Current status and hotspots in breast cancer patient self-management research: a bibliometric and visual analysis via CiteSpace

Xinyue Chen, Shan Huang, Yanyan Chen, Yan Cao, Cuiping Zhang

Submitted to: Interactive Journal of Medical Research
on: December 13, 2023

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Abstract

Background: Breast cancer is the most common cancer in women and the leading cause of cancer-related deaths among women worldwide.With significant improvements in breast cancer screening, diagnosis and treatment, the number of breast cancer survivors has significantly increased.Individuals with chronic illnesses often develop self-management skills as they cope with their condition, and these include: management of disease symptoms, detection of physiological and psychosocial changes, and lifestyle changes.Fewer studies have systematically summarised the hotspots, pathways and trends in self-care of breast cancer patients, and information on the history, current status and future trends of studies related to self-management of breast cancer patients is incomplete.

Objective: Purpose: To analyze the current status, hotspots, and research trends related to self-management in breast cancer patients from 2005 to 2023 using Citespace on the Web of Science core database.

Methods: Method: A search was conducted in the WoSCC from January 1, 2005, to August 31, 2023. The literature was visualised and analysed by CiteSpace 6.1.R6 for publication time, number of articles, country distribution, institutional distribution, reference co-citation, and keywords. Results: Results: A total of 1,413 English-language documents were included in the research on self-management of breast cancer patients from 2005 to 2023. The USA had the highest amount of issuance, while the University of Toronto had the most among institutions. The reference with the highest number of co-citations was "Self-Management: Enabling and empowering patients living with cancer as a chronic illness. "High-frequency keywords are quality of life, chronic disease, self-management, patient education, randomised controlled trials, education, intervention. These keywords formed 11 clusters related to the content of the intervention, the way of the intervention, outcome indicators, keyword burst analysis predicted that future research hotspots would focus on patient needs, psychological distress, internet technology, and mobile apps. Conclusions: Conclusions: The research on breast cancer self-management is expanding rapidly. To further promote the development in this field, it’s crucial to strengthen cooperation and communication between different countries/regions and institutions. The findings suggest that there’s a need for more research in this field, particularly in areas such as patient needs and the use of technology to improve breast cancer patient self-management. Additionally, our findings offer suggestions for future research.

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Conclusions: The research on breast cancer self-management is expanding rapidly. To further promote the development in this field, it's crucial to strengthen cooperation and communication between different countries/regions and institutions. The findings suggest that there's a need for more research in this field, particularly in areas such as patient needs and the use of technology to improve breast cancer patient self-management. Additionally, our findings offer suggestions for future research.

(JMIR Preprints 13/12/2023:55442)
DOI: https://doi.org/10.2196/preprints.55442

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Keywords: breast cancer[1]; bibliometrics[2]; Research hotspots[3]; self-management[4]; self-care[5]; visualisation analysis[6];

Abstract

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1 Introduction

Breast cancer is the most common cancer in women and the leading cause of cancer-related deaths among women worldwide.(1) Breast cancer is the most commonly diagnosed cancer worldwide and affects one in eight cancer patients, according to the World Health Organization (WHO). In 2020, there were approximately 2.26 million new cases of female breast cancer globally, and the age of onset is tending to be younger.(2) It's good news that breast cancer is becoming more treatable, leading to an increase in survival rates.The global 1-, 3-, 5-, and 10-year pooled survival rates in women with breast cancer were 0.92,0.75,0.73,0.61.(3) With significant improvements in breast cancer screening, diagnosis and treatment, the number of breast cancer survivors has significantly increased.(4) Researches indicate that during the recovery of breast cancer patients from predominantly surgical treatment supplemented by chemotherapy, radiotherapy, and endocrinology(5), patients experience lymph node dissection (all or some of the anterior sentinel lymph nodes) and/or upper extremity lymphedema after radiotherapy(6),nausea and vomiting(7), cancer-caused fatigue(8), physical symptoms such as dysfunction of the affected limb/limitation of shoulder motion(9), and decreased bone density(10, 11), as well as anxiety, depression, and a range of negative emotions(12), Patients are experiencing a negative impact on both their physical and mental health, which is significantly lowering their overall quality of life.(13)

Individuals with chronic illnesses often develop self-management skills as they cope with their condition, and these include: management of disease symptoms, detection of physiological and psychosocial changes, and lifestyle changes.(14) In 2005, self-management was defined at an international conference as the ability of any person with a long-term health problem to Setting goals or guidelines to face and deal with the situation caused by health and to live with it.(15)

Fewer studies have systematically summarised the hotspots, pathways and trends in self-care of breast cancer patients, and information on the history, current status and future trends of studies related to self-management of breast cancer patients is incomplete. Visual analytics allows for the representation of data through visualisation,revealing research trends and dynamic structures in a given field. Currently, visualisation has not been widely used to analyze self-management research in breast cancer patients.This study utilizes bibliometric and visualization analyses to systematically elucidate the current status, hotspots, emerging trends, and dynamic frontiers of research on self-management of breast cancer patients from 2005 to 2023.

