

Clinical pathway management based on bibliometric analysis in China

Ni Jin¹, Ya Zheng¹, Li Zhu¹, Minhui Xu¹, Jiayi Guo¹, Wenya Chu², and Hui Zhou¹

¹Affiliated Jinhua Hospital, Zhejiang University School of Medicine

²Affiliated Jinhua Hospital, Zhejiang University School of Medicine

August 17, 2020

Abstract

Objective: To identify the current situation and further research direction of clinical pathway management in China. **Methods:** The published time, research institutions, key words of the literatures obtained from China National Knowledge Infrastructure (CNKI), VIP and Wanfang databases were analyzed by using Citespace software. **Results:** The clinical pathway research in China has been carried out for 20 years, with delivering about 447.3 articles per year. The number of articles reached its peak in 2012, and then decreased year by year. The research field focuses on nursing clinical pathway, health education and clinical pathway teaching, and the research institutions are scattered and lack of inter-agency cooperation. **Conclusions:** At present, the clinical pathway research in China is insufficient incorporation with medical quality control and performance evaluation, the adjustment of medical service expenses, the reform of payment mode, and the information construction of medical institutions. **Practice Implications:** How to combine clinical pathway effectively with medical quality control, with DRGs performance evaluation, with medical insurance payment reform, with information construction and with hierarchical diagnosis and treatment, is worthy of deep exploration.

Introduction

The optimization of patient safety and quality in health-care remains the primary focus of quality improvement initiatives.[1,2] CPs are increasingly used in healthcare settings and recommended by broader healthcare systems internationally as a form of quality improvement.[3] Clinical Pathways (CPs) are viewed as important strategies to improve medical care in China.[4] In 2017, the former National Health and Family Planning Commission and the State Administration of Traditional Chinese Medicine jointly revised and issued "the Guiding Principles for Clinical Pathway of Medical Institutions", highlighting the principle of "four combinations", the combination of clinical pathway management with medical quality control and performance appraisal, with the adjustment of medical service costs, with the payment reform, and with the information construction of medical institutions.[5] With the deepening of medical and health system reform, it is necessary to deeply study the development process and research results of clinical pathway, which is of great significance to clarify the research direction of clinical pathway, and to improve the quality of clinical pathway management, and to promote the further development of clinical pathway. Therefore, we studied the current situation of clinical pathway management in China, analyzed the problems existing in the implementation of clinical pathway management, and put forward some suggestions for the development of clinical pathway management.

Materials and methods

This study was based on the databases of CNKI, VIP and Wanfang databases, and the Chinese literatures on the topic or keyword containing "clinical pathway" was searched. Search Conditional Formula: "Chinese

Journal = Y and annual between (unlimited, 2019) and (topic = clinical pathway or keyword = clinical pathway) (exact matching)". As of Oct 29, 2019, 9982 literatures were obtained. After ruling out the repeatings, meeting announcements, interviews with people, standard interpretation and experience introduction, the remaining valid literatures were 8945 articles.

Citespace software is a knowledge map visualization software developed by Dr. Chen Chao-Mei from Drexel University. It presents the analysis results in the form of nodes and connections. The type of nodes can be selected as needed to extract node information in topics, abstracts, authors and other content.[6] In this study, valid literatures were exported in Refwork format, and the exported data was analyzed by conversion and input into Citespace 5.5.R1(July 28, 2019)software. Since the literatures were published in 1999-2019, the time was divided into 1, and 21 time slices were formed. We set the threshold to (2,2,20), (4,3,20), (3,3,20), topN per plice=50.According to the specific content of the software, visual analysis of number of published papers, keywords, and research institutions was carried out.

Results

In 1999, the director of the International Hospital Federation published an article in the "Chinese Hospital" magazine, titled "International Trends in Quality Assurance", at which the concept of clinical pathway was proposed for the first time. No related articles were published in 2000, and there has been an increasing trend later since 2001. Especially from 2009 to 2012, the number of articles increased rapidly, with an average annual growth of more than 200 articles. After reaching a peak of 956 articles in 2012, the number began to decline ,734 articles in 2018. According to the number of published articles in the first ten months of 2019, it is expected that the amount of publications will continue to decline this year (Figure 1).

