary healthcare, as well as the community elderly care in health insurance reforms in the IPHC era. These hotspots are surely important for suggesting more reasonable policy measures, enhancing the accessibility of healthcare services, reduce costs, and improve the quality of healthcare, thus better serving the people in need.
In summary, the study of the application of health insurance in internet healthcare services is quite forward-looking, and it is an important frontier for future healthcare service research.

Significance

This study conducted a bibliometric analysis of the current high-quality Chinese literature on the application of telemedicine and IPHC in China health insurance. The study utilized the popular software tool VOSviewer to analyze the literature published in CNKI that involved the development of this field, and provides an overview of all the existing high-quality Chinese research literature and guides future research developments to improve the application of telemedicine and IPHC in health insurance. Especially the unique IPHC paradigm from China, is of importance for healthcare professionals around the world.

Conclusions

This article used bibliometric analysis to describe the current situation and trends of health insurance in IPHC and telemedicine in Chinese literature. The study concludes the important research institutions, hospital researchers, and research institutes in universities researchers in this field. More health insurance in IPHC and telemedicine papers are expected to be published in the next few years. The utilization of internet hospitals has underscored the potential of healthcare insurance payment in IPHC services, yet it has also highlighted challenges pertaining to regional integration and inter-regional coordination. As the key lever for instigating systemic change, healthcare insurance payment reform hinges on the progression of digitalization and informatization, along with ongoing investment in electronic medical records, information technologies, and primary healthcare services. Future research and policy formulation are anticipated to concentrate on tackling the integration of technologies with administrative systems, fostering the advancement of mobile healthcare, and

delving into the interoperability among healthcare payment systems to attain efficiency and standardization in medical healthcare. This research provides an invaluable reference, enhancing our grasp of the current landscape and prospective progresses in the field of health insurance within the domains of IPHC and telemedicine.

Declarations

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There are no human or animal studies in this manuscript, and no potentially identifiable human images or data are presented in this study.
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3. Data Availability
All data and materials generated or analyzed during this study are included in this published article.
4. 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.
5. Author Contributions
Z.H, K.C. and B.W. designed the study and wrote the manuscript. X.Q., R.W. Y.C., T.T., and Y.H. critically reviewed the manuscript. Z.H., R.W., X.Q. and Y.H. directed statistical analysis and helped interpret the results. Y.H., R.W., Y.C., T.T., and B.W. edited the paper. All authors reviewed and approved the manuscript. All authors have read and agreed to the published version of the manuscript.
6. Disclose of generative AI
No generative AI used in drafting the manuscript.

Abbreviations

IPHC: Internet Plus HealthCare
CNKI: China National Knowledge Infrastructure
CSSCI: Chinese Social Sciences Citation Index
TLS: Total Link Strength

References

1. *The Decision on Establishing the Basic Medical Insurance System for Urban Employees<in Chinese>*. 1999; Available from: http://www.gov.cn/banshi/2005-08/04/content_20256.htm.
2. Jakovljevic, M., et al., *Successes and challenges of China's health care reform: a four-decade perspective spanning 1985—2023.* Cost Effectiveness and Resource Allocation, 2023. **21**(1): p. 59.
3. Li, Z. and J. Li, *Lessons and prospects of Universal Health Coverage in China: the importance of equity, quality, and affordability.* Asian Bioethics Review, 2019. **11**(1): p. 21-40.
4. *Guiding Opinions of the National Healthcare Security Administration on Actively Promoting the Payment of Internet plus Healthcare by Health insurance<in Chinese>*. 2020; Available

