Global Trends and Hotspots in Narrative Medicine Studies: A Bibliometric Analysis

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Introduction. In recent decades, the overemphasis on technical aspects of precision medicine has led to the neglect of patients' personal feelings, leading to conflicts and tensions between doctors and patients. Narrative medicine（NM） is an interdisciplinary approach aimed at facilitating physician-patient communication, enhancing empathy, and improving the quality of medical care through storytelling. However, the global trends and hotspots in the field of narrative medicine remain unclear. To fill this gap, we conducted a bibliometric analysis of global scientific publications in the field of narrative medicine, utilizing two visualization tools, CiteSpace and VOSviewer, on papers published in the Web of Science database between 2011-2021.

Methods. This study presents a bibliometric and visual analysis of the research status, global trends, and hotspots in narrative medicine. Using the Web of Science Core Collection (WoSCC) as the data source, 736 articles published between 2011 and 2021 were retrieved and analyzed based on publications, authors, countries, institutions, journals, and keywords.

Results. Over the past decade, the number of publications in this field has steadily increased annually. The study found that American scholars contributed the most research papers in this field (369 papers) and that the United States is the key node in cooperation with the UK, Canada, Italy, and other countries. The most influential research team was Columbia University (29 papers and 406 citations). The research hotspots were classified into four clusters: narrative medicine education, consumer health information, health insurance, and medical overuse. The functions of education and the application of narrative medicine were identified as potential future research hotspots.

Conclusion. This study suggests active cooperation among authors, institutions, and countries. Among the four clusters, NM education was closely related to the other three. Thus, more attention

Keywords. narrative medicine, CiteSpace, VOSviewer, bibliometric, hotspots, research trends.

INTRODUCTION

In recent decades, precision medicine, focusing on science and technology, has been increasingly applied to address patients' health problems, resulting in more accurate diagnoses and effective treatments for clients (1). However, overemphasis on technical aspects of precision medicine may neglect patients' personal feelings, leading to conflicts and tensions between doctors and patients, which are becoming a public concern. Narrative medicine (NM) is defined as the ability to recognize, absorb, interpret, and be moved by stories of illness in daily medical practice (2). The three key elements of NM are attentiveness, representation, and affiliation (3). Attentiveness refers to listening to and observing the patient with complete attention, while representation involves reflecting and writing on the narrative of the patient's disease. Affiliation pertains to adopting an empathetic attitude towards the patient's suffering. Techniques such as effective listening, literature reading, empathy, reflection, and communication are integrated into clinical practice (2,4,5). According to Avrahanmi et al., the essence of NM is complete constructivism following a scientific description of evidence-based medicine (6). Dr. Poses of Brown University suggests that deconstructivism, post-structuralism, and post-modernism are the philosophical bases of narrative medicine, based on the narrative context and origin of NM (7). From a literature perspective, Canadian sociology professor Frank lists five characteristics of the description of medical practice: temporality, particularity, opportunism, intersubjectivity, and ethics (8). Medical anthropologists emphasize the importance of clinicians, paying attention not only to the physical condition of the patient but also to the patient's painful experience (9). The application of narration in medical activities can penetrate patients' subjective experiences of disease and pain, helping alleviate their suffering (10,11,12). NM can be considered a correction of the purpose of medicine, from simply treating patients to healing them with holistic healthcare, bridging the gap between evidence-based care and the medical humanities (13). Moreover, current medical education not only emphasizes medical theories and clinical skill competency-based training, but also focuses on patient-centered medical services with good communication skills and medical humanistic spirit. Several studies have explored the application and practice of NM in medical education (14,15,16).

MATERIALS AND METHODS

data source and retrieval strategy

To ensure the validity and reliability of the data sources, we used the English database Web of Science Core Collection (WoSCC) for our literature review and selected SCI-Expanded and SSCI as the indexes. WoSCC is a high-quality digital document resource database that has been widely accepted by researchers and is suitable for bibliometric analysis(17). We searched the database for relevant journal articles published between 2011 and 2021. We completed the data download and document search on May 1, 2022, to avoid bias due to regular database updates. Figure 1 shows the search process in detail. We analyzed the data to extract information on the titles, abstracts, authors, institutions, countries, journals, references, and citations of each article.

Inclusion criteria

This scholarly publication encompasses investigations pertaining to the title, abstract, associated keywords, and retrieval subject terms. The scope of Science Core Collection (WoSCC) is not restricted to particular languages or research modalities, and the information contained within it is comprehensive, authentic, and trustworthy.

Statistical methods

CiteSpace is a specialized software program designed to facilitate information visualization (18). The present study employed CiteSpace to undertake a series of analyses of publications in the field of narrative medicine. Specifically, this study examines the confluence of publishing institutions, jointly cited references, and relevant keywords to identify research hotspots. Network visualization maps were created to highlight the most frequently occurring nodes and items of interest. Furthermore, the centrality score was used to evaluate the significance of network nodes, with higher centrality scores indicating greater importance. An analysis of the centrality score was conducted to gain insights into the development status and trends in the field of narrative medicine.

VOSviewer is a bibliometric analysis software designed for knowledge mapping. This software was developed through a collaborative effort between Nees Jan van Eck and Ludo Waltman, both scholars affiliated with the Leiden University. VOSviewer offers an intuitive approach for evaluating the co-occurrence of terms and generating density maps that effectively display research results. The

advanced cluster technology of the software is particularly noteworthy. In this study, VOSviewer is utilized to classify keywords into distinct "clusters" that are differentiated by varying colors.(19)

RESULTS

Descriptive Statistics

Annual output and growth trend of publications

The annual volume of literature is a crucial metric that indicates the current state of research in a given field. In this study, we conducted an analysis of the entire body of documents contained within WoSCC, spanning the period from January 1, 2011, to December 31, 2021. The aim was to gain a macroscopic perspective of the level of interest and development in this field. The data were compiled and presented in the form of a line chart (Figure 1) that effectively conveys an overview of the state of narrative medical research (Figure 2).