2.Research Institution Analysis

"Research institutions" are selected as network nodes for visual analysis, and a total of 529 nodes and 185 connections (N 529, E185), Density=0.0013, are obtained. It shows that although there are a lot of research institutions, there is less cooperation among institutions. Traditional Chinese Medicine Hospital of Guangdong Province, Tongji Medical College of Huazhong University of Science and Technology School of Medical and Health Management, Affiliated Hospital of Jining Medical University and other medical institutions received the most articles. The cooperation network is more prominent in Guangdong Traditional Chinese Medicine Hospital, Jiangsu Traditional Chinese Medicine Hospital, but the collaboration network is mostly limited to medical institutions in the medical field, lack of inter-regional cooperation (Figure 2).

3.Keyword analysis

Keywords are high generalizations of the core views and themes of the paper. Keywords analysis is an important part of bibliometric analysis, and keyword co-occurrence network analysis can reflect the research hotspots in the research field. It can well reflect the key contents and related issues of the research.[7,8]

Frequency analysis: Keyword analysis in the graph of keyword cooccurrence network analysis, the size of the graph indicates the frequency of keyword occurrence, while the purple graph represents a good between centrality (Figure3).

Between centrality reflects the central position of nodes in the network, that is, the importance of measuring nodes. The more centralized the node is, the more important the corresponding subject words are, which represents the research hotspot.[9] The frequency and centrality of keywords are shown in Table 1. Because this paper searches for the theme of "clinical pathway", it is certain that "clinical pathway" is the largest and most important node in the spectrum, and all nodes will have co-occurrence relationship with it, which leads to the disorder of network structure. Therefore, the key word "clinical pathway" is not included in the visualization analysis. AS shown from Table 1, it shows that the top three keywords in frequency are closely related to nursing, and there is a great gap between them and the other keywords in the next ranking. Centrality and frequency are not positively correlated, and the order is slightly different.

Temporal evolution of high-frequency keywords: As can be seen from Figure 4, recent research focuses on

clinical pathway teaching, application value and payment method reform.

3.3 Burst term analysis: In addition to frequency and centrality analysis, Citespace software also provides the analysis of the burst terms. The burst frequency can reflect the change of research hotspots. High burst value refers to the sudden increase of citation frequency in the time dimension, which has received special attention. Sigma value is the combination of centrality and burst value through formula, which can better explore the hot research issues in the field of clinical pathway.[10] As can be seen from the analysis of burst terms, the top five burst terms of burst value and Σ value can be seen from Table 2, in addition to nursing, the research focuses on the evaluation of the application and clinical pathway teaching. Comprehensive evaluation, in addition to the above content, informatization has also been a research hotspot.

4. Discussion

4.1 The current situation of clinical pathway management in China

Insufficient of research in combination with medical quality control

The clinical pathway has been carried out in China for 20 years. Of the 9982 articles, 932 were published in core journals, accounting for only 9.33% of the total, and only 178 were related to hospital management and medical quality control, which accounted for 1.78%. The publication time of this kind of literature is mostly concentrated before 2010, and it is in the initial stage of clinical pathway in our country, so it lacks enough practical experience. The pilot work of clinical pathway began in 2009, and the guiding principles of Clinical Pathway in Medical institutions were issued by the former National Health and Family Planning Commission in 2017. Pan Zhang et al. investigated the work of clinical pathway in 43 public hospitals from 2014 to July 2017. The entry rate has met the requirements of the state, of which 62.8% have carried out quality control.[11] However, the degree and form of quality control are not described in detail.

Clinical pathway is a kind of fine management tool for hospitals, but it can be seen from the literature analysis above that nursing category occupies a large proportion. However, nursing management is only a part of hospital management, and the application of clinical pathway to improve hospital management is rarely mentioned in the research literature. In recent years, most of the clinical pathway study of nursing focus on single-care and nursing teaching, and there is few literatures about the quality of management from the perspectives of path formulation, path implementation, and results evaluation.[12,13] And the research on hospital quality management is even less, which can not fully reflect its influence on the quality of hospital management as a comprehensive management tool.