from: http://www.gov.cn/zhengce/zhengceku/2020-11/03/content_5556883.htm.
5. Ehrmeyer, S.S. and R.H. Laessig, *Total quality management in hematology.* Accreditation and Quality Assurance, 2000. **5**(9): p. 360-362.
6. Yang, F., H.L. Shu, and X.Q. Zhang, *Understanding "Internet Plus Healthcare" in China: Policy Text Analysis.* JOURNAL OF MEDICAL INTERNET RESEARCH, 2021. **23**(7).
7. Zhou, X.F., & Chen, L., *Digital health care in China and access for older people.* The Lancet. Public health, 2021. **6**(12): p. e873–e874.
8. Huang Liu., *Internet plus healthcare under the pressure of the epidemic<in Chinese>*. China Hospital CEO, 2020(05): p. 37-41.
9. Shihong, Z., J. WenSheng, and S. Tao, *The Development Prospect of Internet Medicine under the Epidemic Situation<in Chinese>*. China Digital Medicine, 2020. **15**(09): p. 15-17+48.
10. Jeffer, E.K., *Total Quality Management and the Army Health-Care System.* Military Medicine, 1991. **156**(10): p. 546-550.
11. Guo Y, H.Z., Zhao S, Gong J, Yang F, *Artificial intelligence in health care: bibliometric analysis.* J Med Internet Res, 2020. **22**(7): p. e18228.
12. Ahmadvand A, K.D., Clark M, Drennan J, Nissen L, *Trends and visibility of "digital health" as a keyword in articles by JMIR Publications in the new millennium: bibliographic-bibliometric analysis.* J Med Internet Res, 2019. **21**(12): p. e10477.
13. Yang K, Q.H., *Research on health disparities related to the COVID-19 pandemic: a bibliometric analysis.* Int J Environ Res Public Health, 2022. **19**(3): p. 1220.
14. van Eck NJ, W.L., *Software survey: VOSviewer, a computer program for bibliometric mapping.* Scientometrics, 2010. **84**(2): p. 523-538.
15. Yang K, H.Y., Qi H., *Digital Health Literacy: Bibliometric Analysis.* J Med Internet Res, 2022. **24**(7): p. e35816.
16. LEI., J., *The Current Status and Research on Strategies for the Development of Telemedicine<in Chinese>*. JINGJISHI, 2018(12): p. 244-245.
17. Lin Xueyu, et al., *Problems and Countermeasures in Medical Insurance Payment for Internet Plus Medical Services<in Chinese>*. Chinese Journal of Medical Management Sciences, 2021. **11**(02): p. 35-37.
18. Yuan Ji, et al., *Analysis and Thinking of Telemedicine to Better Meet the Needs of Patients with Chronic Disease<in Chinese>*. Chinese Hospitals, 2021. **25**(08): p. 44-47.
19. Guo Minjiang and Liu Yang, *Research on Development Opportunities and Countermeasures of*