2 Materials and methods

2.1 Data collection and search strategy

The data used in this study were collected from the Web of Science Core Collection database's

Citation Index using an advanced search strategy between 2005 and 2023. The data was downloaded on 31 August 2023, within a single day, to minimize the impact of daily database updates on the results and avoid any bias. The following terms were used for the search: TS = ('Breast Cancer' OR 'Breast Tumors' OR 'Malignant tumors of the breast ' OR 'Breast Carcinoma' OR 'Breast neoplasm') AND TS= (patient*) AND TS= ('self-management' OR 'self-help' OR 'self-management' OR 'self-management') AND TS= ('self-management' OR 'self- care' OR 'self- administ' OR 'self-help' OR 'self- directed' OR 'self-guided'). For this study, we selected "article" and "review" as the document types and restricted the publication language to "English". After conducting the initial search, we carefully screened and evaluated all relevant literature to ensure it was related to the study topic. This screening process was conducted by two researchers separately to ensure accuracy. In case of any disagreements, we sought the opinion of a third investigator.

A total of 1413 publications related to this field were identified and exported as "full records and references". This included the titles, authors, abstracts, and keywords. All of these records were then imported into Citespace to summarize and visualize the scientific literature. You can find a flow chart of the literature selection process used in this study in *Figure 1*.

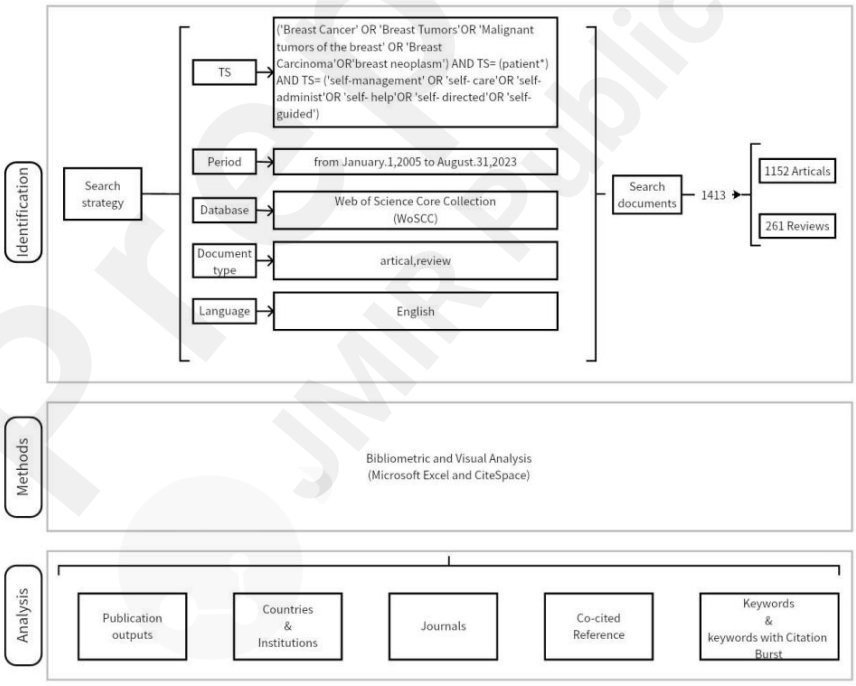

Figure 1. Flowchart of the literature-screening process and research framework.

2.2 Data analysis

Data were entered using Excel software, and bibliometric methods were used to analyse the inclusion of the literature in terms of the year of publication, the number of publications, the number of publications and the degree of cooperation centrality of the top 10 countries, the top 10 institutions in terms of the number of publications, the top 10 journals, and the co-cited journals. The research

involved analyzing the collaboration between countries and institutions, as well as the distribution of these collaborations. This was done using the CiteSpace 6.1.R6 software, which is a scientific knowledge graph visualization tool powered by JAVA.(16) The software helped to identify co-occurrences and clusters in the literature, and also facilitated reference co-citation and keyword co-occurrence analysis. Additionally, the software was used to study the temporal evolution of the literature and analyze keyword bursts, data in the form of full records with cited references were saved in plain text format and imported into the software for analysis, and 1413 documents were checked and processed without finding duplicates. In the software, the time period was set as 2005-2023, the "Time Slicing" was set as 1 year, the "Top N% per slice" was selected as 25, and the Minimum Spanning Tree (MST) was selected as 1 year. Minimum Spanning Tree (Minimum Spanning Tree) and Prunning Slice Network (Prunning Slice Network), the rest of the settings select the default value, and then according to the content to be analysed, mainly select the country, institution, cited literature, keywords and other node options for analysis. Node centrality is to quantify the importance of the node's position in the network, the higher the centrality, the more connections in the network need to pass through the node, so the node often plays the role of a bridge in the network, and is able to produce a certain degree of control over the communication of other nodes.(17) The keywords of the literature are the embodiment of the important information in the content of the literature, is the representative of the core vocabulary with relatively high frequency in the content of the literature, and is one of the important labels reflecting the content of the literature. Studying the clustering network of keywords in literature can summarise the research hotspots in recent years.(18) In the keyword clustering network, the module value (Q) and average profile value (S) are calculated based on the network structure and clustering clarity, Q □0.300 represents the significant clustering structure, S□0.500 represents the reasonable clustering, and S□0.700 indicates that the clustering is significant and credible.(19)

2.3 Ethics statement

Since this study did not involve any human or animal subjects, ethical considerations were not necessary.