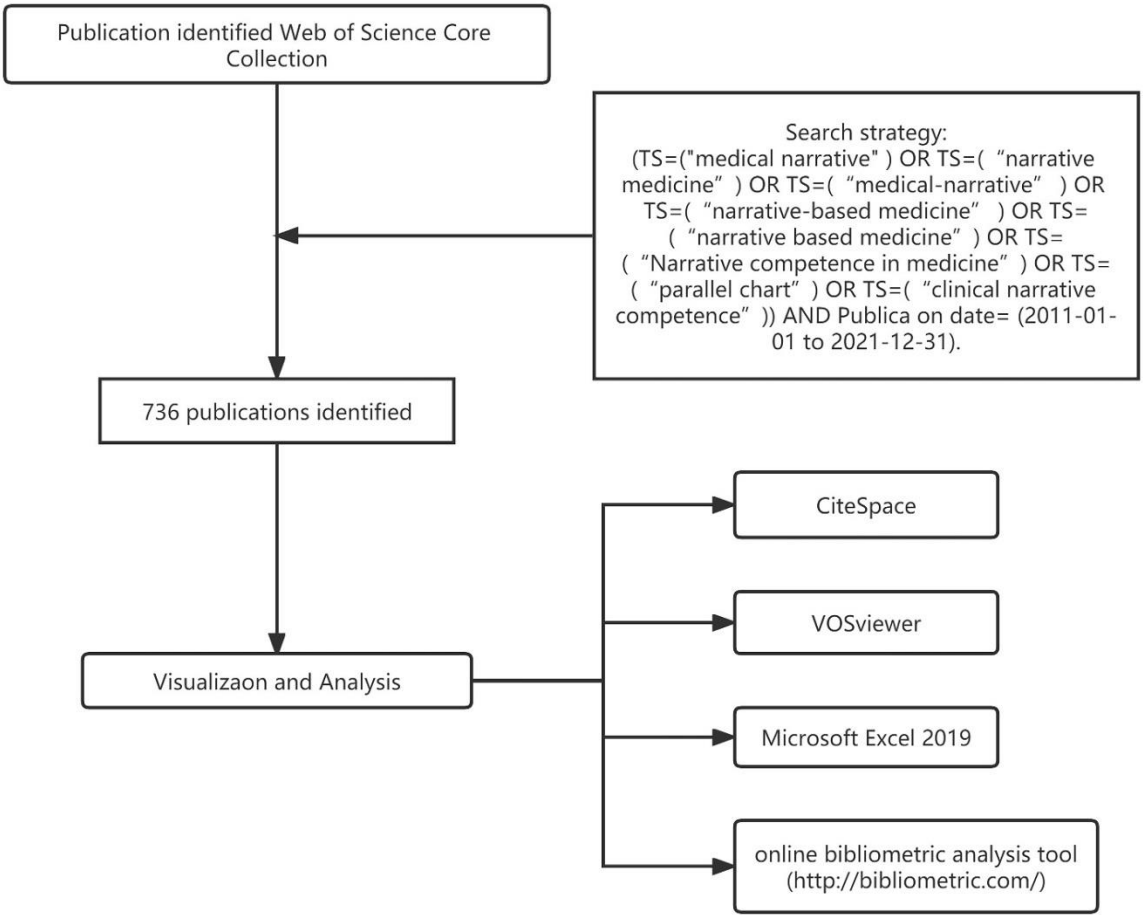


Figure 1. Data preprocessing flowchart in this study.

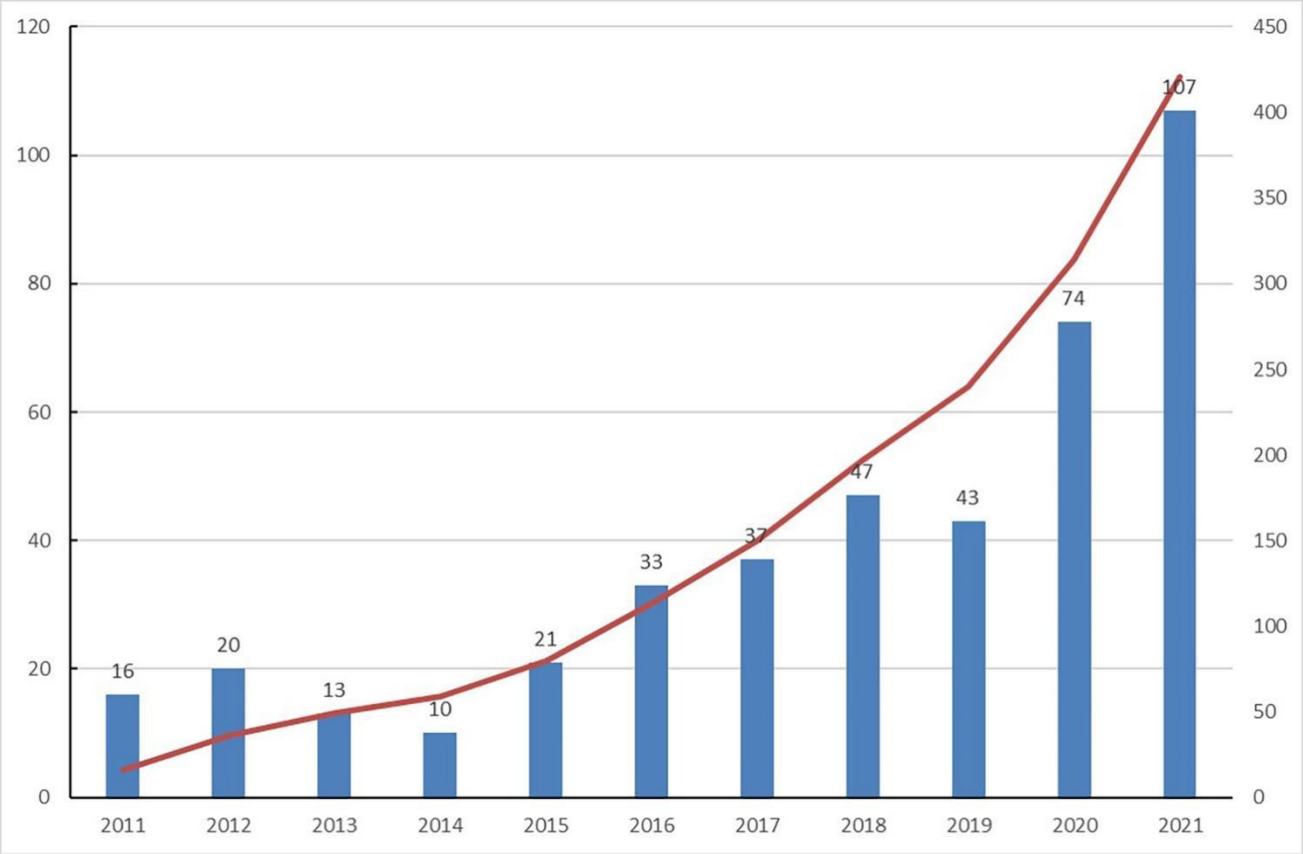


Figure 2. The temporal change of the number of published works from 2011 to 2021 Time(Year)

Bibliometric analysis of the author

This study undertakes an analysis of the authors of the literature, representative scholars, and core research forces operating within the research field under investigation. Drawing on Price Law(20), which posits that half of the papers on a given topic are authored by a select group of prolific authors, we explore the distribution of authorship and identify the approximate number of core author sets. Specifically, we find that the number of core author sets is approximately equal to the square root of the total number of authors in the field.

$$\sum_{m+1}^{I} n(x) = \sqrt{N}$$

Price's law stipulates that the minimum number of articles published by core authors in a given field must meet a threshold of $0.749 \times \sqrt{(n_{max})} \approx 2.996$. Thus, the establishment of core authors in the field requires a minimum of three articles (inclusive of three articles). In this study, our statistical analysis

revealed 168 core authors who collectively authored 422 articles, accounting for 57.3% of the total number of articles in the field. This figure meets the half (50%) standard proposed by Price and is consistent with the calculation formula of Price's law. Based on these findings, we posit that a relatively stable cooperative group of authors has emerged in the field of narrative medicine research. Table 1 provides a summary of highly productive authors who have published more than three articles in this field.