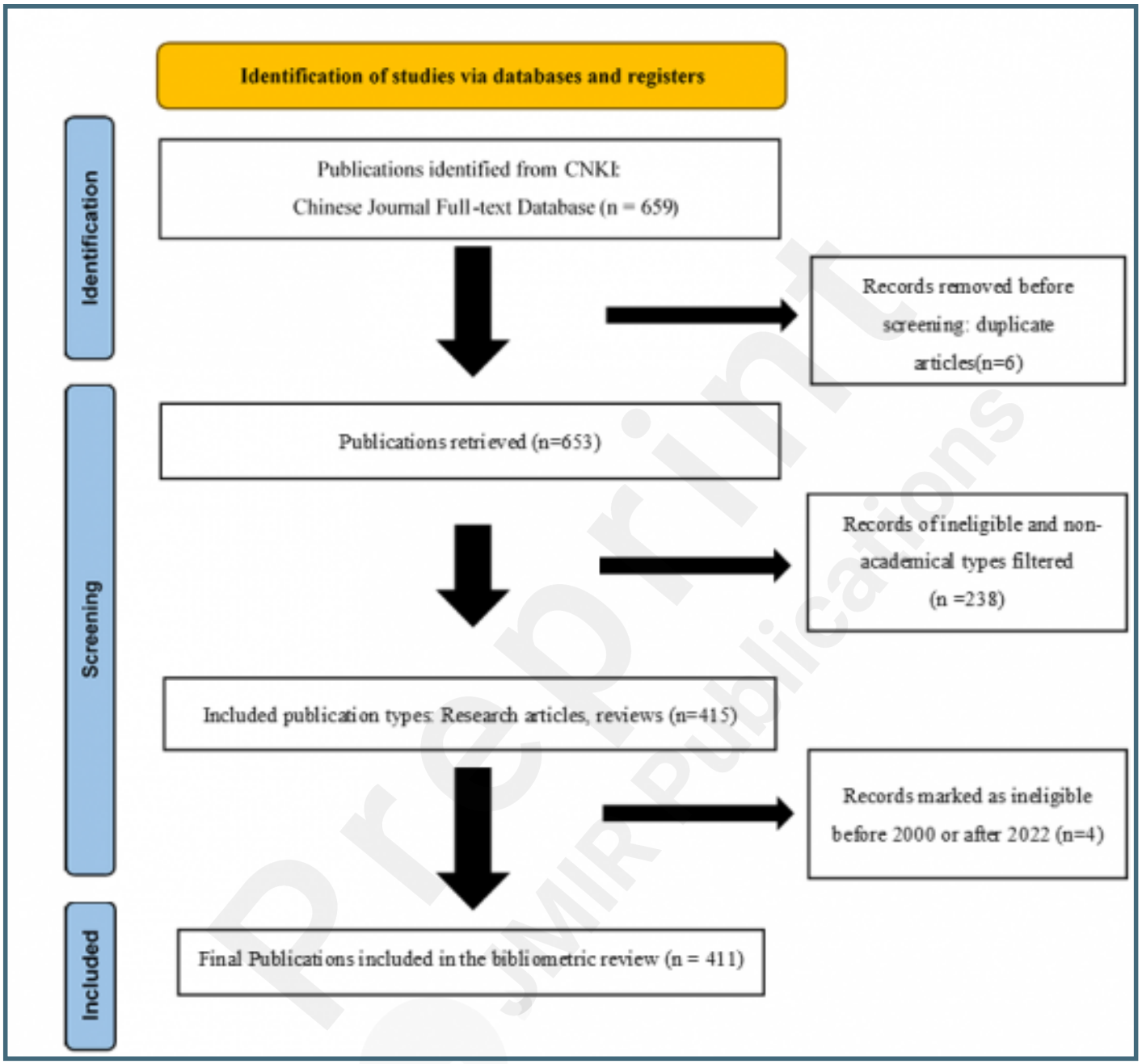
Internet Plus Chronic Disease Management<in Chinese>. China Health Insurance, 2022(07): p. 46-52.
20. Ding Tiantian, Qian Aibing, and Tan Zaixiang, *Comparative analysis of domestic and foreign Internet medical service pricing and medical insurance payment policies<in Chinese>*. Chinese Hospitals, 2022. **26**(09): p. 10-13.
21. Zheng Daxi, et al., *Medical insurance management under the background of Internet Plus Medical<in Chinese>*. Chinese Hospitals, 2021. **25**(06): p. 5-8.
22. Zhou, X., et al., *A probabilistic model for co-occurrence analysis in bibliometrics.* Journal of Biomedical Informatics, 2022. **128**: p. 104047.
23. Wang, H., et al., *A historical review and bibliometric analysis of GPS research from 1991–2010.* Scientometrics, 2013. **95**(1): p. 35-44.
24. Guo, L., et al., *A bibliometric analysis of oyster research from 1991 to 2014.* Aquaculture International, 2016. **24**(1): p. 327-344.
25. Li Xiaojie, et al., *Research on the Construction Strategy of Cloud Pharmacy of Internet Hospitals in Shanghai<in Chinese>*. China Digital Medicine, 2021. **16**(12): p. 29-33.
26. Tian Rui, *Comparative Analysis of Mobile Internet Appointment Platforms in Beijing Hospitals<in Chinese>*. Medical Education Management, 2021. **7**(S1): p. 217-220+227.