3 Results

3.1 Evolution of trends in self-management of breast cancer patients' publications

A total of 1,413 English-language articles were included in this study, and a preliminary analysis of the trend of annual publications in the included literature shows that the overall trend of publications in the field of self-management research on breast cancer patients has shown a steady increase, and the trend of publications is roughly divided into two stages. In the first stage (2005 to

2015), the annual number of publications increased from 13 articles in 2005 to 78 articles in 2015, and although the number of publications showed an increasing trend, the growth rate was small. The second phase (2016 to 2022) saw a faster growth rate during the period, with the number of publications increasing from 114 in 2016 to 168 in 2022. As the publications in 2023 have not yet been fully included, the annual number of publications shows a decreasing trend, with only 115 publications. *Figure 2* displays the yearly count of publications.

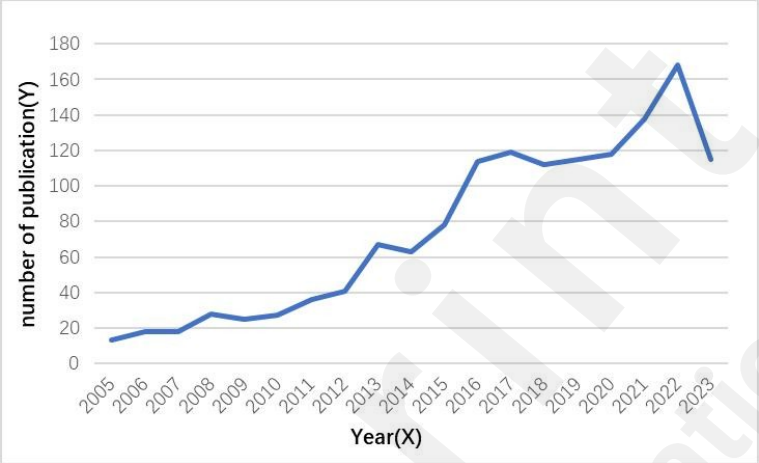

Figure 2. The number of published papers from 2005 to 2023

3.2 National/regional and institutional co-operation networks and distribution

Each node represents a country/region or institution, the node size reflects the number of articles issued, the node outer ring colour corresponds to the year shown by the colour of the optical axis, and the thickness is proportional to the amount of articles issued in that year, and the thickness of the connecting lines between the nodes reflects the closeness of the cooperation between countries/regions or institutions.(20) *Figure 3(a)* demonstrates the national cooperation network and its distribution. The knowledge graph obtained after analysis has 86 nodes, 270 connecting lines, and a network density of 0.0793. In terms of publication count, the top 10 countries are USA, ENGLAND, AUSTRALIA, PEOPLES R CHINA, CANADA, NETHERLANDS, SWEDEN, SOUTH KOREA, ITALY and SCOTLAND, of which, the United States issued 516 articles, occupying a dominant position in the international arena and cooperating relatively closely with other countries, with a greater influence, and the amount of its articles is more than twice as much as that of the United Kingdom (211), which ranked second, and more than three times as much as that of Australia (134), which ranked third, with the intermediary centrality of the United States, Australia, and Canada > 0.1. The mediated centrality value of Canada is the highest (0.19).*Figure 3(b)* shows the institutional collaboration network and distribution, the knowledge graph obtained after analysis has a total of 488 nodes, 793 connectivity lines, and a network density of 0.0067, and the top 10 institutions in terms of the number of articles published are Univ Toronto, Univ

Manchester, Univ Penn, Kings Coll London, Johns Hopkins Univ, Univ Southampton, Univ Michigan, Univ Washington, Case Western Reserve Univ and Univ Calif San Francisco, of which about 60% are from the U.S. From this, we can see that the research institutions are mainly colleges and universities and the cooperation between colleges and universities is relatively close, but only the Univ Washington intermediary centrality > 0.1, indicating that the institution cooperates with other institutions.The table shows the top 10 countries/regions and institutions that contribute to publications regarding self-management among breast cancer patients(*Table 1*).