In this study, we identified highly productive authors in this field of investigation. Notably, Charon emerged as the most prolific author, with 16 published articles between 2011 and 2021, garnering 386 citations. Balmer closely followed 14 articles and 54 citations with an average citation count of 123. Both scholars are affiliated with Columbia University and collaborated extensively. Additionally, we identified co-cited authors, which refers to authors who are frequently cited together in publications. (Tables 1 and 3).

Table 1. The top 10 authors by publication count and their citation counts.

Rank	Author	Documents	Citations
1	Charon, Rita	16	386
2	Balmer, dorene f.	14	54
3	Cappuccio, Antonietta	9	35
4	Marini, Maria Giulia	8	128
5	Reale, Luigi	6	42
6	Huang, Chien-Da	5	40
7	Banfi, paolo	4	22
8	Fiorencis, alessandra	4	13
9	Frank, arthur w.	4	20
10	Napolitano, silvia	4	30

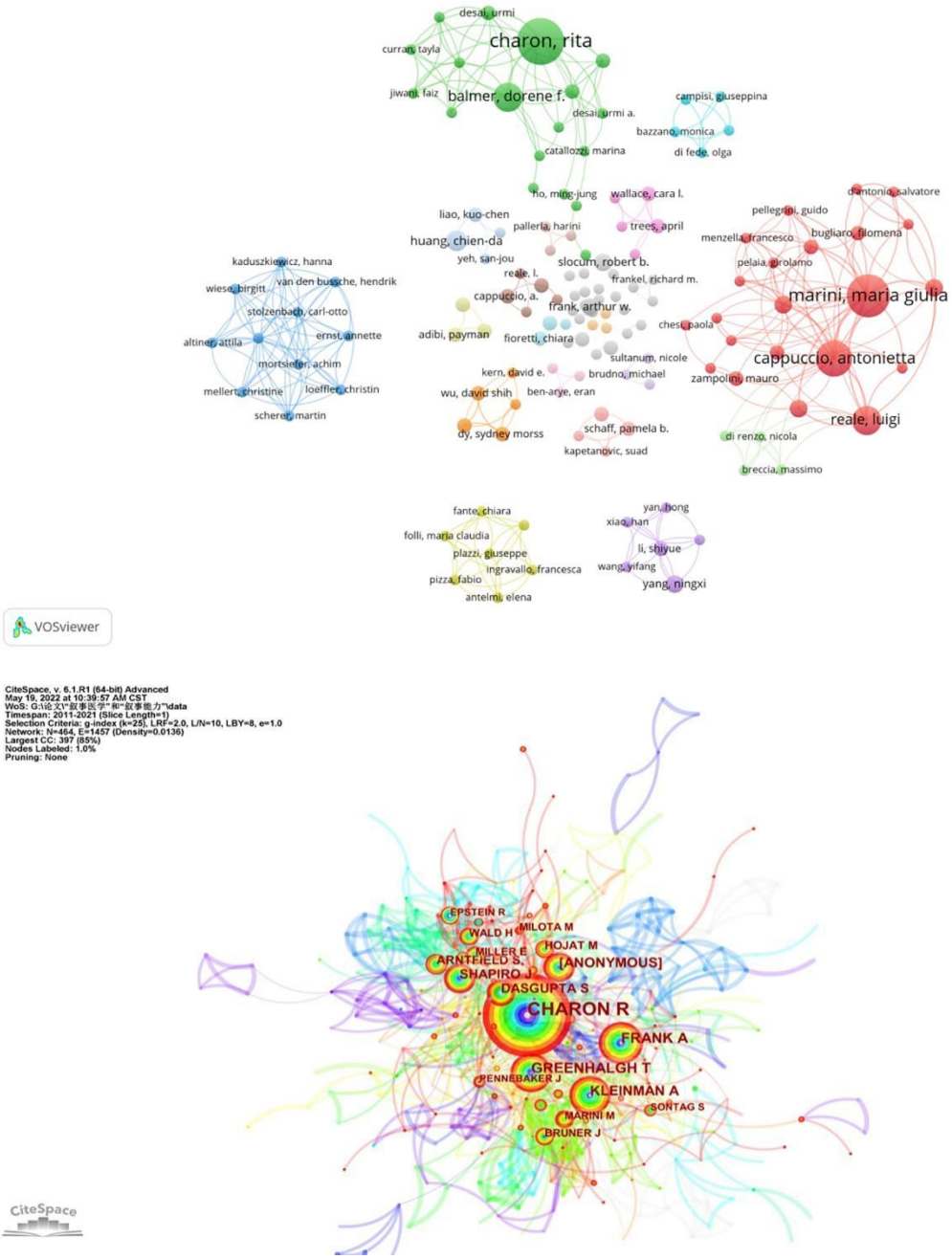


Figure 3. Cooperation network among the authors in the Narrative Medicine research field. (a) Co-authorship network of authors by using VOSviewer software; (b) Co-authorship network of authors by using Citespace software.

Bibliometric analysis of the journal

The present study analyzed the journals in which the literature on narrative medicine was published between 2011 and 2021, and identified that the majority of the publications were featured in the field

of Medical Humanities. Table 2 highlights the top ten journals in the field of narrative medicine and their corresponding article count, with journals such as "Jama-Journal of The American Medical Association", "Journal of Medical Humanities" and "Medical Humanities" featuring 96, 21, and 18 articles, respectively. Furthermore, the analysis of journal citations indicated that "Academic Medicine" was the most frequently cited journal in the field, with a total of 13 articles and 406 citations, highlighting the journal's contribution to the field of educational technology and attesting to the high-quality and significant attention given to narrative medicine research. (Figure 4)

Table 2. The top 10 journals in the Narrative Medicine research field.