Insufficient combination with performance appraisal

In order to effectively combine the clinical path with the performance evaluation, it is necessary to establish the evaluation index of the clinical pathway in order to further develop the performance appraisal plan. However, up to now, the myriad of terms used to describe a CPW has led to conceptual confusion in the field of pathway research.[2] In the same way, domestic clinical pathway evaluation index research still has problems such as the use of statistical terms is irregular and arbitrary, and lack of research on the evaluation index system of clinical pathway.[14] Therefore, different hospitals have different assessment indicators at present, even if has the same name it has different definition and statistical method, which leads to the lack of comparability of indicators among hospitals, and brings some difficulties to the actual management. Due to the lack of research on the formulation, evaluation and influencing factors of clinical pathway, the implementation of clinical pathway has been restricted.[15]

Insufficient combination with the adjustment of medical cost and the reform of medical insurance payment.

Pan Zhang et al. point out that the combination of clinical pathway and payment method is poor. Up to July 2017, only 16.30% of public hospitals declared that there were local medical payment methods associated with clinical pathway.[11] At present, although single-disease payment and DRGs payment are piloted in some provincial and municipal hospitals in China, the implementation of clinical pathway is restricted because of the weak foundation of prepaid payment methods, the information collection and staff proficiency can not

meet the needs of reform in medical insurance payment.[16]The combination of clinical pathways, Adjustment of medical expenses, and reformation of medical insurance requires the participation of price management departments, medical insurance management departments, and medical institutions.

Insufficient information construction

Peng-Zhen Liu et al. put forward in 2011 that there were few examples of management variation through information system management in China, and the problem of underdeveloped information system generally exists.[17] After 7 years, Shu-Yan Guo et al. have concluded that the level of clinical path management in China is low, and it is recommended to strengthen the construction of clinical path-related information.[16] It showed that the development of the informatization at clinical pathway in the past 7 years is dissatisfactory. The relevant researches were mainly published during 2008 and 2014, which focused on how to implement clinical path management in hospital information systems. However, informationalized clinical pathways would encounter many practical problems in clinical implementation and functional management, which needs more study.

In order to promote the implementation of clinical pathway in China, in addition to relevant policies formulated by government departments, it is also crucial for medical institutions to improve their own resource allocation (especially informatization) and management ability of clinical pathway implementation.[18]

Suggestions on clinical pathway work

4.2.1 Strengthening Hospital Management and Medical Quality Management

Clinical pathway is used by hospital management departments as a management tool, but the management departments lack experience in how to apply this management tool and how to continuously improve the quality of management in the practice process. Hospitals are exploring on their own, because lack of summary and promotion, it is difficult to evaluate the effect on the overall hospital management and medical quality management, so it needs further study.

4.2.2 Strengthen quality control of clinical pathway, optimize evaluation index system and combine with performance evaluation.

Only when a hospital implemented a CP with financial incentives was compliance higher, suggesting that CP implementation is more effective when accompanied by financial incentives.[2]In order to strengthen the implementation of quality control of clinical pathway, unified evaluation index definition and statistical method principles can be formulated by the health administration department for the reference of hospitals. Hospitals should establish a standardized evaluation system according to the principles in order to combine best of clinical pathway with medical quality and performance assessment. At the same time, it makes the evaluation indexes of different hospitals comparable, which is beneficial to further promote the balanced development of clinical pathway. In the process of establishing the evaluation index system, the specific system of implementing process quality control, implementing effect evaluation index and performance appraisal should be effectively combined, so as to achieve the whole process management of medical services.[19] It is worth noting that clinical pathway management in hospitals is not only the responsibility of the quality control department, but also it is necessary to establish a multi-department linkage management mechanism.[20]

4.2.3 Combined with DRGS performance evaluation and medical insurance payment.

DRGS has been applied in performance evaluation and medical insurance payment reform, which is closely related to hospital quality and economic lifeline. DRGS evaluation requires medical institutions to save medical costs and improve work efficiency, and clinical pathway is an effective management tool to reduce medical costs and improve work efficiency on the premise of ensuring medical quality. Therefore, clinical pathway is a strong support for the promotion of DRGS. Some studies have proposed that one of the application conditions of DRGS is to establish a scientific and unified clinical pathway of diagnosis and treatment standards and norms. The implementation of the clinical pathway provides a better comparison

and benchmark for general diagnosis and treatment behaviors, as well as a good tool for monitoring the suitability of medical behaviors and controlling their service quality.[21] Clinical pathway management is the basis of implementing medical security system, but the coordination between payment mechanism of basic medical insurance premium and clinical medical management system needs further study.[22]How to combine the two management tools effectively and give full play to their important role in standardizing medical behaviors, improving medical efficiency and reasonably controlling costs is worth thinking and exploring by the management department.