27. Zhang Ruili and Wang Gang, *"Internet+"Medical Service Supply□Model Comparison and Optimal Pathway<in Chinese>*. Health Economics Research, 2022. **39**(03): p. 32-37.
28. Guan Dekun and Sun Zixue, *Analysis of dynamic resistance factors and construction emphases of telemedicine development in the new period<in Chinese>*. Chinese Hospitals, 2020. **24**(04): p. 56-58.
29. Lu Chunji, et al., *Discussion on Constructing Moblie Medical Plus Medicare to Further Promote Graded Medical Treatment Model<in Chinese>*. JOURNAL OF MEDICAL IN FORMATICS, 2017. **38**(11): p. 53-59.
30. Liu Xia, et al., *Study on the Normative Development of Internet Hospitals in China<in Chinese>*. Journal of Medical Informatics, 2022. **43**(05): p. 21-24+29.
31. Shen Jiawen, *The Situation, Connotation, and Reflection on the Digital Reform of Medical Security in China<in Chinese>*. China Economic & Trade Herald, 2021(22): p. 47-51.
32. Yao Fei, *Exploring the Construction of a Smart Healthcare System from the Perspective of the Internet: Based on the Solow Economic Growth Model<in Chinese>*. East China Science & Technology, 2022(12): p. 93-95.
33. Gu Jiawei, et al., *Research on the realization path and key strategies of the high quality development of Internet medicine in China<in Chinese>*. Chinese Hospitals, 2022. **26**(06): p. 33-35.
34. Jiang Mingfu, et al., *Evaluation of the Quality and Efficiency of Clinical Medical Treatment in Case of Public Health Emergencies by Using Internet Plus Contactless Management System in Emergency Centers<in Chinese>*. Ningxia Medical Journal, 2022. **44**(06): p. 524-526.
35. Wu Danmai, Cui Wenbin, and Yu Guangjun, *Analysis on the Operation Strategy of Internet Hospitals in China<in Chinese>*. Chinese Hospitals, 2021. **25**(10): p. 79-80.
36. Gao Jiankang, *Exploration of the Internet Plus Home-based Comfort Health Care Model for Chronic Diseases<in Chinese>*. China Hospital CEO, 2022. **18**(11): p. 86-89.
37. Yang Xuli, et al., *Construction and practice of Internet medical quality control system<in Chinese>*. Chinese Hospitals, 2022. **26**(01): p. 17-19.
38. Lu Qingjun, *nternet Plus Healthcare Officially Integrates with Medical Insurance<in Chinese>*. China Health, 2021(01): p. 105-106.
39. Xu Ziyi, *Research on the Current Status of Mobile Payment for Healthcare Insurance under the Internet Plus Health Care Background<in Chinese>*. China Management Informationization, 2021. **24**(01): p. 125-127.
40. Li Tao and Feng Hexia, *Digital Health Community Empowers Grassroots Health Governance Transformation<in Chinese>*. Administration Reform, 2022(08): p. 56-63.
41. Liu Wensheng, *Internet-based Diagnosis and Treatment: Strong Regulatory Oversight Promotes Transformation<in Chinese>*. China Hospital CEO, 2021. **17**(20): p. 22-25.
42. Jiang Han, Xu Aijun, and Dai Zeyang, *Study on Internet Medical Information Spillovers and Health Care Choice of Urban and Rural Residents—Based on the Sixth Health Service Survey Data of Jiangsu Province<in Chinese>*. Chinese Primary Health Care, 2022. **36**(03): p. 17-20.
43. Li Hui, *SWOT Analysis of Medical Insurance Management in Tertiary Hospitals under Internet Medical Model<in Chinese>*. Chinese Medical Record, 2021. **22**(11): p. 32-33+36.
44. Deng Yong and Zhou Yizhao, *Regulatory Deficiencies and Comprehensive Governance in Internet Plus Healthcare Insurance Services<in Chinese>*. China Hospital CEO, 2021. **17**(07): p. 66-69.

