

Global Research Trends on Surgery in Uterine Cervical Neoplasms: A Bibliometric Analysis via CiteSpace

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Abstract

Objectives: To identify the cooperation of authors, countries, institutions and explore the hot topics' prospects regarding research of surgical procedure in uterine cervical neoplasms.

Methods: Publications on research of surgical treatment of uterine cervical neoplasms were retrieved from the Web of Science Core Collection (WoSCC). Bibliometric analysis were performed by CiteSpace software. Visualized network maps were performed to evaluate the collaborations between different authors, countries, institutions, and keywords.

Results: A total of 1381 articles related to study were identified. An increasing number of publications were observed from 2006 to 2022, and the number of publications were over 100 in 2020 and 2021. Gynecologic Oncology (715 times) was the most co-cited journal. Active collaborations among the top authors were observed. Scambia G(17 papers) was the top most productive authors and Ramirez PT with the largest numbers of citations (155 co-citations) in this field during the past decades. The USA was the leading contributor in this field with 342papers. Active cooperation between countries and between institutions was observed. The main hot topics in the last three years included matters related to uterine cervical neoplasms, quality of life (QoL), guideline, and gynecologic surgical procedure.

Conclusion: This study provides a comprehensive overview of surgery in uterine cervical neoplasms, allowing relevant authors and research teams to recognize the current research status in this field and provide a reference for formulating future research directions as well.

Introduction

Cancer is one of the leading causes of death worldwide with over 17 million new cases and 8.5 million cancer-related deaths per year¹. Worldwide, cervical cancer is the fourth most common cancer among women². An estimated 500,000 new cases and 200,000 deaths due to cervical cancer are reported annually³. Like many other types of malignancies, cervical cancer is a chronic complex disease caused by a combination of inherited genetic factors and external environmental influences^{4,5}. However, determination of human to defeat cervical cancer has never changed. The technology to combat cervical cancer is also being updated. Including precision prevention and any other treatments which including surgery, chemotherapy, radiotherapy, immunotherapy, targeted therapy and new gene therapy. Specially, surgical treatment is still as the primary measure for cervical cancer. The main types of surgery including cervical conical resection, simple hysterectomy, radical hysterectomy, cervical resection, pelvic lymph node dissection, and pelvic exenteration surgery. A research held in New Orleans indicated that minimally invasive radical hysterectomy has a low risk of additional complications and transfusions, which can save more live compared to open surgery⁶. The study further pointed out that a return to open surgery for all patients would result in 85 additional complications, 70 additional transfusions, and only 4.75 lives would be saved per 1,000 cases. Another fertility-sparing surgery research reported that the majority of cervical cancer survivors desiring the operation, maintain their desire for parenthood after cancer

treatment. For patients with early-stage disease, vaginal radical trachelectomy showed good reproductive outcomes⁷. Moreover, one of the robot-assisted laparoscopic radical hysterectomy researches showed minor sexual dysfunction, and could facilitate the preservation of posterior branches from the hypogastric nerve which are important for arousal and orgasm⁸.

Bibliometric analysis which can qualitatively and quantitatively evaluate research trends refers to use mathematical and statistical methods to analyze all the knowledge carriers of a certain discipline⁹. It plays an important role in the theoretical and practical research of information science. CiteSpace is a web-based Java application for data analysis and visualization about literature. It is major in evaluating co-occurrence network maps of authors, keywords, institutions, and countries¹⁰, to help researchers grasp development trend in specific research areas.

The surgery techniques of cervical cancer have made a great progress, while there is a lack of correlated style literature to visualize and summarize. This article is going to report the characteristics of articles about surgery in uterine cervical neoplasms research, summarize and visualize the major achievements in this field, indicating the current research direction and the main research hotspots in this field, providing further guidance for the next step of research.

Methods

WoSCC database was chosen to performed online retrieval. Articles published from 2006 to 2022 were retrieved. "Uterine Cervical Neoplasms", "Surgical Procedures, Operative" were used as keywords for the search. Title, authors, abstract, keywords, institution, journal, and country/region are gathered from each article. Articles that meet the following criteria were included (1): Publication date is from 2006 to 2022; (2) Articles were indexed in WoSCC; (3) Articles were major in surgery of uterine cervical neoplasms. The following documents were excluded: unpublished documents, repeated articles, irrelevant meeting abstracts, irrelevant case report, letters, irrelevant proceedings, and meta-analysis.