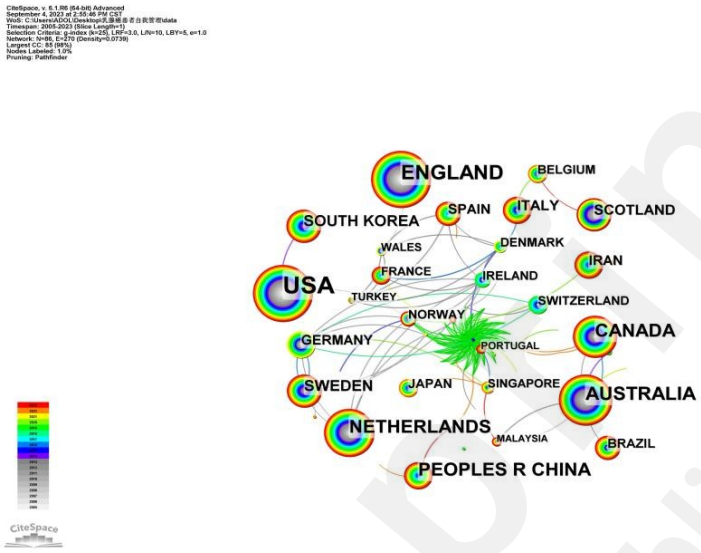

Figure 3(a) National cooperation networks and distribution

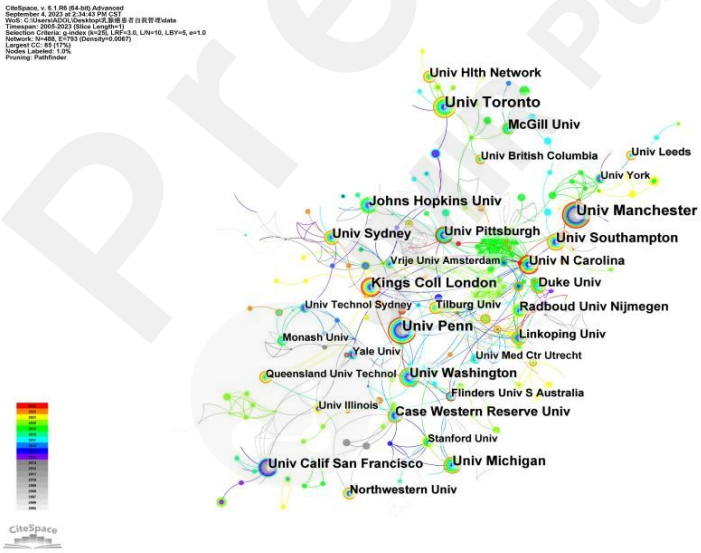

Figure 3(b) Institutional cooperation network and distribution

Rank	Countries	Frequency	Centrality	Year	Institutions	Frequency	Centrality	Year
1	USA	516	0.14	2005	Univ Toronto	36	0.04	2012
2	ENGLAND	211	0.05	2005	Univ Manchester	30	0.03	2006
3	AUSTRALIA	134	0.15	2005	Univ Penn	27	0.06	2008
4	PEOPLES R CHINA	113	0.05	2011	Kings Coll London	25	0.06	2009
5	CANADA	108	0.19	2007	Johns Hopkins Univ	23	0.05	2005
6	NETHERLANDS	107	0	2006	Univ Southampton	22	0.04	2011
7	SWEDEN	49	0.05	2005	Univ Michigan	22	0.03	2015
8	SOUTH KOREA	45	0	2012	Univ Washington	21	0.21	2006
9	ITALY	38	0.09	2012	Case Western Reserve Univ	20	0.09	2009
10	SCOTLAND	34	0	2006	Univ Calif San Francisco	20	0.06	2005

Table 1 The top 10 countries/regions and institutions contributing to publications about self-management of breast cancer patients

3.3 Analysis of reference co-citations

Literature co-citation refers to 2 (or more) papers being cited by other papers at the same time, and the papers that are cited at the same time constitute a co-citation relationship between them.(21) *Figure 4* shows the visualisation of the co-cited literature, and the co-citation network consists of 907 nodes and 3,021 connecting lines, which represent the references of the collected studies and the relationship between co-cited literature, the larger the node, the more citations, the higher the citation frequency, which often represents its influence in the field, the colour and size of the circle indicates the frequency of citations at different times, the colour of the line corresponds to the time of the first co-citation, and the darker the colour means the more recent the time. The author with the highest number of citations was McCorkle R (23), followed by van den Berg SW (18), and the author with the highest central mediacy value (0.38) was Basch E (17), who ranked 3rd. The table displays the top 10 most cited documents in self-management research for breast cancer patients (*Table 2*).