4.2.4 To strengthen the construction of information-based clinical pathway.

Informationalized clinical pathway construction is not only the informatization of clinical use, but also the informatization of management. It is worth exploring how medical institutions apply intelligent terminal and Internet technology to clinical pathway information management. The core contents of the implementation status, such as the standardization of the use process of clinical pathway, medical safety and the analysis of the cause of emergence, are monitored through information means.[23] The implementation and monitoring of hospital information system and clinical pathway are comprehensively connected, [24]and the management effectiveness of clinical pathway is constantly improved.

5. Summary

According to the results of literature analysis, there is still a gap between the current situation of clinical pathway management and the "four combinations" emphasized in the guiding principles in China. It is worth further exploring how to combine clinical pathway with medical quality, performance assessment, medical insurance payment reform and information construction.

Currently, our country is in the stage of vigorously promoting graded diagnosis and treatment, it can be seen from the literature analysis that in the past two years, the researchers have begun to pay attention to the development of clinical pathway in grass-roots hospitals. How to integrate the clinical pathway into the whole process of graded diagnosis and treatment, so that the process of diagnosis and treatment of patient will not be interrupted by the referrals between hospitals at all levels in the medical treatment alliance, and ensure the standardization of the whole process of diagnosis and treatment. It is also worth studying and discussing to ensure the homogeneity of diagnosis and treatment in medical treatment alliance. The normative and homogeneous medical service guarantee in the process of diagnosis and treatment will effectively promote the development of graded diagnosis and treatment. However, the integration of clinical pathway and graded diagnosis and treatment still needs to consider a series of issues, such as medical insurance payment, information interconnection, and the reform of performance distribution system, which are worth discussing.[25-27]

Authors' contributions:

Ni Jin and Ya Zheng contributed equally to this work.

Li Zhu:Editing;

Minhui Xu:supervision;

Jiayi Guo: Conceptualization,Methodology;

Wenya Chu: Preparation;

Hui Zhou: Revision.

References:

- [1]Varkey P, Reller MK, Resar RK. Basics of quality improvement in health care.Mayo Clin Proc.2007;82(6):735-9.
- [2]Adegboyega KL,Thomas R,Leigh K,et al.What is a clinical pathway?Refinement of an operational definition to identify clinical pathway studies for a Cochrane systematic review.BMC Medicine.

2016;14:35.Doi:10.1186/s12916-016-0580-z.