Data analysis

CiteSpace 5.8.R3 developed by Professor Chaomei Chen¹¹ was used to perform co-occurrence analysis and visualize the collaborative networks of the authors/institutes/countries/keywords. Networks of reference co-citation and author co-citation were also performed, and related knowledge maps were constructed. Different colors of node and line represent different years¹². Nodes with purple round outside or centrality > 0.1 mean high centrality and are usually regarded as turning points or pivotal points in a field¹³. We also analyzed burst keyword detection to investigate the recurrent new keywords. The 50 most cited articles were selected to construct the individual network. The parameters of CiteSpace were as follows: time slicing (2006–2022), 2 year per slice. Log-likelihood ratio weighting was used on each cluster analysis. Modularity Q (Q) and Weighted Mean Silhouette (S) were used to measure the cluster degree, Q > 0.3 indicates a significant clustering structure, S > 0.5 indicates that the clustering

results are acceptable. A timeline view visualized by CiteSpace was used to depict changes in the trends of a field with time in this study.

Results

In total, 1,381 papers matched the retrieval criteria. The number of publications by year was presented in Fig. 1, where the overall trend consistently kept gradually increasing from 2006 to 2022, and the number of publications were first over 100 in 2020 and kept stable in 2021.

Analysis of co-cited journals

The journal collaboration network of surgery in uterine cervical neoplasms research was observed. The visualized map contains 527 unique nodes, 3978 lines, and 0.0287 density. Table 1 listed the top 10 cited-journals contributing to surgery in uterine cervical neoplasms research. The top five most co-cited journals were Gynecologic Oncology (715 times), International Journal of Gynecological Cancer (493 times), American Journal of Obstetrics and Gynecology (483 times), Obstetrics and Gynecology (451 times), and Cancer (348 times).

Analysis of leading countries/region and institutions

The country/region collaboration network of surgery in uterine cervical neoplasms research was observed (Fig. 2). Table 2 presented the top 10 countries/regions contributing to the research. The visualized map contains 96 unique nodes, 379 lines, and 0.0831 density. A close connection between the country was found. These nodes and lines represent the relationship between countries of the collected studies, respectively. The more published the country, the larger the node. The color and thickness of the circle in the node indicate the citation frequency at different time periods. The USA had the largest amounts of publications (342 papers) related to uterine cervical neoplasms research, followed by People's Republic of China (145 papers), Italy (135 papers), Japan (115 papers), Germany (105 papers), France (96 papers), and South Korea (70 papers).

The institution collaboration network in uterine cervical neoplasms research was also observed (Fig. 3). The visualized map contains 316 unique nodes, 516 lines, and 0.0104 density. A close connection between the institution was found. Five top productive institutions were Univ Texas MD Anderson Canc Ctr (27 papers), Mem Sloan Kettering Canc Ctr (24 papers), Charles Univ Prague (20 papers), Univ Cattolica Sacro Cuore (19 papers), and Yonsei Univ (18 papers), respectively.

Analysis of authors and co-cited authors

The author collaboration network of surgery in uterine cervical neoplasms research was performed. The visualized map contains 386 unique nodes, 834 lines, and 0.0112 density. A close connection between the author was found. According to Fig. 4, in terms of frequencies Scambia G (17 papers), Leblanc E (14 papers), Bogani G (11 papers), Cibula D (11 papers), Querleu D (11 papers), and Narducci F (11 papers) had the most articles in this field during the past 17 years (Table 3). We also analyzed the information of

author citation. The map contained 521 unique nodes, 3077 lines, and 0.0227 density. A close connection between the author was found. For the co-cited author, the top five authors with the most citations were Ramirez PT (155 co-citations), Querleu D (126 co-citations), Dargent D (108 co-citations), Abu-rustum NR (108 co-citations), and Frumovitz M (96 co-citations), which reflected they play a strongest academic authority in this field.

Analysis of co-occurring keywords and timeline view

A total of 413 keywords were identified and the collaboration network of surgery in uterine cervical neoplasms research as the show in Fig. 5. The main hot keywords are cervical cancer (349), carcinoma (288), cancer (278), surgery (248), management (177), experience (126). These words were classified into six large clusters: “pelvic exenteration,” “robotic surgery,” “cervical intraepithelial neoplasia,” “lymph node,” “sentinel lymph node,” and “radical trachelectomy.” ($Q = 0.4035$, $S = 0.7198$), which indicated that the cluster results are acceptable. And Fig. 6 showed the timeline view of keyword from 2006 to 2022, keyword of each cluster evolves from time to time, from the initial research focus on “laparotomy, vaginal hysterectomy” to the current research of “quality of life, minimally invasive surgical procedure, fertility-sparing surgery” research changes.