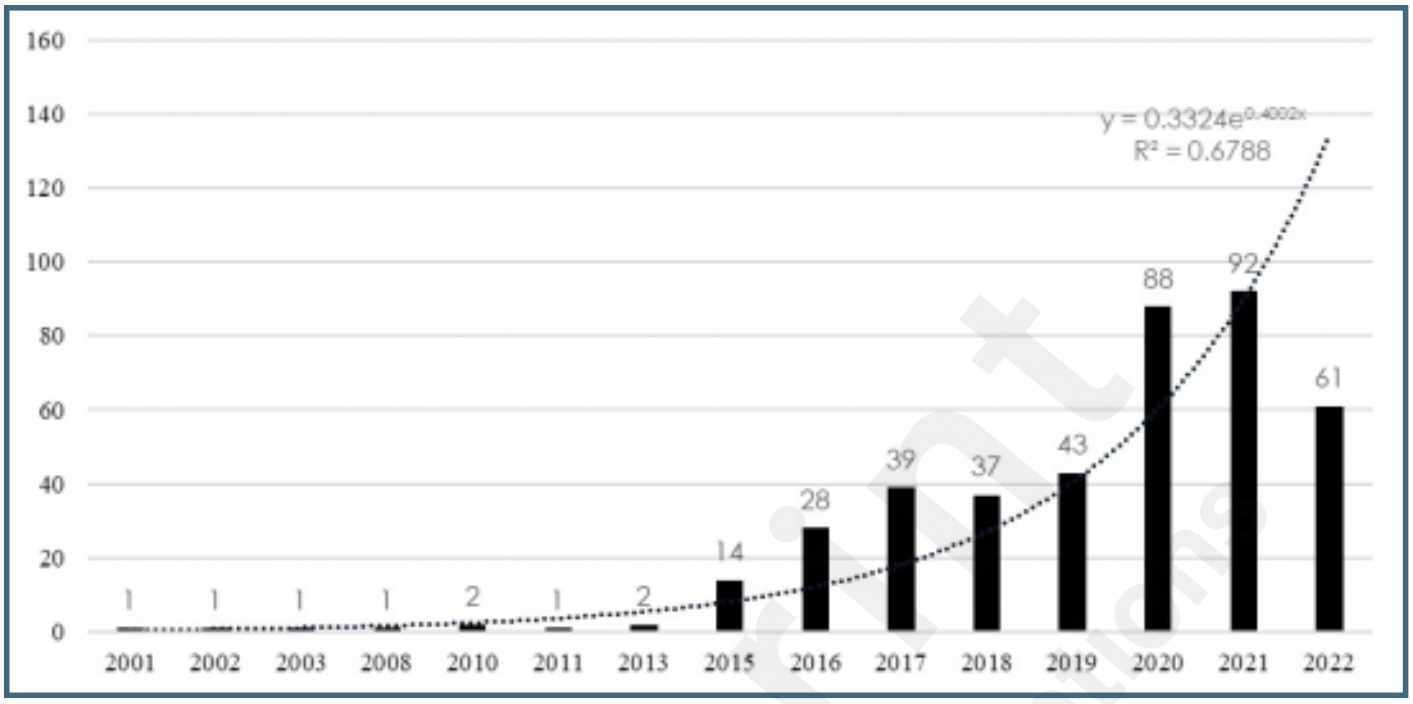
Supplementary Files

Figures