- [3] Mona J, Amanda SN, David J,et al. Defining barriers and enablers for clinical pathway implementation in complex clinical settings. *Implementation Science*.2018,13:139; <https://doi.org/10.1186/s13012-018-0832-8>.
- [4] Jie B,Kate B,Fei B,et al.Relationship between physician financial incentives and clinical pathway compliance:a cross-sectional study of 18 public hospitals in China.*BMJ Open* 2019;9:e027540.
- [5] National Health and Family Planning Commission, State Administration of Traditional Chinese Medicine. Guiding principles for clinical pathway management in medical institutions.[2017-08-30].
- [6] Jie L,Penghui L,Xiaohong Guo. Visual analysis of scientific literature on game theory [J]. *Journal of Hefei University of Technology:Social science edition*,2014,28(5):128-135.
- [7]Jinlin L. A meta-analysis of hospital management research in China based on bibliometrics [J].*Chinese Journal of Hospital Administration*, 2019,35(1):68-72.
- [8] Zenglin H,Bin L,Kunling Z,et al.A map analysis based on Citespace’s research on China’s Marine economy [J]. *Geographical science*,2016,36(5):643-652.
- [9] Xi Ch,Zhanchun F. Hot spot and frontier analysis of public health performance based on scientific knowledge mapping method [J]. *Medicine and society*,2012,25(5):9-11.
- [10]Fang L,Xiu L,Zhan S,et al. Visual analysis of public welfare research in public hospitals based on Map of scientific knowledge [J]. *Chinese general practice*,2018,21(2):211-215.
- [11] Pan Z,Jiajia F,Yu Z,et al. Analysis of clinical pathway development and management in public hospitals in China [J]. *Hospital management in China*,2019,39(2):41-43.
- [12] Honglei W. Analysis on the current situation of Chinese nursing papers published under the name of "pathway" [J]. *Chinese Nursing Management* ,2011,11(7):12-14.
- [13] Chunyin S,Zhihua L,Guoqin R,et al. Application of Delicacy Management in clinical nursing pathway [J]. *Chinese journal of hospital management*,2014,30(10):771-772.
- [14] Chaoyi Z,Xiaodong G,Tian L,et al. Review of clinical pathway effect evaluation in the domestic and overseas [J].*Chinese Pharmaceutical Affairs*,2018,32(1):8-14.
- [15] Hui H,Daning D,Ying Z,et al. Current situation, problems and countermeasures of clinical pathway implementation: a case study of the second affiliated hospital of soochow university [J]. *Soft science of health*,2016,30(7):15-17.
- [16] Shuyan G,Gang H,Siping D,et al. Discussion on clinical pathway policy in China based on bibliometrics [J]. *Chinese Health Policy*, 2018,11(5):74-78.
- [17] Pengzhen L,Hongbin T,Guanghua W,et al. Analysis of clinical pathway variation management in the domestic and overseas[J]. *Chinese journal of hospital management*,2011,27(2):100-103.
- [18] Fei B,Jie B,Huiqin T,et al.. Analysis on the influencing factors of clinical pathway of public hospitals [J]. *Chinese journal of hospital management*,2017,33(1):27-29.
- [19] Feng Z,Dachuan L,Wenbao Z,et al. Review and prospect of clinical pathway management in China [J]. *Chinese journal of hospital management*,2018,34(4):284-287.
- [20]Xuan Y,Yongming Q,Chun X,et al. Exploration of multi-department linkage mechanism in standardizing clinical pathway management [J]. *Chinese Health Quality Management*,2018,25(1):33-35.
- [21]Yu X,Shangzhi Hong,Na L,et al. Application conditions and domestic practice of DRGs from the perspective of economics [J]. 2019,39(2):65-67.

- [22]Sen L,Ming Z,Xingang S. Clinical pathway management of elderly patients in the basic medical insurance system to pay the proportion of the medical insurance fund management [J]. Chinese journal of gerontology,2019,39(2):611-613.
- [23]Xuefeng W,Yongcong C,Jie B,et al. Investigation on clinical pathway control in public hospitals in China [J]. Chinese journal of hospital management,2017,33(1):24-26.
- [24] Xiaojun C,Xiufeng Y. The time and analysis of carrying out JCI certification in the informatization construction of our institute [J]. Chinese journal of hospital management,2014,30(4):305-307.
- [25] Licheng Y,Linhui B,Yijuan T,et al. Discussion on the construction of two-way referral mechanism under the medical conjoined pattern [J].Chinese hospital,2015,19(7):33-35.
- [26] Zhenye G,Wei C,Jian F,et al. Discussion on the feasibility of three-level rehabilitation medical service of medical conjoined body under the new medical reform [J]. Chinese Hospital Management, 2017,37(1):31-33.
- [27] Qingjun Y,Wei W,Dong Z,et al. Study on clinical pathway of grading diagnosis and treatment of early lung cancer under medical consortium [J].Chin J Prim Med Pharm,2018,25(24):3246-3248.