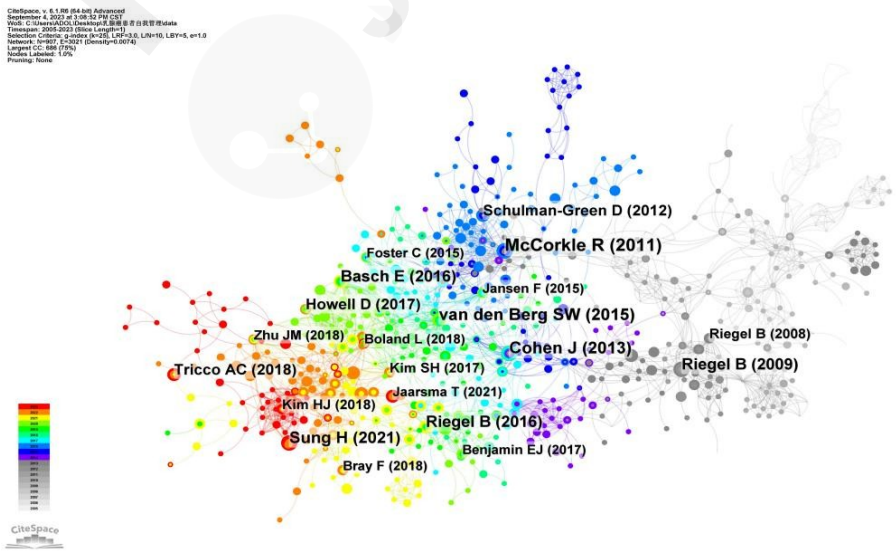

Figure 4 References were co-cited for analysis

Rank	Frequency	Centrality	Year	First Author	Title	DOI
1	23	0.05	2011	McCorkle R	Self-management: Enabling and empowering patients living with cancer as a chronic illness	10.3322/caac.2
2	18	0.12	2015	van den Berg SW	BREATH: Web-Based Self-Management for Psychological Adjustment After Primary Breast Cancer--Results of a Multicenter Randomized Controlled Trial	10.1200/JCO.2013.54.9386
3	17	0.38	2016	Basch E	Symptom Monitoring with Patient-Reported Outcomes During Routine Cancer Treatment: A Randomized Controlled Trial	10.1200/JCO.2015.63.0830
4	13	0.03	2017	Howell D	Self-management education interventions for patients with cancer: a systematic review	10.1007/s00520-016-3500-z
5	11	0.09	2012	Schulman-Green D	Processes of self-management in chronic illness	10.1111/j.1547-5069.2012.01444.x
6	11	0.06	2019	Riegel B	Integrating Symptoms into the Middle-Range Theory of Self-Care of Chronic Illness	10.1097/ANS.0000000000000237
7	9	0.03	2018	Kim HJ	A Mobile Game for Patients with Breast Cancer for Chemotherapy Self-Management and Quality-of-Life Improvement: Randomized Controlled Trial	10.2196/jmir.9559
8	8	0.04	2020	Fjell M	Reduced symptom burden with the support of an interactive app during neoadjuvant chemotherapy for breast cancer - A randomized controlled trial	10.1016/j.breast.2020.03.004
9	8	0.05	2015	Jansen F	Cancer survivors' perceived need for supportive care and their attitude towards self-management and eHealth	10.1007/s00520-014-2514-7
10	8	0	2007	Kennedy A	The effectiveness and cost effectiveness of a national lay-led self care support programme for patients with long-term conditions: a pragmatic randomised controlled trial	10.1136/jech.2006.053538

Table 2 The top 10 most frequently cited documents in the field of self-management research in breast cancer patients

3.4 Keyword analysis

Keywords are highly summarised and refined research topics in the literature and are the core of the research, and the core issues that have received wide attention in the same research field become the keywords of high-frequency words.(22) Keyword co-occurrence mapping is used to show the frequency of keyword occurrence and the degree of association between different keywords, and the larger the node indicates the higher frequency of corresponding topics. Keyword clustering and burst analysis were used to explore the research themes, research hotspots and evolutionary trends in the field. The centrality of nodes is used to measure the size of nodes' role in the association network, the higher the centrality of nodes, the stronger the degree of linkage, and ≥0.1 is a key node.

3.4.1. Keyword co-occurrence analysis

In the keyword co-occurrence map, the frequency of keywords and the size of nodes are positively correlated, the higher the frequency of keywords, the larger the corresponding node area, the different colours of the connecting lines between nodes and nodes represent the different years in which the keywords appeared as well as the different times in which they were established to be interconnected, and the thickness of connecting lines correlates with node intensity. The key issues of common concern to researchers at a particular stage, i.e., research hotspots and focuses, appear in the

keywords with high centrality and frequency, nodes with higher frequency and centrality of certain keywords are more important in research. The chronological structure of the nodes reflects the time of appearance of a keyword, and the colour tone changes from dark to bright, indicating that the time goes from far to near.(23)

Co-occurrence mapping analysis of the keywords is shown in Figure (*Figure 5*), a total of 512 nodes and 4901 connectivity lines were generated with a network density of 0.0375, the top 10 keywords were “breast cancer”, “quality of life”, “chronic disease”, “self-management”, “patient education”, “randomised controlled trial”, “education”, “intervention”, “depression” and “outcome”.

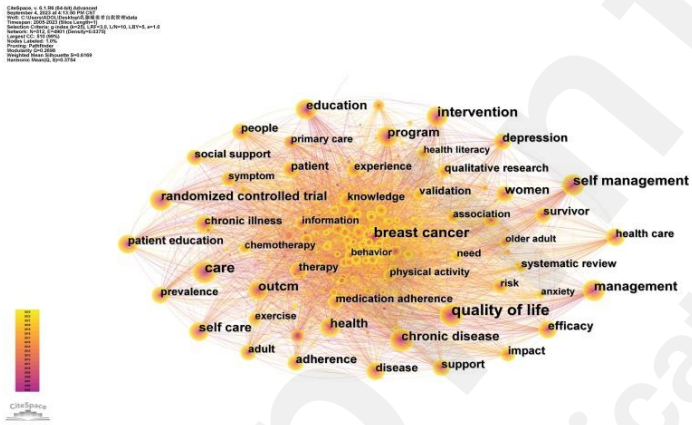

Figure 5 Keyword co-occurrence analysis

3.4.2. Keyword cluster analysis

Based on the co-occurrence network, the keywords of the literature from 2005-2023 were subjected to LLR cluster analysis, and the cluster modularity value Q value (Modularity Q) and the cluster silhouette index S value (Mean Silhouette) were selected to evaluate the clustering mapping; S value is a measure of homogeneity within the clusters, and the larger the S value indicates that the higher the similarity of the internal members of the cluster; Q > 0.3 indicates that the cluster structure is obvious, S > 0.5 indicates that the clusters are reasonable, and S > 0.7 indicates that the clusters are highly plausible.(24) The timeline view of keyword clustering is used to reflect the time span of the research, using "Timeline" to visualise and analyse the timeline view of keywords will show the time span of the development of different clusters, the research process, and the connection between the clusters.