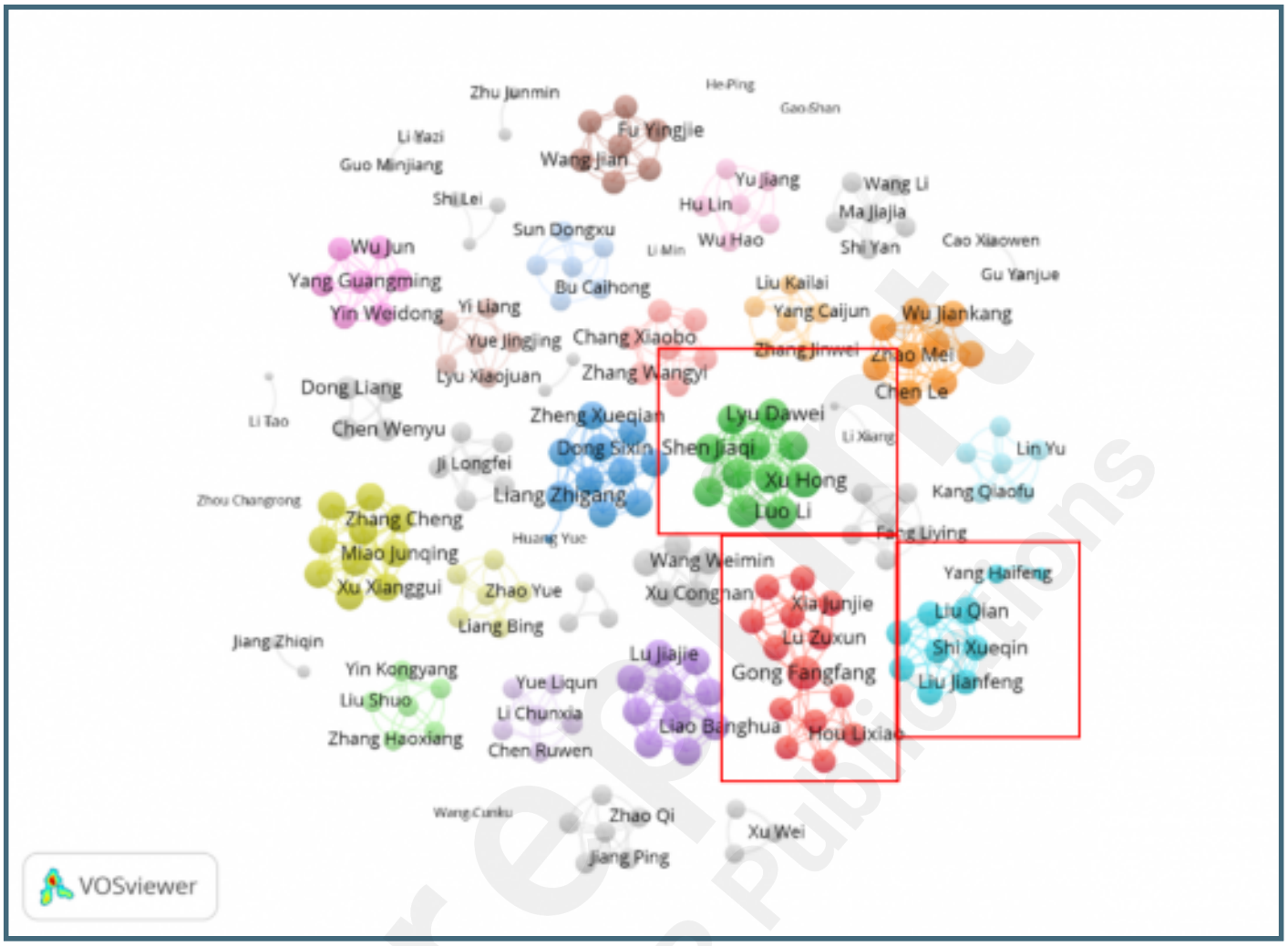
The flowchart for data collection.



