



Sexual health problems of patients with cancer: A bibliometrics study and visualization analysis via CiteSpace

Ying Li, Mingyue Liu^{*}, Yanxia Sun, Dandan Guo, Min Li

Department of Gynecological Oncology, Tianjin Medical University Cancer Institute and Hospital, National Clinical Research Centre for Cancer, Key Laboratory of Cancer Prevention and Therapy, Tianjin's Clinical Research Centre for Cancer, Tianjin, 300060, China

ARTICLE INFO

Keywords:

Bibliometrics
CiteSpace
Patients with cancer
Sexual health
Visualization analysis

ABSTRACT

Purpose: This study aimed to conduct a bibliometric analysis of the data acquired and clarified the current research status of sexual health problems in patients with cancer, to provide a comprehensive visual perspective suitable as a reference for subsequent research.

Methods: We searched the Web of Science Core Collection (WoSCC) up to April 30, 2023 to identify studies associated with sexual health problems in patients with cancer. CiteSpace was used to create visualization networks for countries, institutions, authors, and journals.

Results: A total of 3183 publications related to sexual health problems in patients with cancer were collected from the WoSCC. In terms of volume, the USA (1259 papers) was the leading country, the Memorial Sloan Kettering Cancer Center (119 papers) was the leading institution, and Carter (39 papers) was the author with the most publications. The top-cited references and keywords were related to quality of life. The top five clusters of reference cocitation were 'brachytherapy', 'prostate cancer', 'radical prostatectomy', 'hypogonadism', and 'breast cancer'. Meanwhile, the top five clusters of keyword cocitation were 'breast cancer', 'prostate cancer', 'rectal cancer', 'testicular cancer', and 'sexual function'. The analysis of the top 25 references and keywords with the strongest citation bursts of published papers on sexual health problems in patients with cancer to reveal the research hotspots and trends.

Conclusions: Research on sexual health among patients with cancer is constantly developing. The current research focuses on the impact of different treatment options for sexual health and quality of life of patients with breast, rectal, and genitourinary neoplasms. Exploring the long-term changing regularities of sexual function among cancer survivors and formulating sexual health interventions toward patient-reported outcomes and needs are key research directions.

1. Introduction

The burden of cancer is increasing rapidly worldwide, and yet many patients with cancer achieve long-term survival because of early cancer screening, effective treatment, and supportive care interventions [1]. However, sexual health problems are becoming one of the most common issues among patients with cancer, and a growing body of research has emphasised the importance of sexual health among these patients [2–4]. Sexual health is defined by the World Health Organization as the status of social, mental,

^{*} Corresponding author. Department of Gynecological Oncology, Tianjin Medical University Cancer Institute and Hospital, 22 West Huanhu Rd, Tianta St, Hexi District, Tianjin, 300060, China.

E-mail address: 13044339629@163.com (M. Liu).

<https://doi.org/10.1016/j.heliyon.2023.e20856>

Received 25 June 2023; Received in revised form 5 October 2023; Accepted 9 October 2023

Available online 11 October 2023

2405-8440/© 2023 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

emotional, and physical well-being concerning individual sexuality throughout life [5]. Sexual health is not only a significant aspect of an individual's life but also a fundamental factor related to the quality of life among patients with cancer [6,7].

Cancer and its treatment affect the sexual function, satisfaction, well-being, and relationships of patients [8–10]. A cross-sectional study of patients with breast cancer from China found that 75.37 % and 18.48 % of patients reported sexual dysfunction and sexual distress, respectively [11]. An analysis of patients with gynecological cancer in New England found that the prevalence of sexual dysfunction in this subgroup was 68 % [12]. An American study of adolescent and young adult patients with cancer found that 58 % of the patients had sexual dysfunction, and the prevalence varied based on age and treatment options [13]. A study of patients with hematological malignancies in Turkey found that approximately 80.0 % of women and 57.1 % of men had sexual dysfunction [14]. In other parts of the world, prospective cohort studies from Sweden, America, and the Netherlands showed a decrease in sexual function index domains among patients with cancer [15], and over time, both patients' and partners' sexual satisfaction and intimacy were affected [16,17].

Anatomical changes, hormonal changes, mental status, and drug-related side effects may all contribute to sexual dysfunction in patients with cancer, and sexual function is the most difficult aspect to recover after treatment [18,19]. Although health professionals have continuously explored the factors influencing sexual function, management, and nursing interventions for patients with cancer [20–25], some problems remain that cannot be ignored. For example, patients have difficulty expressing their sexual health education needs to medical professionals [26]; there is a lack of sexual health-related knowledge among oncology nurses and oncologists [27,28]; and there are other unmet sexual health needs that exist in the oncology patient population [29]. The current research focus is not yet clear, so it is necessary to dig deeper into the research data related to the sexual health of patients with cancer to manage their sexual health issues in a targeted manner.

Bibliometrics is a quantitative and visual method for analysing scientific journals and publications. This method helps analyse basic knowledge, research hotspots. It also provides researchers with a framework for analysing subject hotspots and predicting development trends in their discipline. CiteSpace is the most popular tool for the bibliometric and visual analysis of knowledge networks. CiteSpace is the most popular tool for the bibliometric and visual analysis of knowledge networks. With the rapid growth of contemporary scientific research and published literature, CiteSpace has provided researchers with powerful support for extracting new knowledge from existing data by replacing or enhancing repetitive mental work and further promoting scientific development [30]. Bibliometric analysis has been widely used in cancer-related fields, and the fruitful works carried out by researchers are conducive to the formulation of related policies and clinical guidelines [31,32]. However, although researchers have carried out a large number of systematic evaluations and meta-analyses to explore the current research status of sexual health in patients with cancer, there is still a lack of an overview of the growth trend and a summary analysis of research priorities and potential innovative research directions in this field [22,33]. This study used bibliometrics to classify existing studies on sexual health problems in patients with cancer. CiteSpace was used to analyse the network of countries, institutions, authors, clusters of references and keywords, and citation bursts of references and keywords to explore hotspots and trends in sexual health problems among patients with cancer.

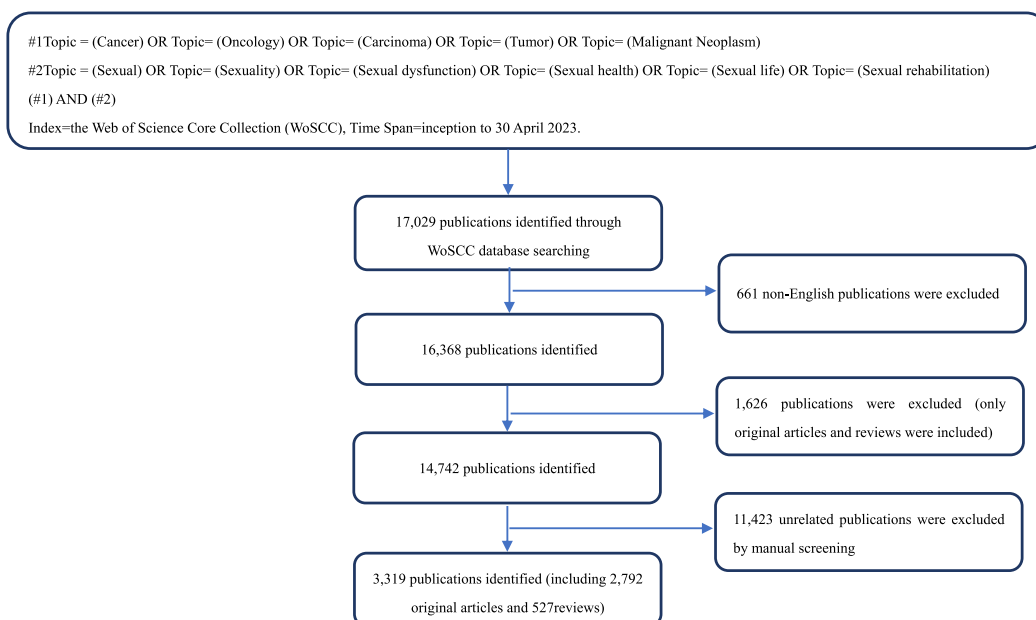


Fig. 1. Flow chart of literature screening included in this study.

2. Methods

2.1. Data sources and search strategies

Fig. 1 shows the document search process. The Web of Science Core Collection (WoSCC) database was searched up to April 30, 2023. The retrieval strategy was as follows: ((“Cancer” [TS] OR “Oncology” [TS] OR “Carcinoma” [TS] OR “Tumor” [TS] OR “Malignant Neoplasm” [TS]) AND (“Sexual” [TS] OR “Sexuality” [TS] OR “Sexual dysfunction” [TS] OR “Sexual health” [TS] OR “Sexual life” [TS] OR “Sexual rehabilitation” [TS])). The language type included only English and the document type included only original articles and comments. After reviewing the titles and summaries, two independent researchers deleted research unrelated to the sexual health problems of patients with cancer and retained 2889 publications.