As is shown in *figure 6(a)*,the result of keyword clustering analysis shows that Q=0.7119,S=0.8619,which indicates that the clustering structure is obvious and the clustering credibility is high. A total of 11 clusters are generated, which are #0 supportive care,#1 breast cancer,#2 randomized controlled trial,#3 medication adherence,#4 chronic disease,#5 mobile health,#6 tamoxifen,#7 quality of life,#8 systematic review,#9 patient education and #10 primary care. The analysis of keyword temporal evolution is shown in *figure 6(b)*. The horizontal coordinate

(x-axis) of the timeline view is the year of publication, and the vertical coordinate (y-axis) is the number of clusters, and each node represents 1 keyword, which will be fixed on the timeline of the first occurrence, and the frequency will be increased accordingly in the original annual cycle when it occurs again, and the larger nodes indicate that the keyword is fixed in the timeline of the first occurrence. The larger the node indicates that the keyword appears more often. Therefore, the graph visually displays the time span and correlation between research clusters, highlighting the evolution of research and scholars' content.

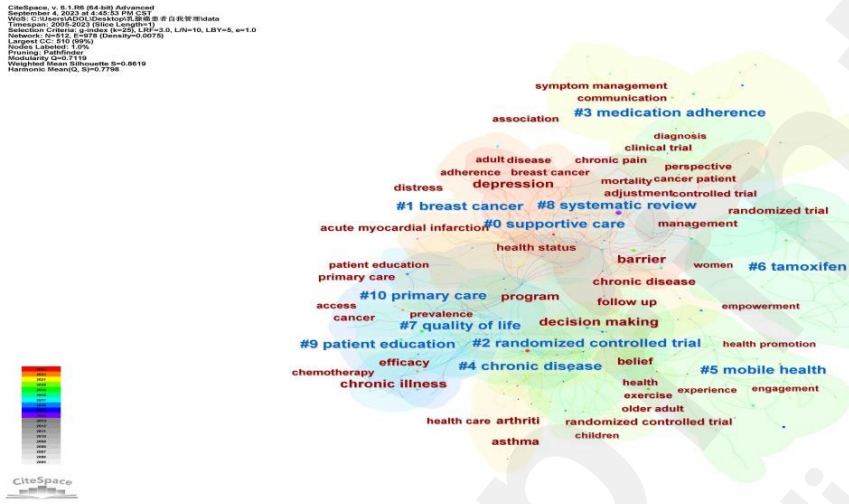

Figure 6(a) Keyword clustering

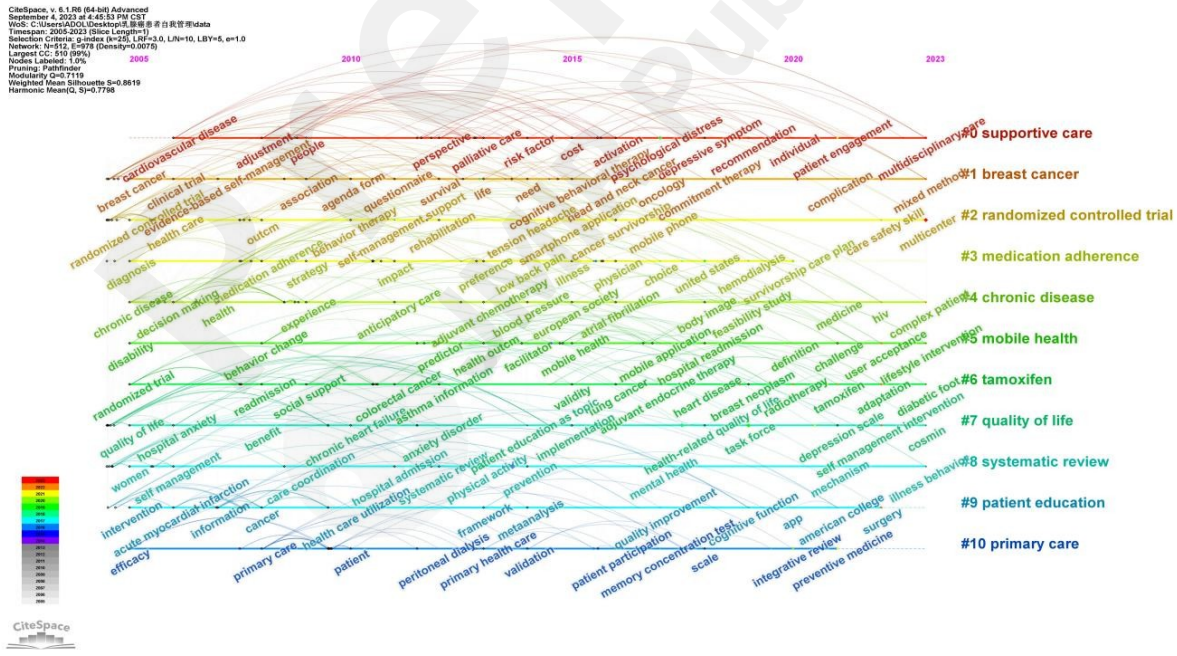

Figure 6(b) Keyword temporal evolution analysis

3.4.3. Keyword burst analysis

Keyword burst analysis can identify research trends in a field and inform future focus. The idea of embedded emergent word algorithm is mainly derived from the "burst detection algorithm"

proposed by KLEINBERG in 2003, the size of the burst is expressed by the burst value, the larger the burst value, the more obvious the development trend of the topic related to the emergent word. (25) The intensity of keyword bursts is shown as a specific value, with higher values indicating greater impact. The light blue colour in the graph indicates the time span of the study, while the red colour indicates the start and end of the outbreak of a keyword burst, with the length of the red line being proportional to the duration of the keyword burst.