Ranks	Source	Documents	Citations	Average Citation/Publication
1	Jama-Journal Of The American Medical Association	96	209	1
2	Journal Of Medical Humanities	21	44	19
3	Medical Humanities	18	172	15
4	Academic Medicine	13	406	43
5	Bmc Medical Education	11	66	28
6	Journal Of General Internal Medicine	11	29	22
7	Patient Education And Counseling	10	138	29
8	Exercer-La Revue Francophone De Medecine Generale	9	5	1
9	Medical Teacher	9	97	32
10	Canadian Family Physician	8	70	10

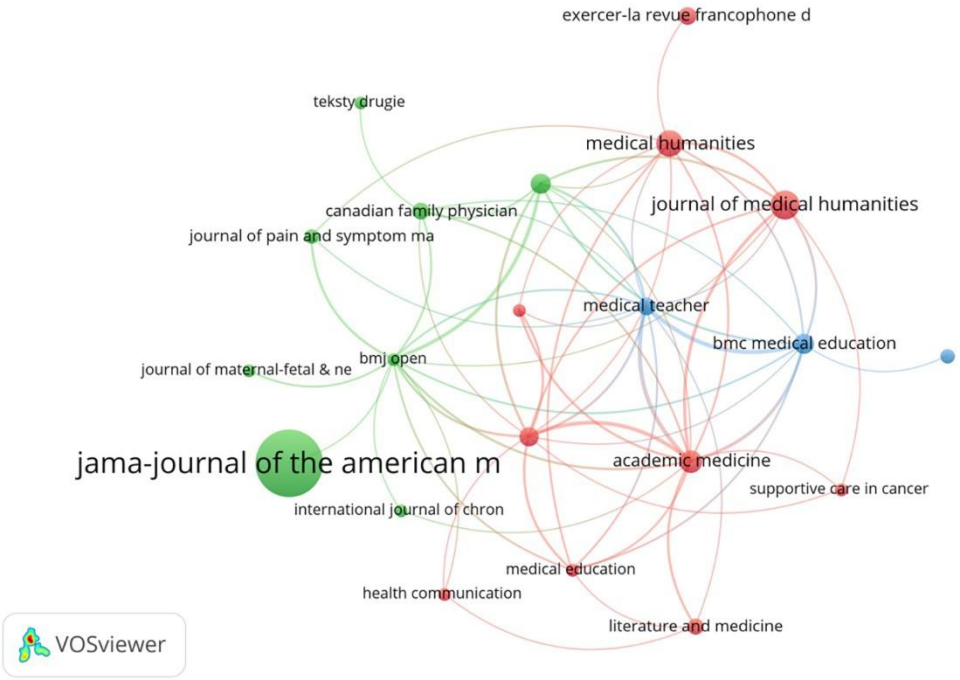
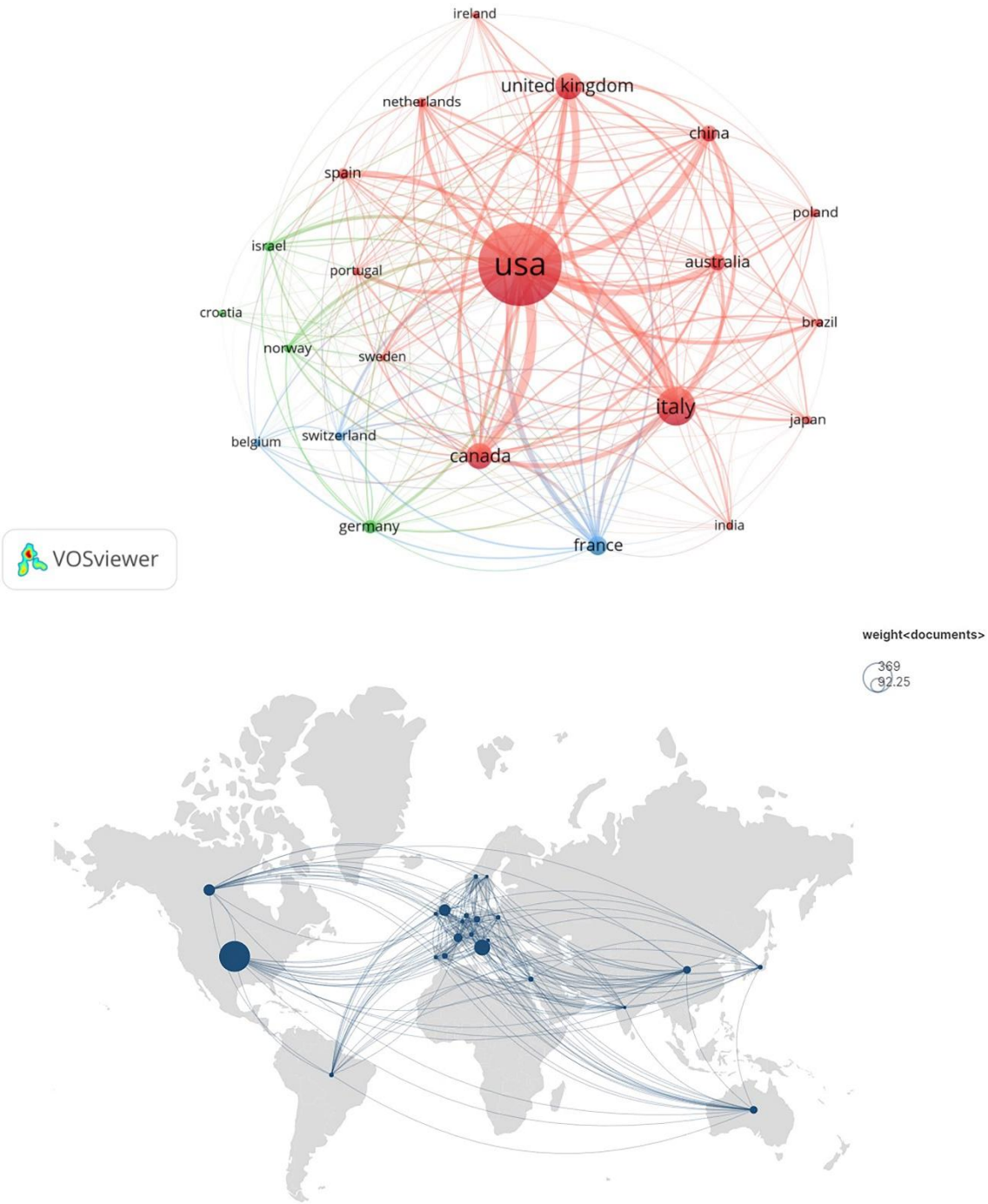


Figure 4. Cooperation network among the journal in the Narrative Medicine research field.