2.2. Data Processing

After the search was completed, we exported all the records and transformed these complete records and references into a plain text format by analysing the original data set using CiteSpace 6.1.R6. The analysis includes the annual distribution quantity and source of the published documents to explore the cooperation network between the country, institutions, journals, and authors. By analysing the clusters of f references and keywords and the citation bursts of references and keywords that vary with time, current research topics and future research directions are elucidated.

3. Results

3.1. Bibliometric analysis of publication years

As shown in Figs. 1, 3,319 records were collected from the WoSCC database. After 136 duplicate records were removed, the final number of research articles on sexual health problems among patients with cancer was 3183, including 2685 original articles and 498 reviews. The number of annual publications related to sexual health problems in patients with cancer increased steadily from 1977 to 2023 (Fig. 2).

3.2. Bibliometric analysis of countries and institutions

The top five countries with respect to the number of relevant publications were the USA, Australia, Canada, England, and the Netherlands, which combined to publish 2191 articles (Fig. 3, Table 1). The top five countries in terms of centrality scores, which reflect cooperation, were Australia, England, the USA, France, and China (Table 1). The top five institutions with respect to the number of publications were the Memorial Sloan Kettering Cancer Center, University of Michigan, University of Texas MD Anderson Cancer Center, University of California Los Angeles, and University of California San Francisco (Fig. 4, Table 2). The top three institutions with respect to the centrality score were the Harvard Medical School, University of Texas MD Anderson Cancer Center, and University Hospital Leuven (Table 2).

3.3. Bibliometric analysis of authors

The top five authors with respect to the number of published papers were Carter, Bober, Reese, Walker, and Mulhall, who published

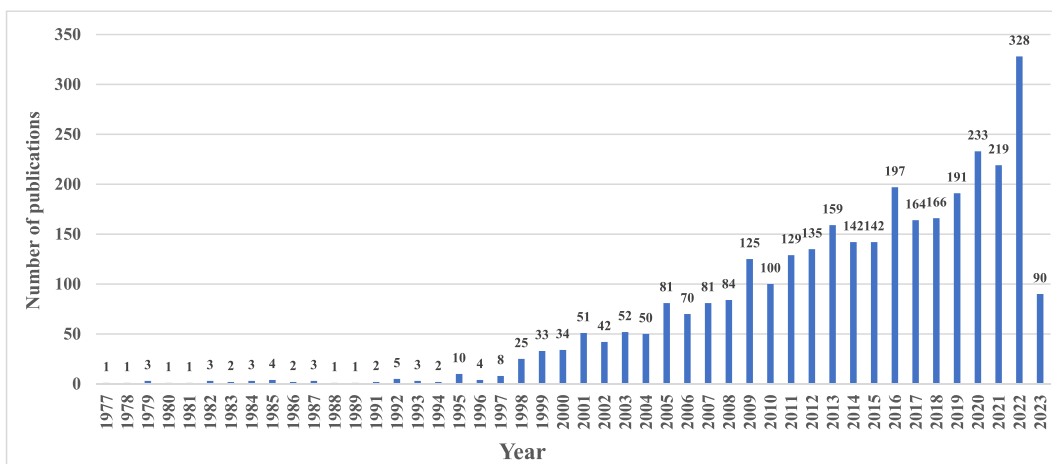


Fig. 2. Number of annually published papers on sexual health problems in patients with cancer.

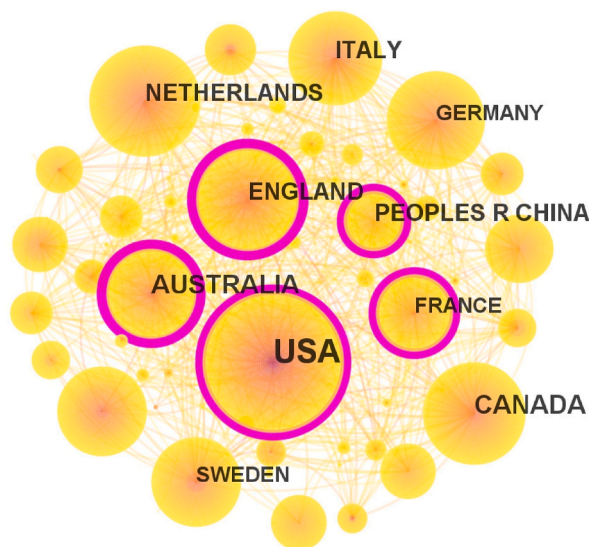


Fig. 3. Visualization map of the countries that published papers on sexual health problems in patients with cancer.

Table 1

Top 10 Countries with respect to the Number of Published Papers on Sexual Health Problems among Patients with Cancer.

Ranking	Count	Country	First Year	Centrality	Country	First Year
1	1259	USA	1977	0.24	Australia	1979
2	260	Australia	1979	0.21	England	1992
3	248	Canada	1988	0.16	USA	1977
4	214	England	1992	0.15	France	1999
5	210	Netherlands	1991	0.11	China	2000
6	176	Italy	1994	0.10	Turkey	1998
7	157	China	2000	0.08	Canada	1988
8	146	Germany	1999	0.08	Spain	2008
9	121	Sweden	1998	0.07	Italy	1994
10	118	France	1999	0.06	Austria	2001

a total of 161 (5.06 %) articles (Fig. 5, Table 3). The top five authors with respect to the centrality scores were Schover, Litwin, Elliott, Wang, and Carter (Table 3). The top five authors with respect to cocitation frequencies were Rosen, Schover, Litwin, Ganz, and Wei (Fig. 6, Table 4). The top five authors with respect to cocitation centrality scores were Andersen, Derogatis, Bancroft, Ganz, and Aaronson (Table 4).

3.4. Bibliometric analysis of journals

The top five journals with respect to the number of cocited published papers were the *Journal of Clinical Oncology*, *Journal of Sexual Medicine*, *Cancer-American Cancer Society*, *Urology*, and *Journal of Urology* (Fig. 7, Table 5). The top four journals with respect to cocited centrality that had centrality scores greater than 0.09 and were the *American Journal of Obstetrics and Gynecology*, the *American Journal of Psychiatry*, *Archives of General Psychiatry*, and the *American Journal of Nursing* (Table 5).

3.5. Bibliometric analysis of references

The top five cocited references were published by Sanda [34], Carter [35], Donovan [36], Reese [37], and Baser [38] (Table 6). The centrality scores of the top five cocited references were greater than 0.10 and were published by Merrick [39], Bergmark [40], Canada [41], Schover [42], and Schag [43] (Table 6). Cluster analysis was conducted according to these cocitation references, and the top five clusters were ‘brachytherapy’, ‘prostate cancer’, ‘radical prostatectomy’, ‘hypogonadism’, and ‘breast cancer’ (Table 7). The timeline view of the cocited references shown in Fig. 8 describes the development and evolution of the cited references in each cluster over time.

3.6. Bibliometric analysis of keywords

The five most frequently used keywords were ‘quality of life’, ‘sexual function’, ‘women’, ‘breast cancer’, and ‘prostate cancer’ (Table 8). Cluster analysis of keyword cooccurrence shows that the top five clusters were ‘breast cancer’, ‘prostate cancer’, ‘rectal

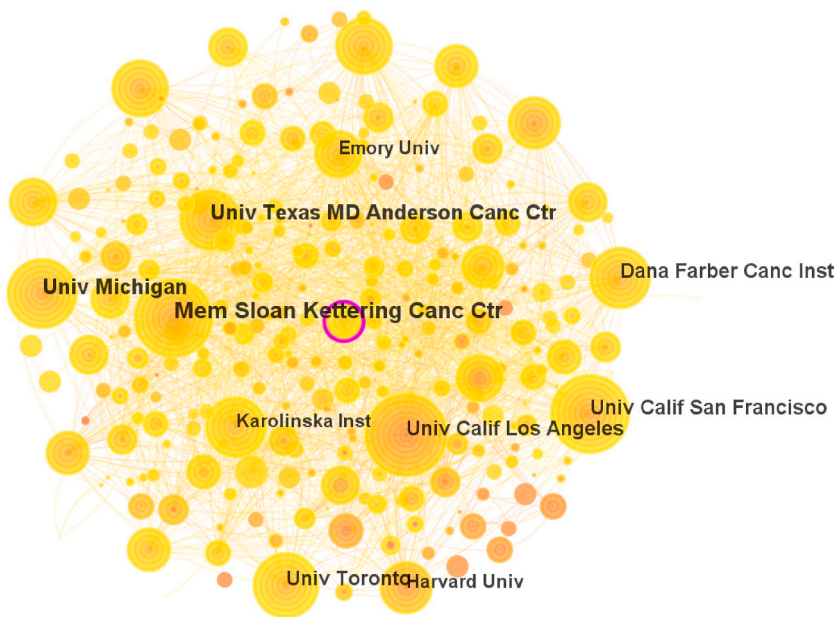


Fig. 4. Visualization map of the institutions that published papers on sexual health problems in patients with cancer.

Table 2

Top 10 Institutions with respect to the Number of Published Papers on Sexual Health Problems among Patients with Cancer.