Keyword burst analysis of studies related to self-management of breast cancer patients from 2005-2023 was performed using CiteSpace. In *Figure 7*, we displayed the top 25 keywords that had the highest burst intensity, sorted based on the time of their bursting. The figure shows that the top five keywords with the highest burst intensity are "health status," "chronic illness," "technology," "meta-analysis," and "need" in that order.It's also worth noting that the research focus has shifted from "health status", "chronic illness", "self-management program", "education", and "randomized trial" in 2005 to "technology" and "mobile application" today.

Keywords	Year	Strength	Begin	End	2005 - 2023
health status	2005	7.58	2005	2012	
chronic illness	2005	6.78	2005	2015	
self management program	2005	5.7	2005	2014	
chronic disease	2005	5.67	2005	2011	
education	2005	5.4	2005	2010	
randomized trial	2005	4.48	2005	2013	
primary care	2008	5.13	2008	2010	
self care	2005	4.89	2008	2010	
trial	2008	4.41	2008	2016	
disease management	2005	4.65	2009	2012	
disease	2007	4.08	2009	2013	
internet	2010	4.41	2010	2016	
long term	2013	4.37	2013	2015	
efficacy	2005	4.25	2013	2014	
primary health care	2013	4.1	2013	2017	
metaanalysis	2014	6.38	2014	2017	
older adult	2009	4.34	2014	2017	
illness	2015	4.05	2015	2016	
strategy	2009	4.3	2016	2019	
system	2017	4.19	2017	2020	
psychological distress	2017	4.19	2017	2020	
technology	2013	6.46	2018	2020	
need	2014	5.72	2019	2021	
prostate cancer	2011	4.4	2020	2021	
mobile application	2017	4.57	2021	2023	

Figure 7 keyword burst analysis

4 Discussion

4.1 Overview of Research on Self-Management of Breast Cancer Patients

In this study, we computer searched the literature related to self-management of breast cancer patients included in the WoSCC from 1 January 2005 to 31 August 2023, a total of 1,413 English-

language publications were gathered from various parts of the world after filtering for literature type and language. Bibliometrics was used to examine the development trend in the self-management of breast cancer patients, and the research hotspots and trends in this field were concisely demonstrated by visualizing and analyzing the number of publications,countries/regions, institutions, and keywords of the relevant literature included in the international mainstream databases during the last 20 years from 2005 to 2023. Researchers can gain reference and inspiration from the presentation of research trends and hotspots.

Preliminary analysis of the annual trend of publications in the included literature (*Figure 2*) shows that the overall trend of publications in the field of research on self-management of breast cancer patients has shown a steady increase, and the trend of publications is broadly divided into two stages. In the first phase (2005 to 2015), the annual number of publications increased from 13 in 2005 to 78 in 2015, and the number of publications showed an increasing trend, but the growth was small. The keywords appearing (*Figure 7*) are mostly “health status”, “chronic illness”, “self-management programme”, “education” and “randomized trial”, and the research hotspots are mostly self-management-related health education for breast cancer patients(26, 27)and the development of self-management programmes(28)or self-management training(29)for breast cancer patients, with the lack of ground-breaking research being the main reason for the stagnation.

The second phase (2016 to 2022) saw a faster growth rate during the period, with the number of publications increasing from 114 in 2016 to 168 in 2022. As not all the publications in 2023 have been included yet, the annual number of articles shows a decreasing trend with only 115 articles. The keyword burst (**Figure 7**) changed to “meta-analysis”, “older adult”, “strategy”, “psychological distress”, “technology”, “prostate cancer” and “mobile application”. The research hotspots are based on the use of modern technology such as mobile devices for psychological interventions for breast cancer patients(30), pain interventions(31)and other measures to promote self-management, and it is expected that the literature in this area of research is likely to continue to grow and the research will become more in-depth.

4.2 Analysis of cooperation by country/region and agency

Research institutes are the organisational form of the main body of scientific research, and the main research institutes lead the direction of the development of the discipline, and their research results can reflect the current status and trends of the discipline. *Figure 3(a)* shows that the USA has the largest node. This suggests that the country may have played a significant role in driving the direction of breast cancer patients' self-management. Additionally, it highlights that the USA has a dominant position globally and collaborates closely with other countries, making it highly

influential.The United Kingdom ranked 2nd in terms of articles published, but had a low centrality score of 0.05, indicating that the researchers in this country have less communication with the international community in this research field, while Australia and Canada have published the most articles and have the most central articles on breast cancer. This is likely due to the fact that the five-year survival rate for breast cancer in both countries is close to 90%,(32)which is among the highest in the world, and is also much higher than that of other countries in terms of healthcare care process and medical outcomes.

As can be seen from the institutional collaborative network demonstrated in *Figure 3(b)*, the research institutions are mainly university colleges or comprehensive university medical schools, and about 60% of the top 10 research institutions in terms of the number of publications are from the U.S. However, only Univ Washington has intermediary centrality > 0.1, and the density of the network is only 0.0067. From this, it can be seen that the field of self-management of breast cancer patients has received attention from top international research institutions, with Univ Washington as the centre of more relevant studies, but the inter-institutional cooperation network is not close, indicating that there are fewer multicentre studies. It is suggested that scholars from various countries should strengthen the cooperation between domestic and international exchanges, carry out large-scale multicentre studies to enhance the influence, and introduce a series of regulations and implementation guidelines on self-management of breast cancer patients at the national level, establish and improve the relevant expert consensus and guidelines, and at the same time, set up a shared database in the field of self-management of breast cancer patients, so as to provide more academic support for the future research.