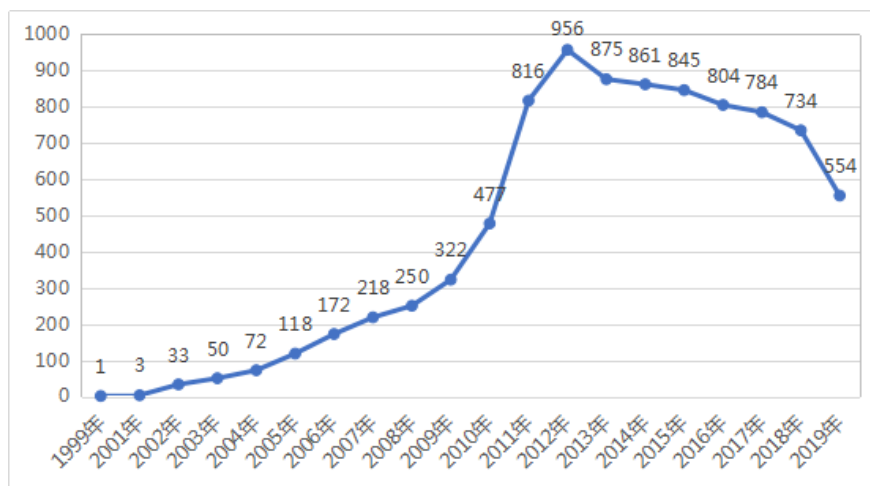


Figure1 Time Distribution of Literature Publication

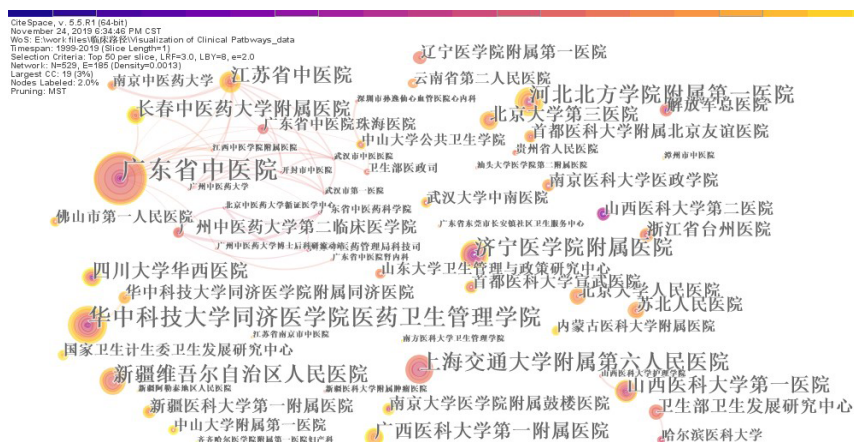


Figure 2 Research Institution of Literature Publication

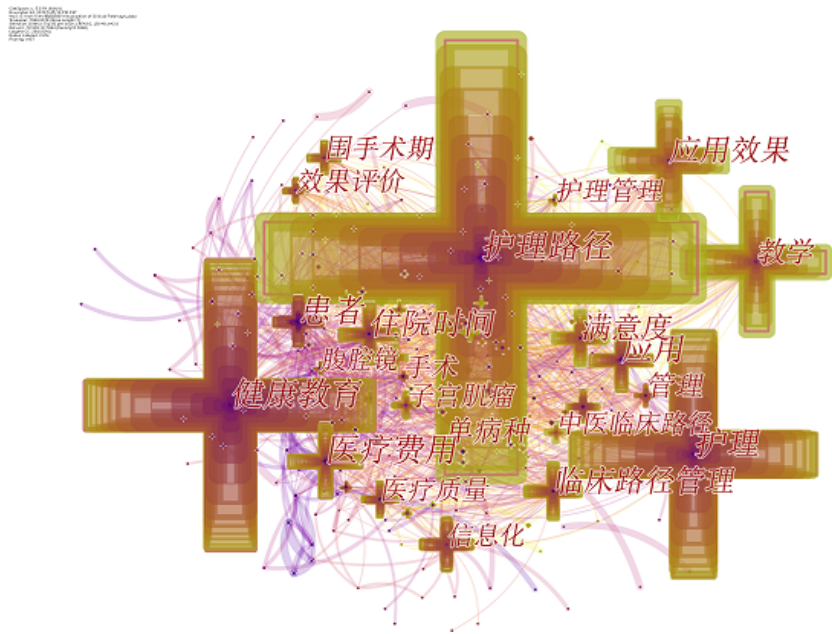