Ranking	Count	Institution	First Year	Centrality	Institution	First Year
1	119	Memorial Sloan Kettering Cancer Center	2001	0.12	Harvard Medical School	2002
2	84	University of Michigan	2002	0.09	University of Texas MD Anderson Cancer Center	2000
3	75	University of Texas MD Anderson Cancer Center	2008	0.08	University Hospital Leuven	2016
4	68	University of California, Los Angeles	1998	0.07	Memorial Sloan Kettering Cancer Center	1998
5	64	University of California, San Francisco	1998	0.07	Emory University	1998
6	61	University of Toronto	1998	0.07	Karolinska Institute	1999
7	59	Dana-Farber Cancer Institute	1998	0.07	The University of British Columbia	2005
8	59	Harvard University	1998	0.07	University of Washington	2008
9	57	Emory University	1998	0.06	University of California, Los Angeles	2012
10	55	Karolinska Institute	2000	0.06	Leiden University	1998

cancer’, ‘testicular cancer’, and ‘sexual function’ (Table 9). The timeline view of keyword co-occurrence in Fig. 9 describes the development and evolution of keywords in each cluster over time.

3.7. Bibliometric analysis of references and keywords with citation bursts

The utility of the references and keywords changed over time, indicating that the research focus shifted. This shift reflected the research frontier trend. The top 25 cited references and keywords with the strongest citation bursts are shown in Figs. 10 and 11, respectively. The red line indicates the citation burst duration. The left end of the red line is the beginning year of the citation burst, and the right end of the red line is the end year of the citation burst. The blue line indicates the citation timeline. In Fig. 10, the light blue line interval indicates the literature that has not been published, and the left end of the dark blue line indicates the year of publication of the literature. In Fig. 11, the blue lines are dark blue, indicating that the keyword was cited between 1997 and 2023. Among the cited references, the most popular citation was ‘Sanda MG, 2008 (38.39)’ published in 2008. The number of citations increased sharply from 2009 to 2013. As a classic paper in this field, the conclusions of this article have been recognised and referenced by several scholars. The treatment of prostate cancer was associated with a distinct pattern of change in quality-of-life domains related to urinary, sexual, bowel, and hormonal functions and influenced satisfaction with treatment outcomes among patients and their spouses or partners. Additionally, the top five nearest citation bursts were ‘Siegel RL, 2019 (17.01)’, ‘Bary F, 2018 (18.01)’, ‘Stabile C, 2017 (19.59)’, ‘Carter J, 2018 (36.34)’, and ‘Reese JB, 2017 (23.91)’. These studies show that the exploration of interventions for sexual problems in patients with cancer, especially women, has been a crucial topic in recent years. The strongest citation burst of keyword was ‘carcinoma (45.87)’ from 1993 to 2009, and the top five nearest citation bursts were ‘need (8.95)’, ‘intervention (11.52)’, ‘cancer survivorship (10)’, ‘patient reported outcome (12.03)’, and ‘sexual health (25.45)’. These keywords imply that the importance

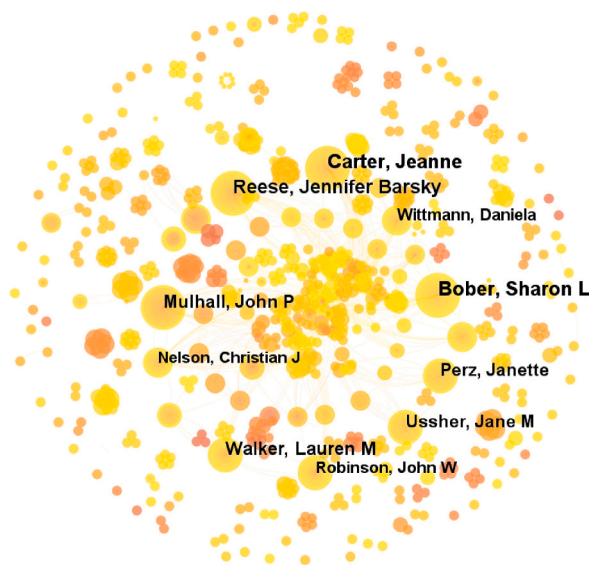


Fig. 5. Visualization map of the authors who published papers on sexual health problems in patients with cancer.

Table 3
Top 10 Authors with respect to the Number of Published Papers on Sexual Health Problems among Patients with Cancer.

Ranking	Count	Author	First Year	Centrality	Author	First Year
1	39	Carter J	2006	0.03	Schover L	2008
2	37	Bober S	2009	0.02	Litwin M	2006
3	32	Reese J	2010	0.02	Elliott S	2010
4	27	Walker L	2010	0.02	Wang R	2010
5	26	Mulhall J	2006	0.01	Carter J	2006
6	25	Perz J	2009	0.01	Bober S	2009
7	25	Ussher J	2009	0.01	Reese J	2010
8	22	Wittmann D	2010	0.01	Fossa S	2006
9	20	Robinson J	2009	0.01	Incrocci L	2006
10	19	Incrocci Luca	2006	0.01	Dahl AI	2006

of sexual health in the survival outcomes of patients with cancer has attracted increasing attention from researchers.

4. Discussion

4.1. General Information

This study is the first to review the current research status of sexual health problems among patients with cancer using CiteSpace, revealing related research hotspots. From the establishment of the WoSCC to April 30, 2023, 3183 publications related to sexual health problems of patients with cancer were downloaded from the WoSCC, with a fluctuating and stable trend.

Eighty-six countries and regions that participated in research on sexual health problems in patients with cancer. The top 10 countries, including Europe, North America, and China, contributed 2909 studies. The USA published 1259 studies, reflecting its principal position in the study of sexual health problems in patients with cancer. Cooperation is concentrated in a few countries, including Australia, England, the USA, France, and China, indicating that close cooperation between countries is relatively limited.

The top 10 institutions published 701 articles, while the top 10 authors contributed 272 studies. Eight of the top 10 institutions and five of the top 10 authors are located in (and originate from) the USA. This shows that the USA ranks first in research on sexual health problems in patients with cancer, also indicating that the interinstitution and interauthor cooperation relationship herein shows a relatively localised trend. Carter was the most productive authors (39 articles), but the most cocited author was not him. If research is limited to a few countries, institutions, and authors, it may not be conducive to formulating research strategies globally or to the cross-disease and cross-cultural development of disciplines. Therefore, it is necessary to strengthen academic exchange activities among scholars in related fields in countries and institutions, help develop domestic and foreign cooperation, expand academic alliances, and promote the global development of sexual health research for patients with cancer.

The most frequently and centrally cited journals in this field are mainly the top professional journals in oncology and urology, as well as the top comprehensive journals in sex and urology. The most cited and cocited references came from Sanda [34] in the *New*

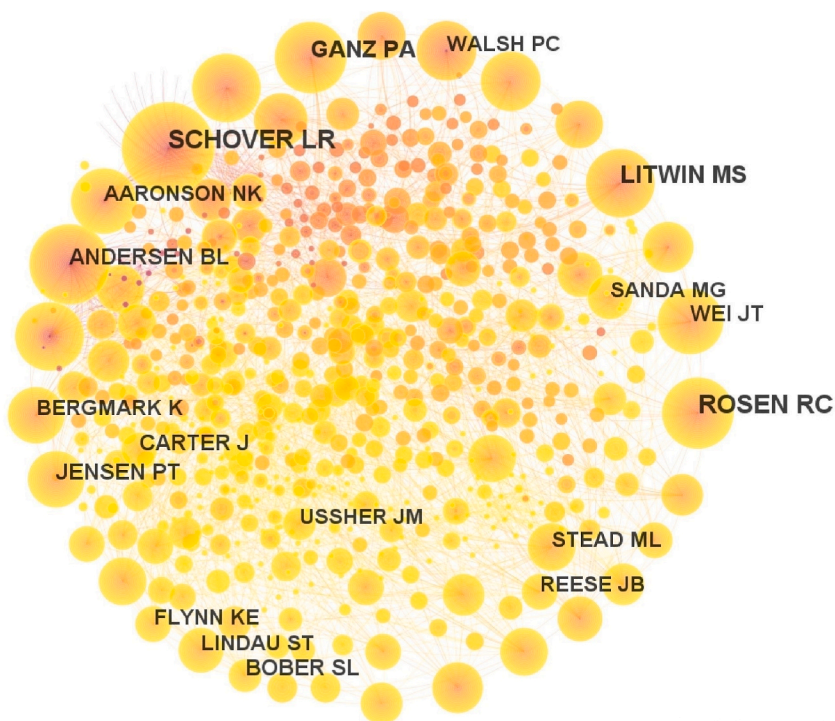


Fig. 6. Visualization map of the authors who published co-cited papers on sexual health problems in patients with cancer.

Table 4

Top 10 Authors with respect to the Number of Co-cited of Published Papers on Sexual Health Problems among Patients with Cancer.