Bibliometric analysis of the country

To gain deeper insight into the global contribution to narrative medicine research, this investigation scrutinized the publication output of 46 countries. To visualize countries with at least four articles, VOSviewer was employed, and the outcomes are shown in Figure 5. Figure 5a shows that the size of the circle node is directly proportional to the number of publications, and the thickness of the connection line indicates the level of collaboration between the two countries in producing articles. The node colors denote different clusters. Figure 5b presents a cartographic representation of the global collaboration network involving multiple countries, where the magnitude of the blue nodes corresponds to the volume of publications emanating from each nation. The blue lines signify the collaborative ties between diverse countries/regions. As discerned from the analysis, the United States assumes a preeminent position as the most frequent collaborator in the international arena. As shown in Figure 5c, the distribution of countries was highly imbalanced, with a few nations making substantial contributions, and the majority of the articles were authored by researchers from these countries.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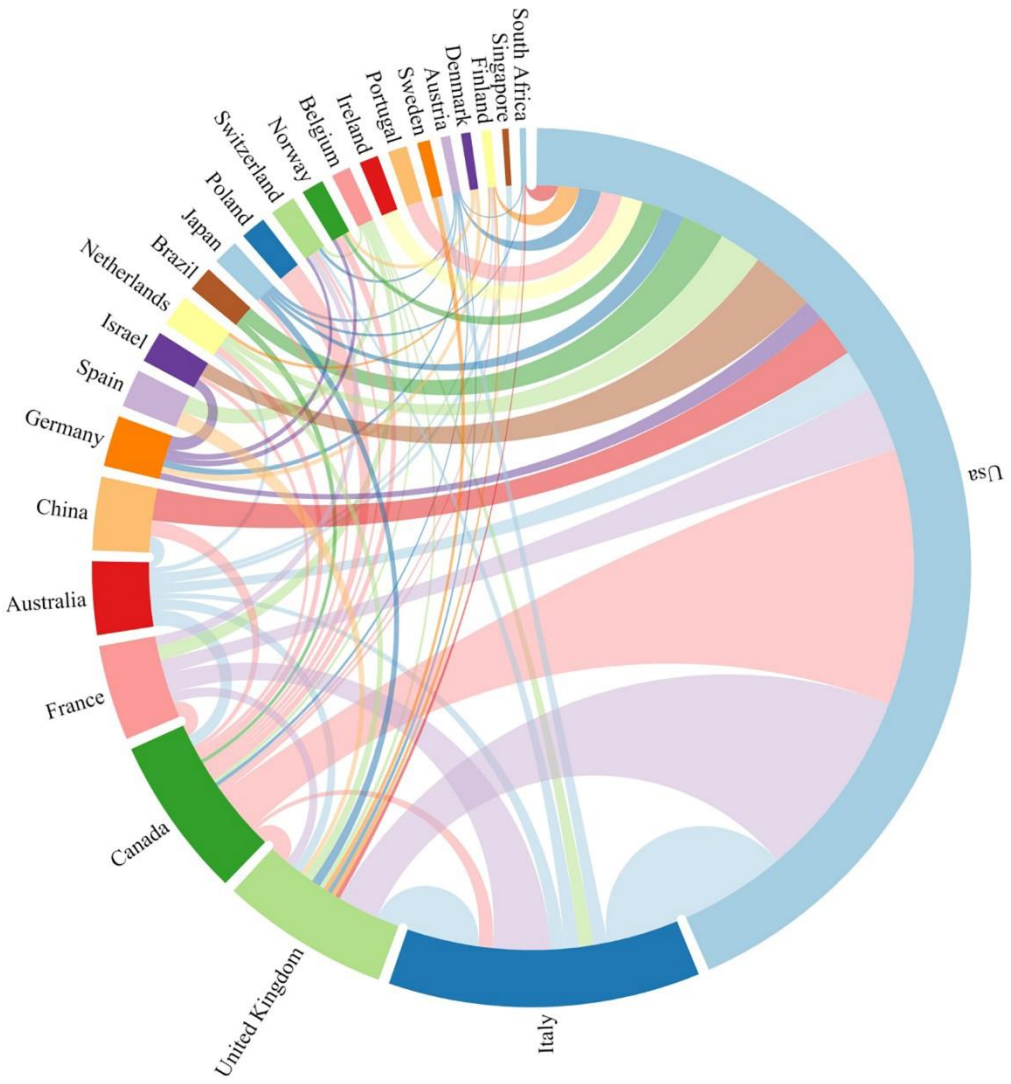


Figure 5. International bibliometric visualization analysis (a) Co-occurrence of each country; (b) World map showing the contribution of each country;(c) The collaboration analysis among different countries/regions.

Upon conducting a comprehensive examination of the top five high-yielding countries in the field of narrative medicine, as demonstrated in Figure 5 and Table 3, it has been determined that the United States has been the foremost contributor to this area of research, publishing a total of 369 papers, which accounts for 48% of the aggregate number of papers published in this field. Notably, the number of citations obtained by the United States far exceeded that of other countries. Italy is the second-highest contributor in this domain, having submitted 98 papers and obtained 425 citations. In total, the top five countries with the highest productivity published 601 research papers, accounting for 78% of the total number of papers published in this area. These findings suggest that these countries have a significant influence on the field of narrative medicine.

Table 3. Top 5 countries in the Narrative Medicine research field

Ranks	Country	Documents	Citations	Average Citation/Publication
1	Usa	369	1962	23771
2	Italy	98	425	10270
3	United Kingdom	53	331	6068
4	Canada	51	442	9002
5	France	30	106	4104

Bibliometric analysis of the organization

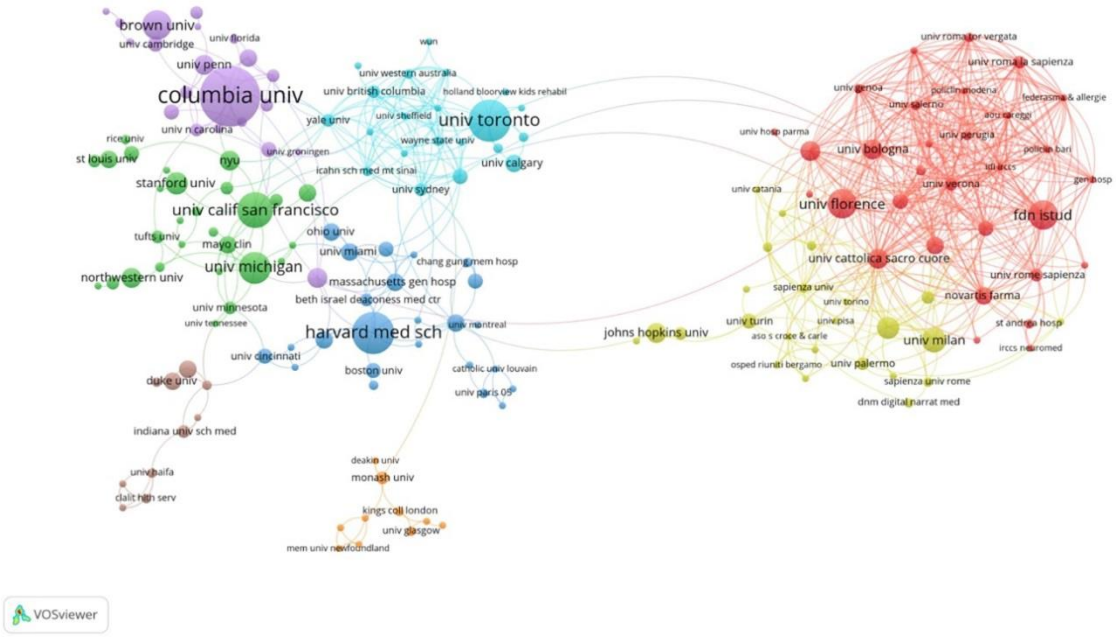
The assessment of organizational strength in discipline development can be achieved objectively through independent analyses irrespective of national or regional collaborative networks.