Figure 3 Keywords co-occurrence network analysis atlas

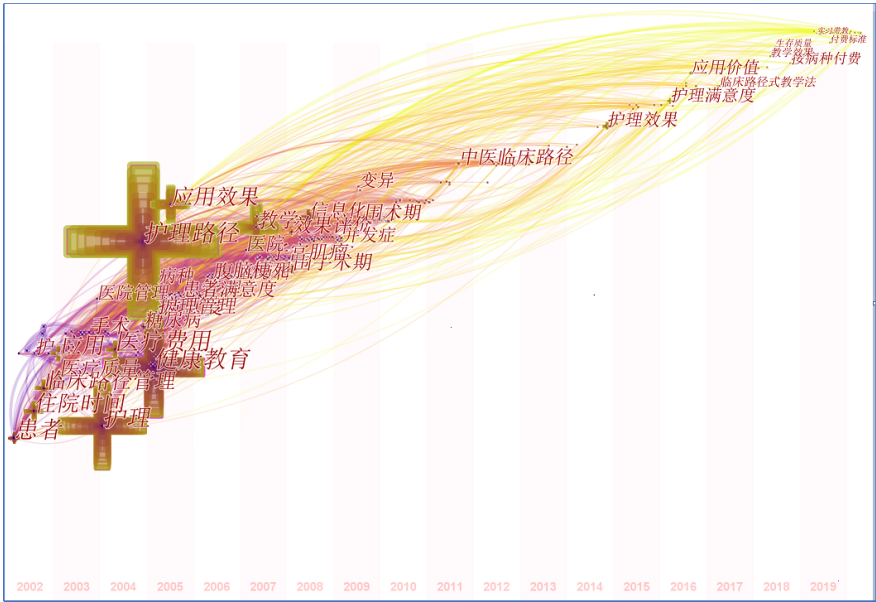


Figure 4 The keyword time-zone

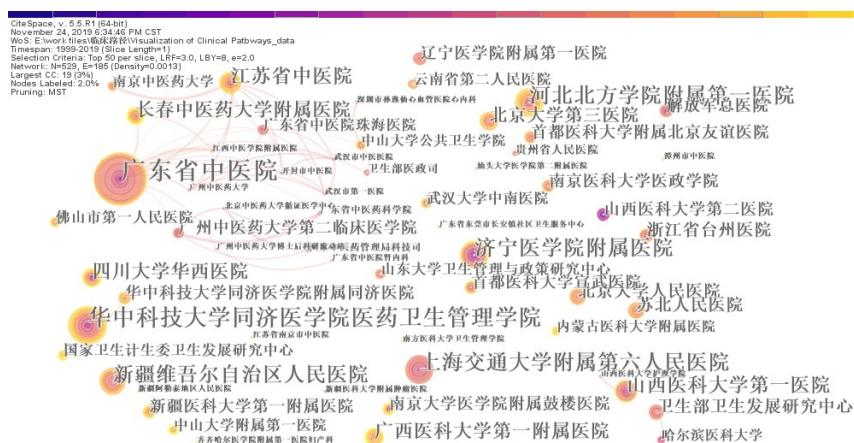
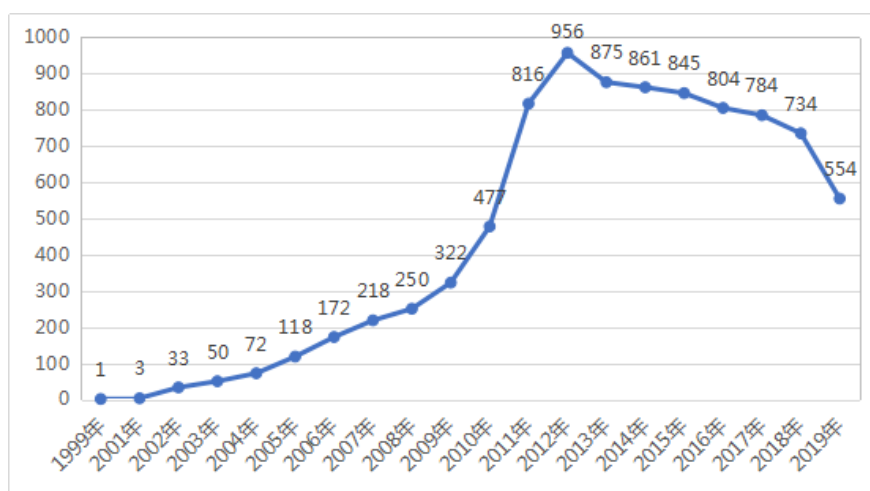
Table 1 Frequency and centrality of keywords of Clinical pathway