Ranking	Count	Co-Author	First Year	Centrality	Co-Author	First Year
1	779	Rosen RC	1999	0.13	Andersen BL	1985
2	686	Schover LR	1984	0.10	Derogatis LR	1982
3	395	Litwin MS	1997	0.10	Bancroft J	1987
4	365	Ganz PA	1997	0.06	Ganz PA	1995
5	279	Wei JT	2001	0.06	Aaronson NK	1994
6	262	Carter J	2010	0.06	Abitbol MM	1980
7	261	Bober SL	2013	0.05	Schover LR	1984
8	257	Jensen PT	2004	0.05	Walsh PC	1985
9	253	Andersen BL	1985	0.05	Adelusi B	1985
10	243	Aaronson NK	1994	0.05	Fobair P	1992

England Journal of Medicine. This indicates that high-quality articles from top journals are more instructive.

4.2. Analysis of research hotspots for Sexual health problems in patients with cancer

4.2.1. Quality of life

In the context of increased cancer burden and prolonged survival, the quality of life of patients with cancer has received increasing attention as an important predictor of treatment and prognosis [44,45]. Both the top-cited references and keywords of sexual health problems in patients with cancer were related to quality of life. Treatment-related complications, sexual dysfunction, and lack of sexual activity are major factors that impair the quality of life of cancer survivors and patients with cancer who receive treatment report lower sexual function and quality of life than the general population [46–49]. Studies have shown that sexual rehabilitation interventions can effectively improve psychosexual and sexual function and promote quality of life for patients with cancer [50–52]. Therefore, quality of life may be a hotspot of sexual health problems in patients with cancer [53], and oncology medical professionals should clarify the advantages and disadvantages of various sexual rehabilitation interventions, applicable objects, and precautions to improve the sexual health and quality of life of patients.

4.2.2. Breast, rectal, and genitourinary neoplasms

Cluster 1 ‘prostate cancer’, cluster 4 ‘breast cancer’, and cluster 7 ‘rectal cancer’ in Fig. 8, as well as cluster 0 ‘breast cancer’, cluster 1 ‘prostate cancer’, cluster 2 ‘rectal cancer’, cluster 3 ‘testicular cancer’, and cluster 5 ‘cervical cancer’ in Fig. 9, indicate that the

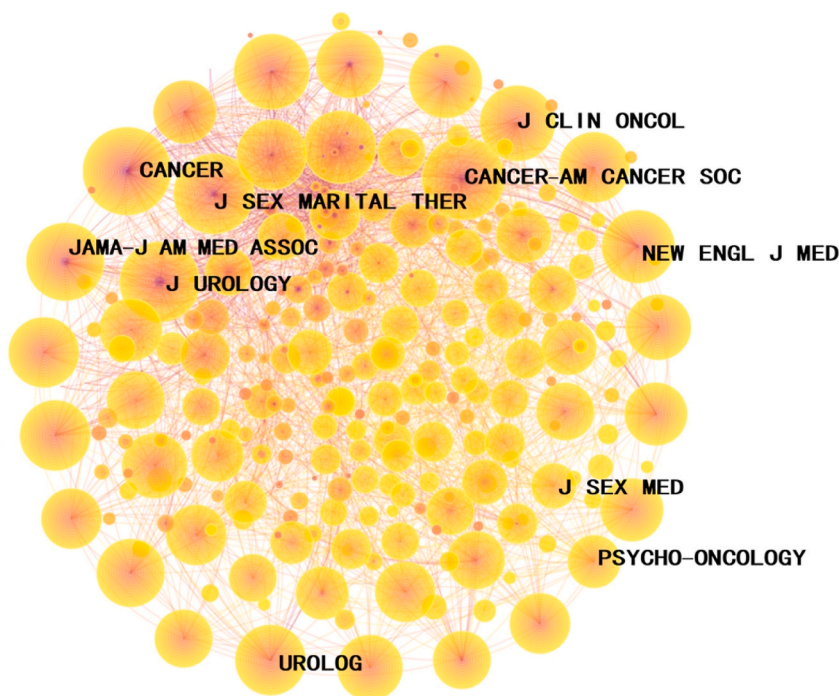


Fig. 7. Visualization map of the journals that published cocited papers on sexual health problems in patients with cancer.

Table 5

Top 10 Journals with respect to the Number of Co-Cited Published Papers on Sexual Health Problems among Patients with Cancer.

Ranking	Count	Journal	First Year	Centrality	Journal	First Year
1	1935	<i>Journal of Clinical Oncology</i>	1984	0.14	<i>American Journal of Obstetrics and Gynecology</i>	1977
2	1402	<i>Journal of Sexual Medicine</i>	2006	0.12	<i>American Journal of Psychiatry</i>	1977
3	1349	<i>Cancer-American Cancer Society</i>	1977	0.10	<i>Archives of General Psychiatry</i>	1977
4	1273	<i>Urology</i>	1978	0.09	<i>American Journal of Nursing</i>	1978
5	1248	<i>Journal of Urology</i>	1978	0.08	<i>BMJ-British Medical Journal</i>	1985
6	1147	<i>Psycho-Oncology</i>	1999	0.08	<i>Annals of Internal Medicine</i>	1979
7	1081	<i>Cancer</i>	1979	0.08	<i>Archives of Physical Medicine and Rehabilitation</i>	1982
8	1062	<i>New England Journal of Medicine</i>	1982	0.07	<i>American Journal of Epidemiology</i>	1995
9	949	<i>JAMA-Journal of the American Medical Association</i>	1979	0.07	<i>British Medical Bulletin</i>	1979
10	902	<i>International Journal of Radiation Oncology</i>	1980	0.07	<i>British Journal of Obstetrics and Gynaecology</i>	1985

research focus population is all related to breast, rectal, and genitourinary neoplasms. Cancer and its treatment often result in gonadotoxic and normal pelvic floor tissue damage among patients with breast, rectal, and genitourinary neoplasms [54], and studies show that the incidence of sexual dysfunction in those patients with ranges from 30 % to 80 % [55–58]. Given this situation, the publication of sexual health care guidelines for patients with these types of cancer can better help patients solve sexual health problems [59]. Currently, patients with breast, rectal, and genitourinary neoplasms are a target group in sexual health research, and health professionals need to use appropriate methods and tools to accurately assess the risk and frequency of sexual health issues in this group of people [60,61].

4.2.3. Surgery resection and radiotherapy

Cluster 0 ‘brachytherapy’, Cluster 0 ‘radical prostatectomy’, and cluster 5 ‘radical hysterectomy’ in Fig. 8, as well as cluster 6 ‘radical prostatectomy’ in Fig. 9, show that researchers pay more attention to the effect of treatment options on the sexual health of patients with cancer. Surgical resection and radiotherapy are the most effective methods for cancer treatment; however, they also lead to hypogonadism and sexual dysfunction [62,63]. Studies show that the radiation dose, radiation modality, type of surgical resection, surgical resection range, and surgical technique affect the risk of sexual dysfunction among patients with cancer, while the damage to sexual health from adjuvant radiotherapy combined with surgical resection is more obvious [62,64–68]. Among all the treatment options, the most common sexual alterations and sexual dysfunction reported by men include erectile dysfunction, ejaculatory dysfunction, and dysorgasmia, whereas dyspareunia and poor lubrication are common among women. The focus content of the current research was to continue to clarify the impact of different techniques of surgery and radiation on the sexual health of patients with

Table 6
Top 10 References with respect to the Number of Co-Cited Published Papers on Sexual Health Problems among Patients with Cancer.

Ranking	Count	Co-Reference	First Year	Centrality	Co-Reference	First Year
1	81	Carter J, 2018, J CLIN ONCOL, V36, P492, DOI 10.1200/JCO.2017.75.8995	2018	0.16	Merrick GS, 2002, INT J RADIAT ONCOL, V52, P893, DOI 10.1016/S0360-3016(01)02675-X	2002
2	77	Sanda MG, 2008, NEW ENGL J MED, V358, P1250, DOI 10.1056/NEJMoa074311	2008	0.16	Bergmark K, 1999, NEW ENGL J MED, V340, P1383, DOI 10.1056/NEJM199905063401802	1999
3	63	Donovan JL, 2016, NEW ENGL J MED, V375, P1425, DOI 10.1056/NEJMoa1606221	2016	0.15	Canada AL, 2005, CANCER, V104, P2689, DOI 10.1002/cncr.21537	2005
4	55	Reese JB, 2017, J CANCER SURVIV, V11, P175, DOI 10.1007/s11764-016-0577-9	2017	0.10	Schover LR, 1991, CA-CANCER J CLIN, V41, P112, DOI 10.3322/canjclin.41.2.112	1991
5	54	Baser RE, 2012, CANCER-AM CANCER SOC, V118, P4606, DOI 10.1002/cncr.26739	2012	0.10	Schag CAC, 1993, J CLIN ONCOL, V11, P783, DOI 10.1200/JCO.1993.11.4.783	1993
6	51	Flynn KE, 2012, PSYCHO-ONCOLOGY, V21, P594, DOI 10.1002/pon.1947	2012	0.09	Lindau ST, 2007, GYNECOL ONCOL, V106, P413, DOI 10.1016/j.ygyno.2007.05.017	2007
7	51	Bober SL, 2012, J CLIN ONCOL, V30, P3712, DOI 10.1200/JCO.2012.41.7915	2012	0.09	Bines J, 1996, J CLIN ONCOL, V14, P1718, DOI 10.1200/JCO.1996.May 14, 1718	1996
8	49	Stanford JL, 2000, JAMA-J AM MED ASSOC, V283, P354, DOI 10.1001/jama.283.3.354	2000	0.09	Andersen BL, 1988, OBSTET GYNECOL, V71, P15	1988
9	49	Resnick MJ, 2013, NEW ENGL J MED, V368, P436, DOI 10.1056/NEJMoa1209978	2013	0.08	Juraskova I, 2003, PSYCHO-ONCOLOGY, V12, P267, DOI 10.1002/pon.639	2003
10	47	Sadovsky R, 2010, J SEX MED, V7, P349, DOI 10.1111/j.1743-6109.2009.01620.x	2010	0.08	Andersen BL, 1985, CANCER-AM CANCER SOC, V55, P1835, DOI10.1002/1097-0142(19850415)55:8 < 1835:AID-CNCR2820550832 > 3.0.CO; 2-K	1985