Table 4 presents a list of the top 10 organizations in terms of post volume, wherein Columbia University emerged as the foremost core organization with 26 articles and the highest degree of centrality (c=406). Subsequently, Harvard Medical School and the University of Toronto have each published over 15 articles, thereby contributing significantly to the advancement of research in the field of narrative medicine.

The VOSviewer module of co-authorship was employed to construct a map of the collaboration network among the countries, as shown in Figure 6A. In the past decade, the top five institutions have not only established close collaborative ties with each other but have also formed research communities centered around their respective institutions, thereby significantly advancing in-depth research in the academic field. As illustrated in Figure 6B, institutions are colored according to their mean publication year. It is noteworthy that despite some institutions having engaged in narrative medicine research at an early stage (indicated in purple), their output and citation rates are quite limited. With the emergence of narrative medicine research at Columbia University, the University of Toronto, and the University of Florence in the period around 2018, the level of collaboration among institutions intensified. Subsequently, the primary research institutions in the field of narrative medicine shifted to a cooperative consortium centered on Harvard Medical School after 2020. This migration of research institutions reflects, to some extent, a change in research domains and directions.

Table 4. Top 10 organizations in the Narrative Medicine research field.

Ranks	Organization	Documents	Citations	Total link strength
1	columbia univ	26	406	19
2	harvard med sch	17	32	11
3	univ toronto	17	96	22
4	univ calif san francisco	14	71	11
5	univ michigan	12	119	11
6	brown univ	11	146	1
7	fdn istud	11	60	54
8	univ florence	11	42	29
9	univ milan	9	71	16
10	istud fdn	8	35	28



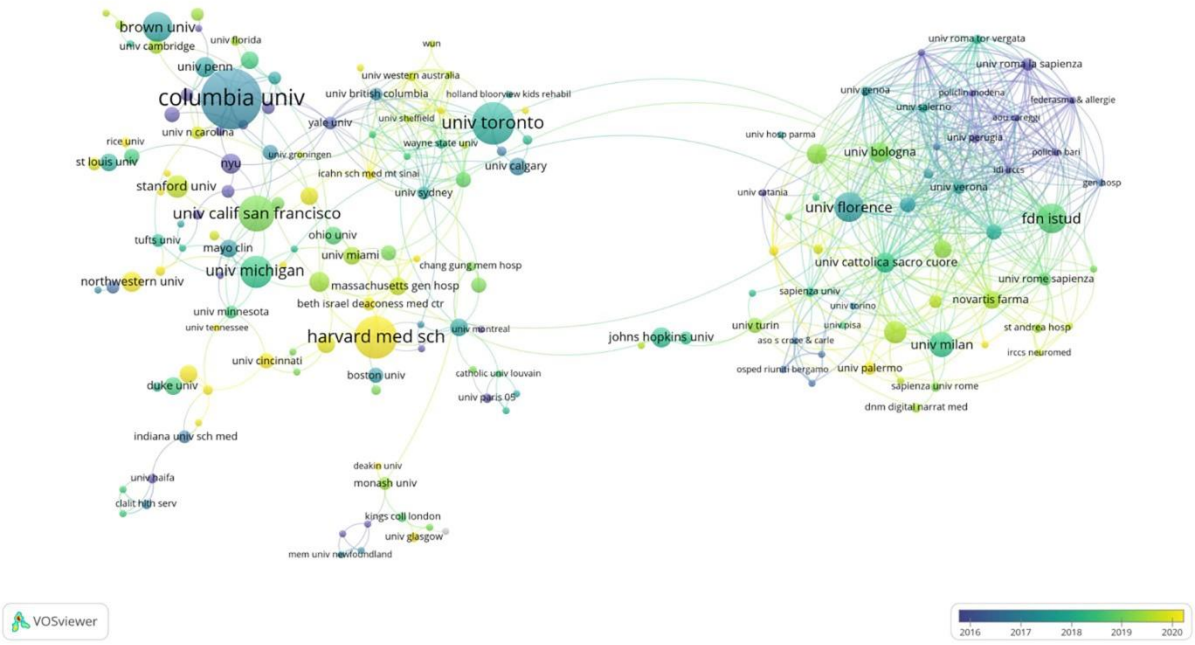


Figure 6. Collaboration network of high productive institutions in the research. (a) the cluster of institutions collaboration network; (b) the average publication year of each institution.

Keywords

The identification of keywords that encapsulate the central themes of a given body of literature, coupled with an analysis of their frequency distribution, enabled us to discern prevailing research trends and areas of focus within a particular field of study.

A total of 1427 keywords were subjected to analysis, revealing 15 keywords with a frequency exceeding 20 and 92 keywords appearing more than five times, as presented in Table 5 and Figure 7a. Figure 7b displays the resulting keyword network comprising 22 co-citation clusters, with the top 10 clusters summarized in the figure.

The term "burst keyword" pertains to the phenomenon in which a keyword exhibits a high frequency of occurrence during a specific timeframe. Such information can help elucidate the temporal evolution of research hotspots, highlight current research trends, and potentially forecast future research directions. To gain deeper insights into the emergent hotspots within the field of narrative medicine, we utilized the citespace to identify burst keywords across the entire dataset, as shown in Table 6. The clustering of keywords highlighted the prominence of graphic medicine (n=77), health insurance (n=66), consumer health information (n=59), healthcare (n=92), patient stories (n=58),

illness experience (n=57), cancer (n=56), China (n=56), phenomenology (n=55), and medical overuse (n=55).

Table 5. Top 15 keywords in the Narrative Medicine research field.