Co-cited references and burst references

We also revealed the top 10 co-cited references related to research of surgery in uterine cervical neoplasms. Articles with citation bursts show a significant increase in research interest in the field of surgery in uterine cervical neoplasms research. The article (Ramirez PT 2018) was co-cited more than 50 times, three articles (Melamed A 2018; Querleu D 2008; Haugen BR 2016) were co-cited 20–50 times. Figure 7 lists the 15 strongest references from 2006 to 2022. The first seven references highlight the emerging trend of surgery in uterine cervical neoplasms research from 2006 to 2009, while the middle six references highlight the emerging trend for 2010–2018. The last two references were those which received great attention in 2018 and continued to 2022.

Discussions

We have made an analysis about the number of publications, countries, institutions, co-cited references and authors researching surgery in uterine cervical neoplasms research. The results showed that countries worldwide have paid more attention on this topic over the last 17 years. And the United States is the center of this field with the most publications, academic institutions, high-impact journals, and authors.

The analysis of high-frequency keywords and keywords with timeline view showed that the researches' focus has changed over time. From 2006 to 2008, laparotomy, vaginal hysterectomy, abdominal hysterectomy, positron emission tomography, pelvic lymphadenectomy, and sentinel node have been the research hot spots. Women with Stage 1B disease traditionally require a radical abdominal hysterectomy (RAH) and pelvic lymph node dissection. However, it carries significant morbidity, particularly in terms of large volume blood loss, bladder and bowel dysfunction. The results from a research showed women

who diagnosed with early (stage 1 to 2A) cervical cancer underwent laparoscopically assisted radical vaginal hysterectomy (LARVH) have less blood loss compared with those who underwent RAH. And RAH was associated with significantly shorter operation time compared with LARVH (median: 180 minutes with LARVH versus 138 minutes with RAH, P value = 0.05)¹⁴. The advances in minimal access surgery have made it possible to perform radical hysterectomy with the use of laparoscopy with the aim of reducing the surgical morbidity and promoting a faster recovery¹⁵. Since 2016, the interest in the relationship among prognostic factor, preservation, neoadjuvant chemotherapy, human papilloma virus (HPV) infection and surgery have gradually increased, which means auxiliary methods has been put more emphasis on. HPV infection is closely associated with cervical cancer. Vaccination has shown the potential to reduce the risk of cervical cancer, and ultimately, making a lower cervical cancer patient number. Some researchers believed HPV vaccines, together with a growing arsenal of HPV-based screening tests, have the potential to radically change public health, would substantially impact on the reduction of the world cervical cancer burden^{16,17}. And patients' quality of life, surgical procedure guideline, and gynecologic surgical procedure have become the hot interests since 2019. Cervical cancer with a five-year survival rate of 60%¹⁸, many cervical cancer patients are young, socially and sexually active women whose QoL is at risk of being endangered by surgery treatment. A Romania research took translated standardized questionnaires, namely QLQ-C30 and QLQ-CX24 to assess their QoL after radical hysterectomy¹⁹. The questionnaires include functional scales, symptom scales, global health QoL scale and single items assessing symptoms²⁰. The survivors revealed a relatively good global score of QoL (64.6, median), the symptoms scales showed a relatively low level of side effects of cancer treatment. However, the analysis of some symptoms and sexual activity had a low score. This suggests that researchers are increasingly concerned about the quality of life of patients after surgery. How to improve surgical efficacy and reduce surgical trauma are also been more valued. In the era of COVID-19, some articles were major in gynecologic surgical considerations, indicating that it is necessary to have a pre-operative COVID-19 testing, a triage before the gynecologic surgical procedures, and an appropriate using of personal protective equipment (PPE) during the operation^{21,22}.

The USA made the great contribution in this field with 342 publications, followed by People's Republic of China, Italy, Germany, Japan, France, and South Korea. A large number of studies output from these countries may be attributed to the wide interest within this field in these countries' researchers and a stable financial investment. The USA and Germany nodes had purple trims, which means the United States' articles and Germany's had high betweenness centrality. Indicating the US and Germany had a more concentrated research direction. A gradually increased trend in the number of publications was also found, this may be associated with the growing economy of developing country, which lead to more financial support for scholars²³. The next step is to increase respect for knowledge, strengthen government functions and increase financial support for scientific research, thereby narrowing the gap between developing and developed countries in this field.