Table 7
Top 10 Clusters of Reference with respect to the Number of Co-Cited Published Papers on Sexual Health Problems among Patients with Cancer.

Cluster	Label	Size	Silhouette	Mean (Year)
0	brachytherapy	351	0.895	2000
1	prostate cancer	333	0.835	2016
2	radical prostatectomy	293	0.882	2009
3	hypogonadism	219	0.939	1997
4	breast cancer	202	0.926	2016
5	radical hysterectomy	164	0.938	2006
6	quality of life	164	0.968	1996
7	rectal cancer	160	0.963	2004
8	psychosexuality	118	0.985	1996
9	sexuality and cancer	115	0.997	1994

cancer.

4.3. Analysis of research trends for Sexual health problems in patients with cancer

With continuous improvements in global medical technology, the survival time of patients with cancer is increasing. Needs and patient reported outcomes based on long-term survival, sexual health interventions, and sexual health status have become the focus of research on sexual health among patients with cancer. Therefore, keywords such as ‘need’, ‘cancer survivorship’, ‘intervention’, and ‘patient reported outcome’ had citation bursts between 2018 and 2023. Similarly, the strongest citation burst of cited references showed that sexual health is a key theme in patient reports and an issue of general concern for survivors [34,35,69]. However, sexual healthcare is yet to be fully integrated into medical oncology, and sexual health issues have not been addressed in many cancer survivors [37,70]. Faced with these problems, in 2018, the American Society of Clinical Oncology published guidelines for interventions to address sexual problems in patients with cancer. They recommended that psychosocial and/or psychosexual counselling be offered to all patients with cancer, aiming to improve sexual response, body image, intimacy, relationship issues, and overall sexual functioning and satisfaction [35]. In future research, medical oncologists should pay attention to sexual function changes in long-term cancer survivors and explore more feasible and effective sexual health interventions from the perspectives of patient reports and needs.

With the increasing number of papers related to sexual health issues among patients with cancer being published, primary care providers, oncologists, and nurses must pay more attention to their patients. The integration of sexual healthcare into oncology medicine is essential. Therefore, health professionals need to stay up-to-date on current research related to sexual health among

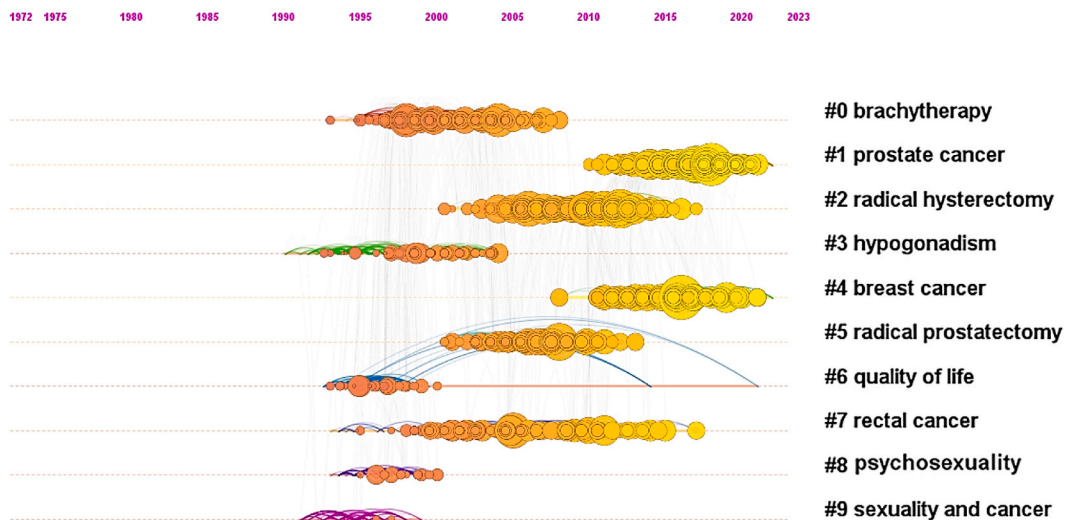


Fig. 8. Timeline view of cocited references that published papers on sexual health problems in patients with cancer.

Table 8

Top 10 Keywords Co-occurrence with respect to Published Papers on Sexual Health Problems among Patients with Cancer.

Ranking	Count	Keyword	First Year	Centrality	Keyword	First Year
1	1816	quality of life	1994	0.07	experience	1995
2	671	sexual function	1994	0.06	long term survivor	1998
3	588	women	1991	0.06	preservation	1997
4	541	breast cancer	1992	0.06	testicular cancer	1998
5	529	prostate cancer	1995	0.05	body image	1995
6	514	erectile dysfunction	1995	0.05	prevalence	2000
7	489	men	1997	0.05	morbidity	1995
8	459	dysfunction	1992	0.05	follow up	1996
9	448	sexual dysfunction	1992	0.05	impotence	1992
10	422	radical prostatectomy	1992	0.05	cervical cancer	1991

Table 9

Top 10 Clusters of Keywords Co-occurrence with respect to the Published Papers on Sexual Health Problems among Patients with Cancer.

Cluster	Label	Size	Silhouette	Mean (Year)
0	breast cancer	202	0.582	2005
1	prostate cancer	170	0.693	2002
2	rectal cancer	156	0.806	2001
3	testicular cancer	120	0.793	2000
4	sexual function	109	0.85	2003
5	cervical cancer	105	0.756	2000
6	radical prostatectomy	93	0.792	2001
7	quality of life	63	0.91	2003
8	erectile dysfunction	39	0.94	2002
9	advanced cancer	33	0.981	2003

patients with cancer and improve their awareness of the importance of sexual health. Our research results will aid health professionals in clarifying the hotspots, target population, and focus content, provide reference directions for sexual health research among patients with cancer, and enrich the connotations of oncology medicine.

The limitations of this study should be mentioned. First, this study included only English documents, which made the analysis incomplete. Second, we only collected data from the WoSCC database, and the data may not represent all the available literature. Third, there is no universal standard for the parameter setting or analysis method of CiteSpace. Therefore, this study may have biased the statistical results, and the design needs to be further improved.

5. Conclusion

The body of research and publications on sexual health problems among patients with cancer has grown steadily in the past few

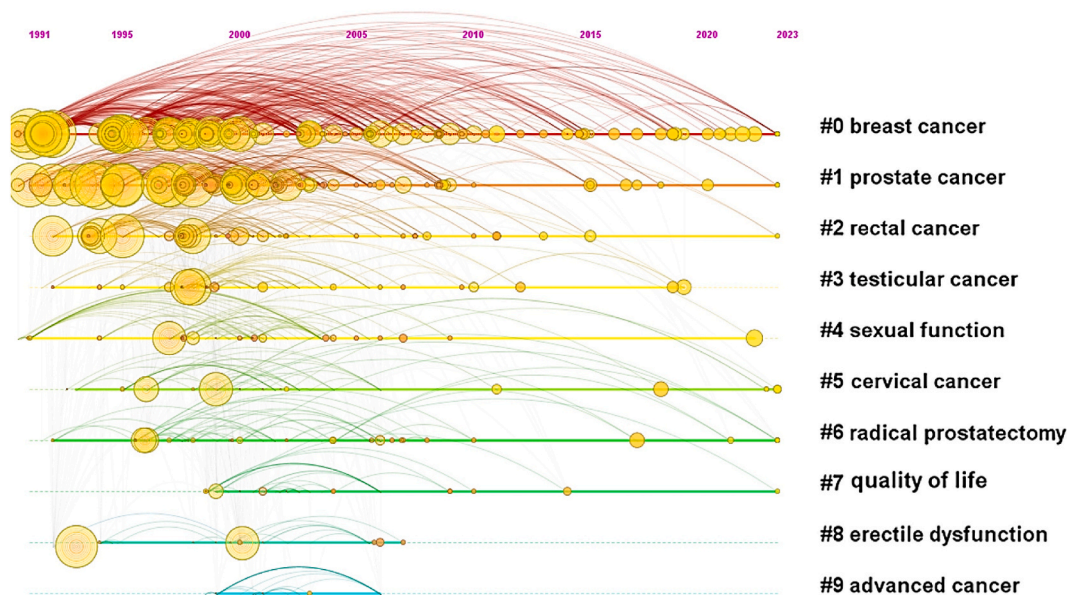


Fig. 9. Timeline view of keyword cooccurrence among published papers on sexual health problems in patients with cancer.