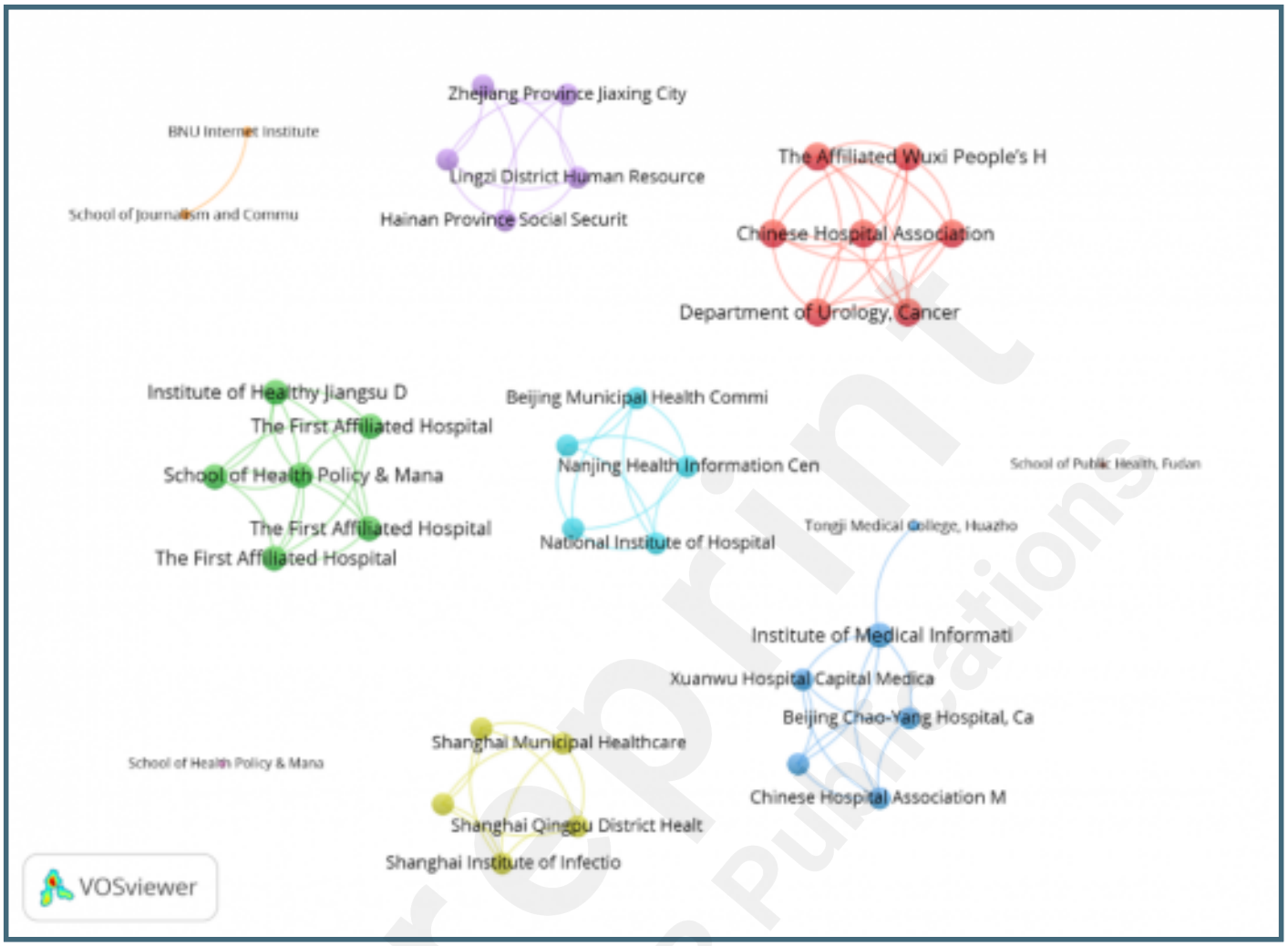
The number of cumulative publications. (2000-2022) and model fitting curve.



Co-authorship analysis of authors.



Institution co-occurrence of publications.



Keywords co-occurrences analysis visualization.