Rank	Count	Centrality	Year	Keywords
1	286	0	2011	narrative medicine
2	47	0.01	2011	education
3	43	0	2011	medical education
4	37	0.04	2011	care
5	32	0	2011	medical humanity
6	30	0	2012	student
7	30	0.03	2011	medicine
8	29	0.02	2011	model
9	28	0.01	2011	physician
10	27	0.03	2011	health
11	26	0	2011	empathy
12	26	0.02	2012	health care
13	23	0	2012	story
14	22	0.01	2012	quality of life
15	22	0.01	2011	illness

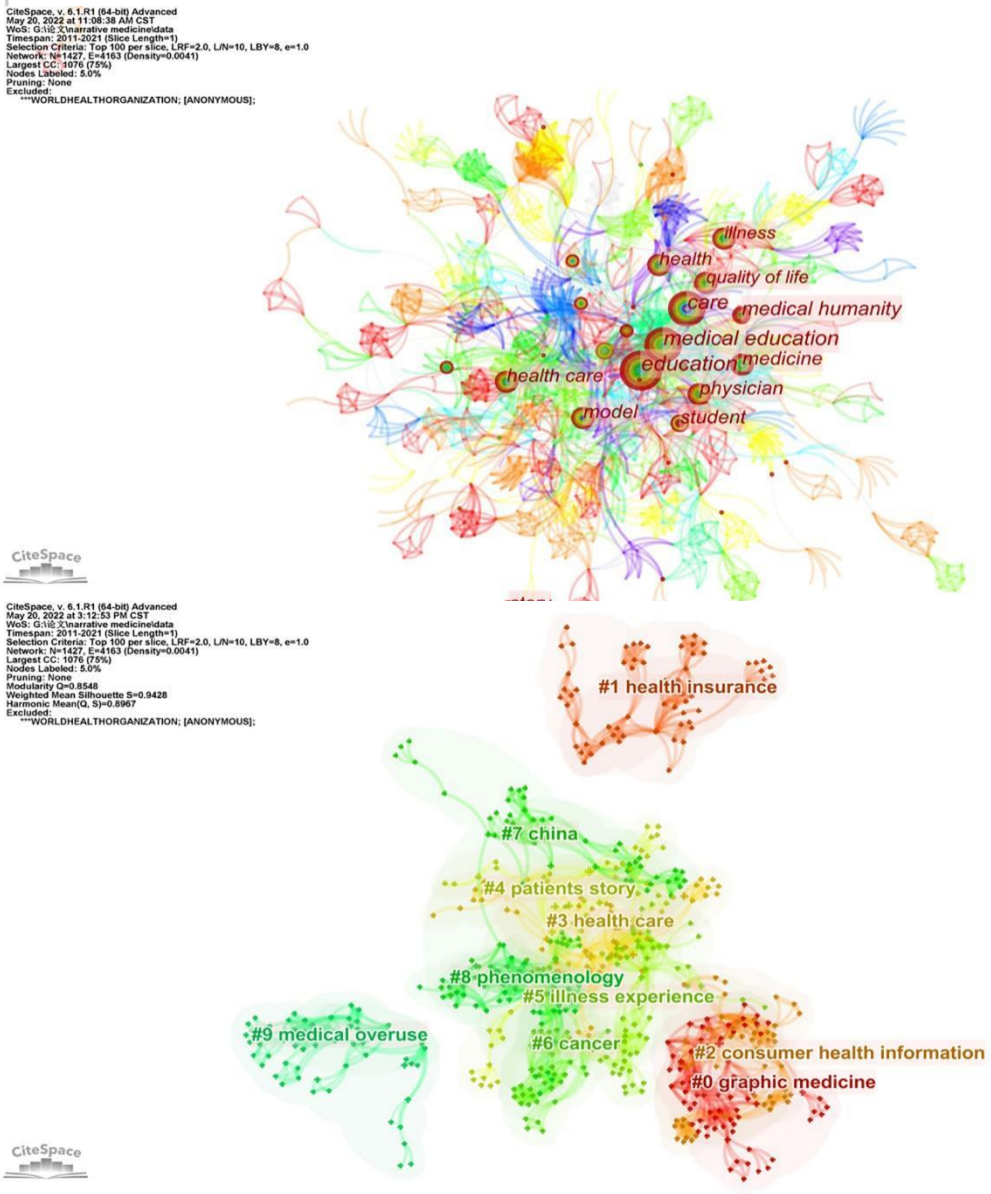


Figure 7. Keywords co-occurrence network analysis. (a) Co-occurring keywords map.; (b) Keywords cluster analysis co-occurrence map.

Table 6. The top 9 largest clusters of co-cited references in the Narrative Medicine research field.

ClusterID	Silhouette	Mean (Year)	Label (LSI)	Label (LLR)
0	77	0.969	2017	graphic medicine ; communication skills ; medical ethics ; information technology ; accuracy
1	66	0.967	2016	health insurance ; medical narrative ; eortc ; dynamic interplay ; minority stress
2	59	0.949	2017	consumer health information ; orthotopic liver transplantation ; journalism ; health care seeking behaviour ; familial cancer
3	58	0.873	2016	health care ; family medicine ; primary health care ; biocultural and biopsychosocial model ; explanatory model of illness
4	58	0.888	2015	patients story ; quality of life ; patient-centered medicine ; informal caregiver ; intervention programs
5	57	0.948	2016	illness experience ; chronic myeloid leukemia ; illness narratives ; refugee health ; sick role
6	56	0.881	2017	cancer ; psychiatry ; knowledge gap ; shamanism ; p4 medicine
7	56	0.925	2017	china ; uncertainty ; sleep ; children with cancer ; emotional well-being in cancer
8	55	0.961	2015	phenomenology ; general practice ; biopsychosocial model ; humanistic medicine ; systems biology
9	55	0.999	2017	medical overuse ; intersectionality ; age ; lung cancer ; evidence based practice

Measuring the impact of a research article is a crucial aspect of an academic evaluation. One of the key metrics used to assess the impact of an article is citation burst, which refers to a significant increase in the number of citations of an article compared to its historical citation rate. Table 7 shows the top-16 cited references with the largest bursts from 2011 to 2021. The red line indicates a sudden increase in citations of that reference during this period and the blue line represents relative unpopularity. Among the references cited in recent years, the earliest citation burst was observed

between 2011 and 2014 and was attributed to "Narrative medicine: Honoring the stories of illness" authored by Charon R (21)and published in the Oxford University Press. This article also had the highest burst strength (strength = 7.78) among all the highly cited articles, indicating significant academic attention during this period.