Top 25 References with the Strongest Citation Bursts

References	Year	Strength	Begin	End	1977 - 2023
LITWIN MS, 1995, JAMA-J AM MED ASSOC, V273, P129, DOI 10.1001/jama.273.2.129, DOI	1995	16.64	1997	2000	[Bar chart showing citation burst from 1997 to 2000]
Talcott JA, 1998, J CLIN ONCOL, V16, P275, DOI 10.1200/JCO.1998.16.1.275, DOI	1998	20.34	1999	2003	[Bar chart showing citation burst from 1999 to 2003]
Litwin MS, 1998, MED CARE, V36, P1002, DOI 10.1097/00005650-199807000-00007, DOI	1998	17.51	1999	2003	[Bar chart showing citation burst from 1999 to 2003]
Stanford JL, 2000, JAMA-J AM MED ASSOC, V283, P354, DOI 10.1001/jama.283.3.354, DOI	2000	27.25	2001	2005	[Bar chart showing citation burst from 2001 to 2005]
Potosky AL, 2004, J NATL CANCER I, V96, P1358, DOI 10.1093/jnci/djh259, DOI	2004	17.2	2005	2009	[Bar chart showing citation burst from 2005 to 2009]
Hendren SK, 2005, ANN SURG, V242, P212, DOI 10.1097/01.sla.0000171299.43954.ce, DOI	2005	20.1	2007	2010	[Bar chart showing citation burst from 2007 to 2010]
Fobair P, 2006, PSYCHO-ONCOL, V15, P579, DOI 10.1002/pon.991, DOI	2006	18.32	2008	2011	[Bar chart showing citation burst from 2008 to 2011]
Sanda MG, 2008, NEW ENGL J MED, V358, P1250, DOI 10.1056/NEJMoa074311, DOI	2008	38.39	2009	2013	[Bar chart showing citation burst from 2009 to 2013]
Sadovsky R, 2010, J SEX MED, V7, P349, DOI 10.1111/j.1743-6109.2009.01620.x, DOI	2010	24.6	2011	2015	[Bar chart showing citation burst from 2011 to 2015]
Emilee G, 2010, MATURITAS, V66, P397, DOI 10.1016/j.maturitas.2010.03.027, DOI	2010	19.35	2011	2015	[Bar chart showing citation burst from 2011 to 2015]
Abbott-Anderson K, 2012, GYNECOL ONCOL, V124, P477, DOI 10.1016/j.ygyno.2011.11.030, DOI	2012	18.67	2012	2017	[Bar chart showing citation burst from 2012 to 2017]
Baser RE, 2012, CANCER-AM CANCER SOC, V118, P4606, DOI 10.1002/ncr.26739, DOI	2012	27.09	2013	2017	[Bar chart showing citation burst from 2013 to 2017]
Bober SL, 2012, J CLIN ONCOL, V30, P3712, DOI 10.1200/JCO.2012.41.7915, DOI	2012	25.58	2013	2017	[Bar chart showing citation burst from 2013 to 2017]
Flynn KE, 2012, PSYCHO-ONCOLOGY, V21, P594, DOI 10.1002/pon.1947, DOI	2012	25.58	2013	2017	[Bar chart showing citation burst from 2013 to 2017]
Resnick MJ, 2013, NEW ENGL J MED, V368, P436, DOI 10.1056/NEJMoal200978, DOI	2013	22.71	2013	2018	[Bar chart showing citation burst from 2013 to 2018]
Panjanji M, 2011, J SEX MED, V8, P294, DOI 10.1111/j.1743-6109.2010.02034.x, DOI	2011	17.96	2013	2016	[Bar chart showing citation burst from 2013 to 2016]
Gilbert E, 2011, MATURITAS, V70, P42, DOI 10.1016/j.maturitas.2011.06.013, DOI	2011	16.87	2013	2016	[Bar chart showing citation burst from 2013 to 2016]
Ussher JM, 2012, CANCER NURS, V35, P456, DOI 10.1097/NCC.0b013e3182395401, DOI	2012	16.52	2013	2017	[Bar chart showing citation burst from 2013 to 2017]
Raggio GA, 2014, PSYCHOL HEALTH, V29, P632, DOI 10.1080/08870446.2013.879136, DOI	2014	17.51	2016	2019	[Bar chart showing citation burst from 2016 to 2019]
Donovan JL, 2016, NEW ENGL J MED, V375, P1425, DOI 10.1056/NEJMoal606221, DOI	2016	30.41	2017	2021	[Bar chart showing citation burst from 2017 to 2021]
Reese JB, 2017, J CANCER SURVIV, V11, P175, DOI 10.1007/s11764-016-0577-9, DOI	2017	23.91	2017	2023	[Bar chart showing citation burst from 2017 to 2023]
Carter J, 2018, J CLIN ONCOL, V36, P492, DOI 10.1200/JCO.2017.75.8995, DOI	2018	36.34	2019	2023	[Bar chart showing citation burst from 2019 to 2023]
Stabile C, 2017, BREAST CANCER RES TR, V165, P77, DOI 10.1007/s10549-017-4305-6, DOI	2017	19.59	2019	2023	[Bar chart showing citation burst from 2019 to 2023]
Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492, DOI	2018	18.01	2019	2021	[Bar chart showing citation burst from 2019 to 2021]
Siegel RL, 2019, CA-CANCER J CLIN, V69, P7, DOI 10.3322/caac.21551, DOI	2019	17.01	2019	2023	[Bar chart showing citation burst from 2019 to 2023]

Fig. 10. Top 25 references with the strongest citation bursts of published papers on sexual health problems in patients with cancer.

decades. The study showed that the USA ranks first (in light of its contributions) in research on sexual health problems among patients with cancer and that authors need to strengthen collaboration with other countries, institutions, and authors to facilitate the progress of relevant research. Recent studies have focused on the impact of different treatment options on the sexual health of target populations. In the future, exploring long-term changes in sexual function among cancer survivors, and formulating more feasible and effective sexual health interventions towards patient-reported outcomes and needs are key research directions.

Data availability statement

Data included in article/supp. material/referenced in article.

Top 25 Keywords with the Strongest Citation Bursts



Fig. 11. Top 25 keywords with the strongest citation bursts of published papers on sexual health problems in patients with cancer.

Funding

This study was supported by the Tianjin Key Medical Discipline (Specialty) Construction Project (no. TJYXZDXK-011A).

CRediT authorship contribution statement

Ying Li: Conceptualization, Writing – original draft. **Mingyue Liu:** Conceptualization, Writing – review & editing. **Yanxia Sun:** Data curation, Formal analysis. **Dandan Guo:** Software. **Min Li:** Software.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- [1] C. Allemani, T. Matsuda, V.D. Carlo, et al., Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries, *Lancet* 391 (10125) (2018) 1023–1075, [https://doi.org/10.1016/S0140-6736\(17\)33326-3](https://doi.org/10.1016/S0140-6736(17)33326-3).
- [2] K. Roberts, T. Chong, E. Hollands, et al., Screening for sexual health concerns in survivors of gynecological cancer, *Support. Care Cancer* 28 (2020) 599–605, <https://doi.org/10.1007/s00520-019-04872-4>.
- [3] L.S. Campos, S.P. De Nardi, L.F. Limberger, et al., Sexual function and disease progression in women with advanced cancer, *Support. Care Cancer* 30 (2022) 5093–5098, <https://doi.org/10.1007/s00520-022-06797-x>.
- [4] A. Bobrie, M. Jarlier, A. Mousson, et al., Sexual quality of life assessment in young women with breast cancer during adjuvant endocrine therapy and patient-reported supportive measures, *Support. Care Cancer* 30 (2022) 3633–3641, <https://doi.org/10.1007/s00520-022-06810-3>.
- [5] World Health Organization (WHO) Sexual health and its linkages to reproductive health: an operational approach. World Health Organization. <https://apps.who.int/iris/bitstream/handle/10665/258738/9789241512886-eng.pdf?sequence=1>. Accessed 30 April 2022.