4.3 Analysis of reference co-citations

The top 10 co-cited publications reflect the hot directions of research related to the field of self-management for breast cancer patients, with the majority of the literature covering chronic disease self-management, cancer symptom monitoring, use of mobile devices or apps, and randomised controlled trials. The article “Self-Management: Enabling and empowering patients living with cancer as a chronic illness”, written by Ruth McCorkle(33)published in “CA: A Cancer Journal for Clinicians”, with the highest total number of citations, the article used the Chronic Care Model (CCM) as a guide to patient self-management through interventions developed collaboratively by oncology providers, patients, and families. The article with the highest centrality value (0.38) was the article with the 3rd highest co-citation frequency “Symptom Monitoring With Patient-Reported Outcomes During Routine Cancer Treatment: a Randomized Controlled Trial” by Ethan Basch(34) and published in the “Journal of clinical oncology”, which examined the management of patients

undergoing chemotherapy for advanced cancers, including breast cancer, through an RCT adopting web-based symptom self-reporting with an automated clinician email alert system, and showed that patient engagement in Symptom self-reporting increases patient engagement, reduces readmission rates, improves quality of life, and improves care experience, efficiency, and outcomes.

4.4 Analysis of research hotspots

Keywords as the core and essence of an article, based on the keyword co-occurrence and clustering analysis, the node of" quality of life" is larger, combined with the clustering #7 (quality of life) indicates that the quality of life is still the most concerned research hotspot in this field. In the field of medicine, quality of life includes global quality of life (GQOL) and health-related quality of life (HRQOL). WHO defines quality of life as an individual's awareness of and satisfaction with his or her social status and living conditions. Individual well-being encompasses physical, psychological, social, and environmental factors, as well as personal beliefs, goals, and cultural values. Health-related quality of survival is defined as the state of health and subjective satisfaction associated with personal life events under the influence of disease, accidental injury, and medical interventions. The field of oncology disciplines has generally adopted quality of life as an important endpoint indicator for evaluating the outcome of treatment and rehabilitation of oncology patients.It has been suggested that health-related quality of life (HRQOL) is a prognostic indicator of survival in breast cancer patients(35), and that quality of life scores may be a marker of patients' behavioural and perceptual societies. Studies have also been conducted to enhance breast cancer patients' self-managed quality of life through enhancing patients' self-efficacy(36)and reducing symptom burden(37, 38), thereby promoting health behaviours and improving health outcomes.

Secondly, the nodes of "patient education", "education" were also larger and appeared more frequently, which, combined with cluster #9 (PATIENT EDUCATION), suggests that self-management-related health education for breast cancer survivors is a major research component. There are related studies on the importance of access to lymphoedema treatment and related resources through timely and continuous self-management education for breast cancer survivors to prevent and manage lymphoedema.(39)

Other keywords with large nodes are randomised controlled trial, intervention, which in combination with clustering #2 (randomized controlled trial) suggests that RCTs are still the primary means by which researchers conduct their studies. In addition, depression and psychological distress indicate that psychological problems are also hot topics in this research area.

According to the keyword burst, it can be seen that the research in the last 5 years focuses on self-management strategies, internet big data, mobile apps, etc., which broadens the breadth and

depth of the research. With the continuous development of the medical model, self-management research for breast cancer patients is paying more and more attention to multidisciplinary crossover, and technological advancement promotes the application of Internet + Artificial Intelligence. National Yang Ming University and National Taiwan University of Science and Technology in Taiwan, China, in conjunction with the Taiwan Breast Cancer Prevention and Control Foundation, have developed the Breast Cancer Self-Management Support (BCSMS) mHealth application, which not only provides support to promote women's quality of life after their first diagnosis of breast cancer, but also supports disease self-management and continuous assessment of QoL.(40) Not only that, mHealth-based breast cancer self-management interventions have also been shown to be effective in self-management behaviours(41, 42), self-management skills(43-45), and the management of adverse effects(46), complication management(47, 48), medication management(49), dietary management(50), exercise management(51), emotional management(30, 52), among others.

5 Limitations and conclusion

We only analysed publications from the Web of Science (WOS) core database, and limitations in the search time may have resulted in a bias in reference frequencies. The search was conducted in August 2023, so a full year of data for 2023 is not available. As the number of citations to a document is influenced by the time of its publication, the number of citations to high quality documents published in 2023 may not yet be at the desired level, which may lead to a time delay in exploring the results of the research frontiers. Additionally, bibliometric analysis of publications was performed using Citespace, but the inability to perform full and partial counting systems in this software is information complication. Therefore, further research could use quantitative and qualitative metrics to analyse the development of publications related to breast cancer patient self-management in specific journals and explore the relationship between citations, topics and publications.

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7 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.

8 Author Contributions

- Xinyue Chen wrote and revised the article, and used Citespace software to draw the map;

- Shan Huang and Yanyan Chen is responsible for determining the content of the study and retrieving data;
- Yan Cao guides data analysis and provides project funding;
- Cuiping Zhang is responsible for the quality control and proofreading of the article, and is responsible for the article as a whole.

9 Funding

This research was supported by the Natural Science Foundation of Xinjiang Uygur Autonomous Region ID:2019D01C255 .