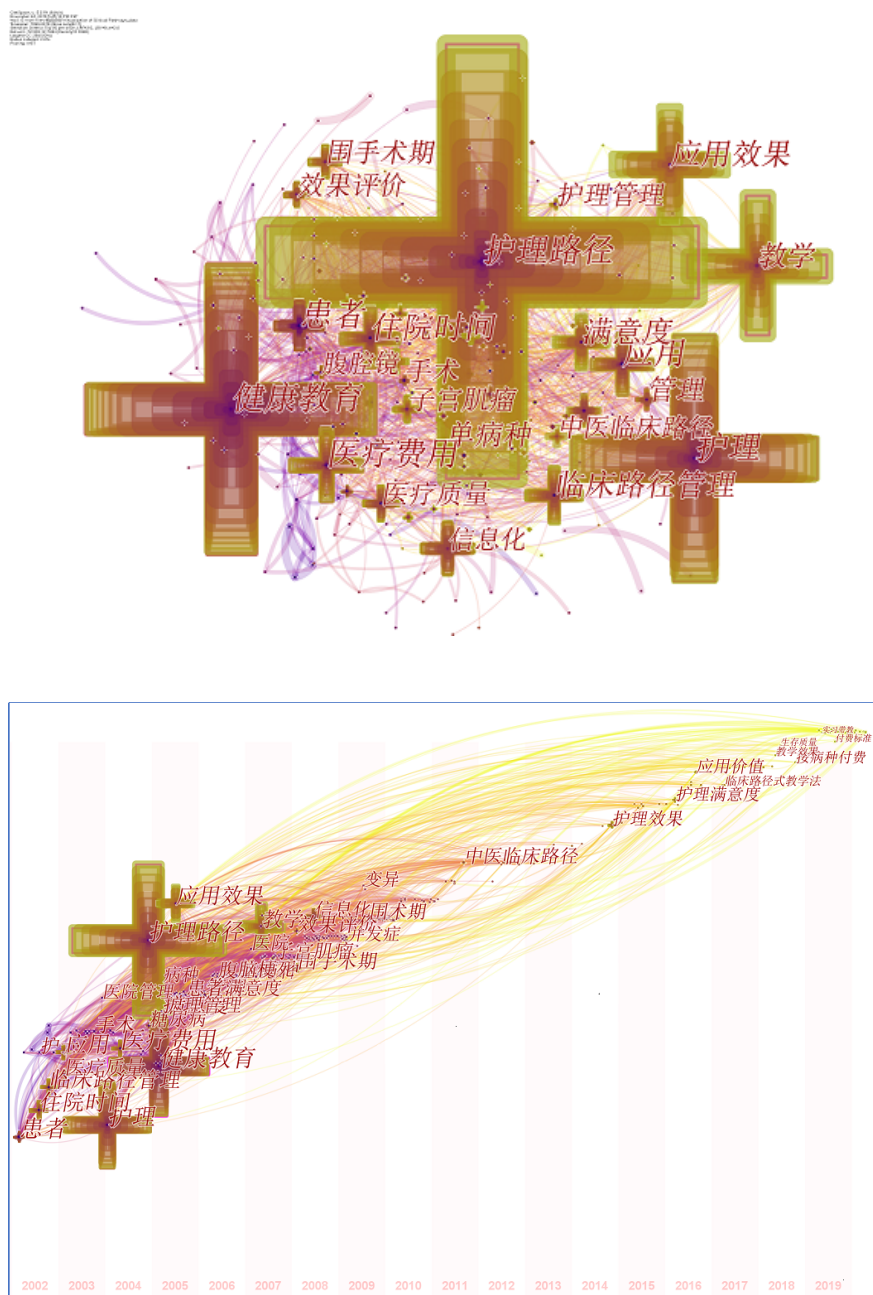
Sequence number	Key word	frequence	Sequence number	Key word	centrality
1	Nursing pathway	1388	1	Health education	0.21
2	Health education	956	2	Nursing pathway	0.17
3	nursing	840	3	nursing	0.17

Sequence number	Key word	frequency	Sequence number	Key word	centrality
4	Teaching	489	4	patient	0.17
5	Application effect	415	5	Application	0.16

Table 2. The top five burst terms in clinical pathway research

Sequence number	Burst term	burst value	Sequence number	Burst term	Σ
1	teaching	42.88	1	Health education	988.64
2	patient	37.29	2	patient	339.71
3	Health education	35.72	3	teaching	82.12
4	Application effect	33.62	4	Application effect	10.65
5	complications	20.37	5	informatization	1.75





Hosted file

table 1.docx available at <https://authorea.com/users/351463/articles/476073-clinical-pathway-management-based-on-bibliometric-analysis-in-china>

Hosted file

table 2.doc available at <https://authorea.com/users/351463/articles/476073-clinical-pathway-management-based-on-bibliometric-analysis-in-china>