- [6] K.E. Flynn, L. Lin, D.W. Bruner, et al., Sexual satisfaction and the importance of sexual health to quality of life throughout the life course of U.S. adults, *J. Sex. Med.* 13 (2016) 1642–1650, <https://doi.org/10.1016/j.jsxm.2016.08.011>.
- [7] S. Cianci, M. Tarascio, A. Rosati, et al., Sexual function and quality of life of patients affected by ovarian cancer, *Minerva Med.* 110 (2019) 320–329, <https://doi.org/10.23736/S0026-4806.19.06080-4>.
- [8] J. Bai, S.M. Belcher, R. Meador, et al., Comparisons of depression, sexual function, and quality of life between women with gynecological cancers and race-matched healthy controls, *Cancer Nurs.* 44 (2021) 116–124, <https://doi.org/10.1097/NCC.0000000000000744>.
- [9] G. Creff, F. Jegoux, M.K. Bendiane, et al., Social and sexual health of thyroid cancer survivors 2 and 5 years after diagnosis: the VICAN survey, *Support. Care Cancer* 30 (2021) 2777–2785, <https://doi.org/10.1007/s00520-021-06715-7>.
- [10] A. Hernández-Blanquisset, V. Quintero-Carreño, A. Álvarez-Londoño, et al., Sexual dysfunction as a challenge in treated breast cancer: in-depth analysis and risk assessment to improve individual outcomes, *Front. Oncol.* 2 (12) (2022), 955057, <https://doi.org/10.3389/fonc.2022.955057>.
- [11] R. Yan, J. Wang, J. Yu, Association of sexual attitudes with sexual dysfunction and sexual distress among Chinese breast cancer survivors: a cross-sectional study, *Support. Care Cancer* 31 (3) (2023) 154, <https://doi.org/10.1007/s00520-023-07600-1>.
- [12] A. Kulkarni, G. Sun, S. Manuppelli, et al., Sexual health and function among patients receiving systemic therapy for primary gynecologic cancers, *Gynecol. Oncol.* 165 (2022) 323–329, <https://doi.org/10.1016/j.ygyno.2022.03.008>.
- [13] Q.C. Rainer, J.M. Dubin, N.C. Balaji, et al., Sexual dysfunction among adolescent and young adult men diagnosed with cancer, *J. Adolesc. Young Adult Oncol.* 18 (2022), <https://doi.org/10.1089/jayao.2021.0211>.
- [14] Y. Karacan, H. Yildiz, B. Demircioglu, et al., Evaluation of sexual dysfunction in patients with hematological malignancies, *Asia-Pac J Oncol Nurs.* 8 (2020) 51–57, https://doi.org/10.4103/apjon.apjon.40_20.
- [15] A.S. Rójjvall, C. Buchli, M. Bottai, et al., Effect of radiotherapy for rectal cancer on female sexual function: a prospective cohort study, *Br. J. Surg.* 107 (2019) 525–536, <https://doi.org/10.1002/bjs.11373>.
- [16] C. Acquati, S. Hendren, D. Wittmann, et al., Psychological and sexual distress in rectal cancer patients and partners, *Psycho Oncol.* 31 (2022) 920–928, <https://doi.org/10.1002/pon.5880>.
- [17] J. Van Rooij, N. Raijmakers, A.T. Johnsen, et al., Sexual health and closeness in couples coping with advanced cancer: results of a multicenter observational study (eQuiPe), *Palliat. Med.* 36 (2022) 698–707, <https://doi.org/10.1177/02692163221074541>.
- [18] R. Valpey, S. Kucherer, J. Nguyen, Sexual dysfunction in female cancer survivors: a narrative review, *Gen Hosp Psychiatry* 60 (2019) 141–147, <https://doi.org/10.1016/j.genhosppsych.2019.04.00>.
- [19] M. Vejlgård, S.L. Maibom, U.N. Joensen, et al., Quality of life and secondary outcomes for open versus robot-assisted radical cystectomy: a double-blinded, randomised feasibility trial, *World J. Urol.* 40 (2022) 1669–1677, <https://doi.org/10.1007/s00345-022-04029-9>.
- [20] A. Qi, Y. Li, H. Sun, et al., Incidence and risk factors of sexual dysfunction in young breast cancer survivors, *Ann. Palliat. Med.* 10 (2021) 4428–4434, <https://doi.org/10.21037/apm-21-352>.
- [21] A. Barcellini, M. Dominoni, F. Dal Mas, et al., Sexual health dysfunction after radiotherapy for gynecological cancer: role of physical rehabilitation including pelvic floor muscle training, *Front. Med.* 8 (2022), 813352, <https://doi.org/10.3389/fmed.2021.813352>.
- [22] N. Reimer, E.M. Zopf, R. Böwe, F.T. Baumann, Effects of exercise on sexual dysfunction in patients with prostate cancer—a systematic review, *J. Sex. Med.* 18 (2021) 1899–1914, <https://doi.org/10.1016/j.jsxm.2021.09.001>.
- [23] N. Mishra, N. Singh, M. Sachdeva, et al., Sexual dysfunction in cervical cancer survivors: a scoping review, *Women's Health Rep (New Rochelle NY)* 2 (2021) 594–607, <https://doi.org/10.1089/whr.2021.0035>.
- [24] F.E. Ursavaş, Karayurt Ö, Effects of a Roy's adaptation model-guided support group intervention on sexual adjustment, body image, and perceived social support in women with breast cancer, *Cancer Nurs.* 44 (2020) E382–E394, <https://doi.org/10.1097/NCC.0000000000000854>.
- [25] Y. Shi, J. Cai, Z. Wu, et al., Effects of a nurse-led positive psychology intervention on sexual function, depression and subjective well-being in postoperative patients with early-stage cervical cancer: a randomized controlled trial, *Int. J. Nurs. Stud.* 111 (2020), 103768, <https://doi.org/10.1016/j.ijnurstu.2020.103768>.
- [26] N. Gong, Y. Zhang, R. Suo, et al., The role of space in obstructing clinical sexual health education: a qualitative study on breast cancer patients' perspectives on barriers to expressing sexual concerns, *Eur. J. Cancer Care* 30 (2021), e13422, <https://doi.org/10.1111/ecc.13422>.
- [27] D.Y. Wazqar, Sexual health care in cancer patients: a survey of healthcare providers' knowledge, attitudes and barriers, *J. Clin. Nurs.* 29 (2020) 4239–4247, <https://doi.org/10.1111/jocn.15459>.
- [28] P. Zhu, B. Wu, R. Zheng, et al., Oncology nurses' and oncologists' experience of addressing sexual health concerns in breast cancer patients: a qualitative study, *Eur. J. Oncol. Nurs.* 63 (2023), 102286, <https://doi.org/10.1016/j.ejon.2023.102286>.
- [29] A. Duimering, L.M. Walker, J. Turner, et al., Quality improvement in sexual health care for oncology patients: a Canadian multidisciplinary clinic experience, *Support. Care Cancer* 28 (2019) 2195–2203, <https://doi.org/10.1007/s00520-019-05040-4>.
- [30] C. Chen, M. Song, Visualizing a field of research: a methodology of systematic scientometric reviews, *PLoS One* 14 (2019), e0223994, <https://doi.org/10.1371/journal.pone.0223994>.
- [31] B. Zhang, B. Ao, X. Lu, et al., Global research trends on precision oncology: a systematic review, bibliometrics, and visualized study, *Medicine (Baltim.)* 101 (43) (2022), e31380, <https://doi.org/10.1097/MD.00000000000003380>.
- [32] Y. Pan, X. Deng, Y. Zhuang, et al., Research trends around exercise rehabilitation among cancer patients: a bibliometrics and visualized knowledge Graph analysis, *BioMed Res. Int.* 2022 (2022), 3755460, <https://doi.org/10.1155/2022/3755460>.
- [33] K. Schubach, T. Niyonsenga, M. Turner, et al., Experiences of sexual well-being interventions in males affected by genitourinary cancers and their partners: an integrative systematic review, *Support. Care Cancer* 31 (5) (2023) 265, <https://doi.org/10.1007/s00520-023-07712-8>.
- [34] M.G. Sanda, R.L. Dunn, J. Michalski, et al., Quality of life and satisfaction with outcome among prostate-cancer survivors, *N. Engl. J. Med.* 358 (2008) 1250–1261.
- [35] J. Carter, C. Lacchetti, B.L. Andersen, et al., Interventions to address sexual problems in people with cancer: American Society of clinical oncology clinical practice guideline adaptation of cancer care ontario guideline, *J. Clin. Oncol.* 36 (2018) 492–511, <https://doi.org/10.1200/JCO.2017.75.8995>.
- [36] J.L. Donovan, F.C. Hamdy, J.A. Lane, et al., Patient-reported outcomes after monitoring, surgery, or radiotherapy for prostate cancer, *N. Engl. J. Med.* 375 (2016) 1425–1437, <https://doi.org/10.1056/NEJMoa1606221>.
- [37] J.B. Reese, K. Sorice, M.C. Beach, et al., Patient-provider communication about sexual concerns in cancer: a systematic review, *J. Cancer Surviv* 11 (2017) 175–188, <https://doi.org/10.1007/s11764-016-0577-9>.
- [38] R.E. Baser, Y. Li, J. Carter, Psychometric validation of the female sexual function index (FSFI) in cancer survivors, *Cancer* 118 (18) (2012) 4606–4618, <https://doi.org/10.1002/ncr.26739>.
- [39] G.S. Merrick, W.M. Butler, R.W. Galbreath, et al., Erectile function after permanent prostate brachytherapy, *Int. J. Radiat. Oncol. Biol. Phys.* 52 (4) (2002) 893–902, [https://doi.org/10.1016/s0360-3016\(01\)02675-x](https://doi.org/10.1016/s0360-3016(01)02675-x).
- [40] K. Bergmark, E. Avall-Lundqvist, P.W. Dickman, et al., Vaginal changes and sexuality in women with a history of cervical cancer, *N. Engl. J. Med.* 340 (18) (1999) 1383–1389, <https://doi.org/10.1056/NEJM199905063401802>.
- [41] A.L. Canada, L.E. Neese, D. Sui, et al., Pilot intervention to enhance sexual rehabilitation for couples after treatment for localized prostate carcinoma, *Cancer* 104 (12) (2005) 2689–2700.
- [42] L.R. Schover, The impact of breast cancer on sexuality, body image, and intimate relationships, *CA Cancer J Clin* 41 (2) (1991) 112–120, <https://doi.org/10.3322/canjclin.41.2.112>.
- [43] C.A. Schag, P.A. Ganz, M.L. Polinsky, et al., Characteristics of women at risk for psychosocial distress in the year after breast cancer, *J. Clin. Oncol.* 11 (4) (1993) 783–793, <https://doi.org/10.1200/JCO.1993.11.4.783>.
- [44] S. Cianci, A. Rosati, V.A. Capozzi, et al., Quality of life and sexual functioning of patient affected by endometrial cancer, *Minerva Med.* 112 (2021) 81–95, <https://doi.org/10.23736/S0026-4806.20.07081-0>.