Table 7. The top 16 References with the Strongest Citation Bursts

References	Year	Strength	Begin	End	2011 - 2021
Charon R, 2006, NARRATIVE MED HONORI, V0, P0	2006	7.78	2011	2014	
Engel J, 2008, NARRATIVE HLTH CARE, V0, P0	2008	2.95	2011	2012	
Kumagai A, 2008, ACAD MED, V83, P653, DOI 10.1097/ACM.0b013e3181782e17, DOI	2008	2.53	2011	2015	
Macnaughton J, 2009, LANCET, V373, P1940, DOI 10.1016/S0140-6736(09)61055-2, DOI	2009	2.2	2011	2013	
Mann K, 2009, ADV HEALTH SCI EDUC, V14, P595, DOI 10.1007/s10459-007-9090-2, DOI	2009	2.03	2011	2016	
Charon R, 2012, ACAD MED, V87, P342, DOI 10.1097/ACM.0b013e3182446fbb, DOI	2012	2.43	2014	2018	
Charon R, 2012, ACAD MED, V87, P5, DOI 10.1097/ACM.0b013e31823a59c7, DOI	2012	2.68	2015	2016	
Kind T, 2009, PATIENT EDUC COUNS, V75, P149, DOI 10.1016/j.pec.2008.09.011, DOI	2009	2.63	2015	2016	
Kerr L, 2010, J MED HUMANIT, V31, P295, DOI 10.1007/s10912-010-9120-6, DOI	2010	2.1	2015	2016	
Wear D, 2012, ACAD MED, V87, P603, DOI 10.1097/ACM.0b013e31824d22e9,	2012	2.1	2015	2016	

DOI					
Charon R, 2012, ACAD MED, V87, P1154, DOI 10.1097/ACM.0b013e3182628d6f, DOI	2012	2.25	2016	2018	
Marini M, 2016, NARRATIVE MED BRIDGI, V0, P0	2016	3.79	2018	2019	
Charon R, 2016, ACAD MED, V91, P345, DOI 10.1097/ACM.0000000000000827, DOI	2016	3.83	2019	2021	
Charon R, 2017, PRINCIPLES PRACTICE, V0, P0	2017	3.19	2019	2021	
Barber S, 2017, MED HUMANIT, V43, P199, DOI 10.1136/medhum-2017-011242, DOI	2017	2.3	2019	2021	
Dasgupta , 2016, PRINCIPLES PRACTICE, V0, P0	2016	2.26	2019	2021	

DISCUSSION

The field of narrative medicine (NM) has seen steady growth in publications over the past ten decades, reaching a record high of 107 articles in 2021 (Figure 2). This reflects the ongoing vitality and development of NM research driven by factors such as patient-centered care, medical humanities, illness narratives, and shared decision-making. NM can help alleviate the rising tension between doctors and patients and provide a theoretical and practical framework for intervention in patient treatment and recovery, complementing evidence-based medicine.

The field of narrative medicine (NM) is dominated by a few countries with high research outputs and impacts (Table 3). The US leads the field with 369 papers published, accounting for 48% of the total publications in NM, and receiving the most citations. Italy ranked second, with 98 papers and 425 citations. The top five productive countries collectively produced 601 papers, representing 78% of the total publications on NM, indicating their significant influence in this field.

Unsurprisingly, the United States leads in the field of narrative medicine research and serves as a key collaborator with countries such as the UK, Canada, and Italy. However, geographic distance does

not appear to be a significant factor influencing international cooperation, as shown in Figure 5. While China and India, as developing countries, have begun to mark the NM research arena, their impact is currently limited due to a paucity of influential articles or reviews. Thus, they may wish to consider strengthening international collaboration in the future. Similarly, among the top 10 research organizations, five are located in the United States, which continues to occupy a dominant position in the field, as demonstrated in Table 4. Columbia University in the United States ranks first in NM research, with 29 publications and 406 citations, followed by Harvard Medical School (USA) and the University of Toronto (Canada) with 17 publications and 32 and 96 citations, respectively. As such, Columbia University (United States) is the most relevant and academically influential organization in the field of NM. Figure 6 illustrates the relative lack of inter-institutional cooperation and communication, suggesting the need for increased collaboration and communication to advance research and development in the field of NM.

The identification of key journals and authors is crucial to gaining an understanding of a specific field of study. In the field of narrative medicine, "Jama-Journal of the American Medical Association," "Academic Medicine," and "Medical Humanities" Medical Humanities emerged as the top three most productive and commonly cited journals (Table 2). Researchers should, therefore, maintain a watchful eye on these journals to stay abreast of the latest developments. Table 1 presents a list of highly productive authors who published three or more articles in the field. Charon, a renowned professor of clinical medicine at Columbia University, published 16 articles between 2011 and 2021, with an average of 123 citations per article and a total of 386 citations. Charon introduced the concept of NM in 2001(1) and has since positioned it as an effective medical practice model that can bridge the gap between doctors and patients (2). Her influence can be seen in Frank's work, which applied NM to nursing to enhance the humanistic quality and narrative ability of nursing staff and to provide warm and humane nursing services to patients.(8) Fioretics have made significant contributions to studying patients' illness experiences using narrative medicine(22), while Dorene has focused on medical courses related to medical narrative ability.(23) Marini collected corpora from therapy, movies, and books to bridge the gap between evidence-based therapy and medical humanities.(13) Figure 3 illustrates that Charon and Balmer, both affiliated with Columbia University, have collaborated frequently, indicating that this research team is one of the most

influential in the field of NM. Finally, Marini and Cappuccio, from Italy, may be potential research partners.

The utilization of keyword and reference analysis is an effective method for comprehending existing knowledge and its interrelationships within a given research field. This study presented the top 25 references with the strongest citation bursts in the field of NM, which is a valuable resource for researchers to identify the key topics and historical evolution of scholarly publications. The results in Table 6 demonstrate that the most significant academic influential papers in NM up to 2021 include “the principle and practice of narrative medicine” (24), “reflective practice” (25), “illness narrative” (26), “close reading and creative writing” (8), and “narrative medicine education” (27). The co-citation analysis of the keyword network revealed that the current research hotspots on NM can be categorized into four clusters: narrative medicine education, consumer health information, health insurance, and medical overuse. The first cluster is primarily associated with NM education, which has been found to promote the development of medical students' cognition, reflection(28), and perception(29), thus enhancing their understanding of emotions and experiences(30,31) as well as their perception of patients(32). Moreover, it has been observed that NM education improves doctors' mental health, professionalism, and emotional strategies(33), while alleviating burnout(34). The second cluster is related to consumer health information, wherein NM assists doctors in accessing patient information and understanding the opinions of patients or their families, thereby facilitating diagnosis or joint decision making, reducing unnecessary treatment, and providing more personalized care for patients.(25,31,35) The third and last clusters focused on health insurance and medical overuse, respectively, which aimed to prevent harm to patients’ interests through the use of NM.(36,37) Among these clusters, NM education was closely associated with the other three, highlighting the significance of education in the future of NM research.

DECLARATIONS

COMPETING INTERESTS

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

AUTHOR'S CONTRIBUTIONS

LR and WL designed the study. LR and WL drafted the manuscript. WL revised the manuscript accordingly. LR and WL analyzed the data. All authors have contributed to the manuscript and approved the submitted version.

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DATA AVAILABILITY STATEMENT

The original contributions presented in this study are included in the article, and further inquiries can be directed to the corresponding authors.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable

CONSENT FOR PUBLICATION

Not applicable

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