- [45] G. Coba, T. Patel, Penile cancer: managing sexual dysfunction and improving quality of life after therapy, *Curr. Urol. Rep.* 22 (2021) 8, <https://doi.org/10.1007/s11934-020-01022-w>.
- [46] M.J. Traa, R.G. Orsini, B.L.D. Oudsten, et al., Measuring the health-related quality of life and sexual functioning of patients with rectal cancer: does type of treatment matter? *Int. J. Cancer* 134 (2013) 979–987, <https://doi.org/10.1002/ijc.28430>.
- [47] W. Zhou, X. Yang, Y. Dai, et al., Survey of cervical cancer survivors regarding quality of life and sexual function, *J Cancer Res Ther* 12 (2016) 938–944, <https://doi.org/10.4103/0973-1482.175427>.
- [48] E. Harju, T. Pakarainen, H. Vasarainen, et al., Health-related quality of life, self-esteem and sexual functioning among patients operated for penile cancer—a cross-sectional study, *J. Sex. Med.* 18 (2021) 1524–1531, <https://doi.org/10.1016/j.jsxm.2021.06.015>.
- [49] S. Haas, A.H. Mikkelsen, C. Kronborg, et al., Management of late adverse effects after chemoradiation for anal cancer, *Acta Oncol* 60 (2021) 1688–1701, <https://doi.org/10.1080/0284186X.2021.1983208>.
- [50] I. Suvaal, S.B. Hummel, J.W.M. Mens, et al., A sexual rehabilitation intervention for women with gynaecological cancer receiving radiotherapy (SPARC study): design of a multicentre randomized controlled trial, *BMC Cancer* 21 (2021) 1295, <https://doi.org/10.1186/s12885-021-08991-2>.
- [51] E.K. Arthur, C.E. Wills, U. Menon, A systematic review of interventions for sexual well-being in women with gynecologic, anal, or rectal cancer, *Oncol. Nurs. Forum* 45 (4) (2018) 469–482, <https://doi.org/10.1188/18.ONF.469-482>.
- [52] D. Wittmann, A. Mehta, S.L. Bober, et al., TrueNTH Sexual Recovery Intervention for couples coping with prostate cancer: randomized controlled trial results, *Cancer* 128 (2022) 1513–1522, <https://doi.org/10.1002/cncr.34076>.
- [53] O.J. Fischer, M. Marguerie, L.A. Brotto, Sexual function, quality of life, and Experiences of women with ovarian cancer: a Mixed-methods study, *Sex. Med.* 7 (4) (2019) 530–539, <https://doi.org/10.1016/j.esxm.2019.07.005>.
- [54] N. Pereira, G.L. Schattman, Fertility preservation and sexual health after cancer therapy, *J Oncol Pract* 13 (2017) 643–651, <https://doi.org/10.1200/JOP.2017.023705>.
- [55] T. Sousa Rodrigues Guedes, M. Barbosa Otoni Gonçalves Guedes, R. de Castro Santana, et al., Sexual dysfunction in women with cancer: a systematic review of longitudinal studies, 21, *Int J Environ Res Public Health* 19 (19) (2022), 11921, <https://doi.org/10.3390/ijerph191911921>.
- [56] E. Watson, S. Wilding, L. Matheson, et al., Experiences of support for sexual dysfunction in men with prostate cancer: findings from a U.K.-Wide Mixed methods study, *J. Sex. Med.* 18 (3) (2021) 515–525, <https://doi.org/10.1016/j.jsxm.2020.12.017>.
- [57] W.R.G. Perry, M.A. Abd El Aziz, E. Duchalais, et al., Sexual dysfunction following surgery for rectal cancer: a single-institution experience, *Updates Surg* 73 (6) (2021) 2155–2159, <https://doi.org/10.1007/s13304-021-01124-1>.
- [58] S. La Vignera, R. Cannarella, Y. Duca, et al., Hypogonadism and sexual dysfunction in testicular tumor survivors: a systematic review, *Front. Endocrinol.* 10 (2019) 264, <https://doi.org/10.3389/fendo.2019.00264>.
- [59] D. Wittmann, A. Mehta, E. McCaughan, et al., Guidelines for sexual health care for prostate cancer patients: recommendations of an international panel, *J. Sex. Med.* 19 (11) (2022) 1655–1669, <https://doi.org/10.1016/j.jsxm.2022.08.197>.
- [60] I. Tounkel, S. Nalubola, A. Schulz, et al., Sexual health screening for gynecologic and breast cancer survivors: a review and critical analysis of validated screening tools, *Sex. Med.* 10 (2) (2022), 100498, <https://doi.org/10.1016/j.esxm.2022.100498>.
- [61] A. Stulz, K. Lamore, L. Montalescot, et al., Sexual health in colon cancer patients: a systematic review, *Psycho Oncol.* 29 (7) (2020) 1095–1104, <https://doi.org/10.1002/pon.5391>.
- [62] M.S. Litwin, H.J. Tan, The diagnosis and treatment of prostate cancer: a review, *JAMA* 317 (2017) 2532–2542, <https://doi.org/10.1001/jama.2017.7248>.
- [63] M. Garutti, M. Lambertini, F. Puglisi, Checkpoint inhibitors, fertility, pregnancy, and sexual life: a systematic review, *ESMO Open* 6 (5) (2021), 100276, <https://doi.org/10.1016/j.esmoop.2021.100276>.
- [64] D.G. Wallington, E.B. Holliday, Preparing patients for sexual dysfunction after radiation for anorectal cancers: a systematic review, *Pract Radiat Oncol* 11 (2021) 193–201, <https://doi.org/10.1016/j.pro.2020.07.007>.
- [65] M. Loi, R.C. Wortel, G. Francolini, et al., Sexual function in patients treated with stereotactic radiotherapy for prostate cancer: a systematic review of the current evidence, *J. Sex. Med.* 16 (2019) 1409–1420, <https://doi.org/10.1016/j.jsxm.2019.05.019>.
- [66] M. Kisse, G. Créhange, P. Graff, Stereotactic radiation therapy versus brachytherapy: relative strengths of two highly efficient options for the treatment of localized prostate cancer, *Cancers* 14 (2022) 2226, <https://doi.org/10.3390/cancers14092226>.
- [67] M. Towe, L.M. Huynh, F. El-Khatib, et al., A review of male and female sexual function following colorectal surgery, *Sex Med Rev* 7 (2019) 422–429, <https://doi.org/10.1016/j.sxmr.2019.04.001>.
- [68] E. Whyte, A. Sutcliffe, P. Keegan, et al., Effects of partial penectomy for penile cancer on sexual function: a systematic review, *PLoS One* 17 (9) (2022), e0274914, <https://doi.org/10.1371/journal.pone.0274914>.
- [69] M.J. Resnick, T. Koyama, K.H. Fan, et al., Long-term functional outcomes after treatment for localized prostate cancer, *N. Engl. J. Med.* 368 (2013) 436–445, <https://doi.org/10.1056/NEJMoa1209978>.
- [70] C. Stabile, S. Goldfarb, R.E. Baser, et al., Sexual health needs and educational intervention preferences for women with cancer, *Breast Cancer Res. Treat.* 165 (2017) 77–84, <https://doi.org/10.1007/s10549-017-4305-6>.