For the institutions analysis, the map contains 316 unique nodes, 516 lines, and 0.0104 density, which means that there is closer cooperation between the various institutions. The top five institutions are all in

developed country. Univ Texas MD Anderson Canc Ctr and Mem Sloan Kettering Canc Ctr are famous organizations where locate in US, Charles Univ Prague and Univ Cattolica Sacro Cuore are in Europe and Yonsei Univ in South Korea. Indicating that the developed countries play the most contribution in this field, and the influence of well-known research institutions and centers continues to increase. But the institutions' cooperation is largely confined to the countries where they locate in. It is therefore necessary to strengthen cross-border cooperation among institutions between different countries and to enhance the depth and breadth of communication.

Authors and co-cited authors analysis showed that Scambia G (17 papers), Leblanc E (14 papers), and Bogani G (11 papers) were the authors that published the most articles. Ramirez PT (155 co-citations), Querleu D (126 co-citations), and Dargent D (108 co-citations) were the top three co-cited authors. In one of the studies, Scambia G updated the related technologies, he proposed the application of sentinel lymph node (SLN) mapping with indocyanine green in cervical cancer patients undergoing open radical hysterectomy, indicating that it has high sensitivity and negative predictive value, comparable to minimally invasive SLN biopsy performance²⁴. Leblanc E reported a simple laparoscopic procedure to restore a normal vaginal length after colpohysterectomy for cervical and vaginal neoplasia²⁵. And Bogani G reported that laparoscopic approach resulted in a faster recovery of bladder function in comparison to open surgery for patients. Minimally invasive surgery improved short-term outcomes of nerve-sparing radical hysterectomy in patients with cervical cancer²⁶.

From the perspective of co-cited journals and co-cited references, the top three most co-cited journals are all in developed country. All of them are publications that major in topics relevant to diagnosis, and treatment of gynecologic malignancies. Gynecologic Oncology (715 times) and American Journal of Obstetrics and Gynecology (483 times) are in USA, International Journal of Gynecological Cancer (493 times) is in Europe. The top three most co-cited references are reported by Ramirez PT, Melamed A, and Querleu D, respectively. Ramirez PT focused to describe survival outcomes after laparoscopic or robot-assisted radical hysterectomy. His results showed that minimally invasive radical hysterectomy was associated with lower rates of disease-free survival and overall survival than open abdominal radical hysterectomy among women with early-stage cervical cancer²⁷. And Melamed A's research was major in survival after minimally invasive radical hysterectomy for early-stage cervical cancer, the results indicated that minimally invasive radical hysterectomy was associated with shorter overall survival than open surgery among women with stage IA2 or IB1 cervical carcinoma²⁸. Querleu D described four types of radical hysterectomy (A-D), A: minimum resection of paracervix, B: transection of paracervix at the ureter, C: transection of paracervix at junction with internal iliac vascular system, D: laterally extended resection²⁹. The research further pointed out that the classification is suitable to fertility-sparing surgery, and can be adapted to other surgery styles like open, vaginal, laparoscopic, or robotic surgery.

The articles enrolled in this study are based on WoSCC database, while some other articles only enrolled in Pubmed, Scopus or any other databases, which may lead to a not comprehensive article enrolled in

this study. Another shortcoming is that the results of this paper are finished by machine algorithm, which may have systemic bias in the program.

From 55 in 2006 to 110 in 2021, the number of publications in the field has been growing year by year. The United States and Europe remain the foremost contributors to this field, with well-known research centers, authoritative journals, and prestigious researchers. But the development of emerging countries does not be ignored. More national cooperation is necessary in the future, and more cooperation results are looked forward to.

Declarations

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

Kadierguli.Haibier and Reziwanguli.Wubuli designed the study. QZ, JX, CS and FD collected data. KL and JX analyzed the data. CS and FD drafted the manuscript. JX contributed to the interpretation of results and critical revision of the manuscript for important intellectual content. Reziwanguli.Wubuli approved the final version of the manuscript. All authors have read and approved the final manuscript.

References

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2018;68:394-424.
2. Curty G, de Carvalho PS, Soares MA. The Role of the Cervicovaginal Microbiome on the Genesis and as a Biomarker of Premalignant Cervical Intraepithelial Neoplasia and Invasive Cervical Cancer. *Int J Mol Sci* 2020;21.
3. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global Cancer Statistics, 2012. *Ca-Cancer J Clin* 2015;65:87-108.
4. Hanahan D, Weinberg RA. Hallmarks of Cancer: The Next Generation. *Cell* 2011;144:646-74.
5. Shi YY, Li L, Hu ZB, et al. A genome-wide association study identifies two new cervical cancer susceptibility loci at 4q12 and 17q12. *Nat Genet* 2013;45:918-U262.
6. Kanao H, Aoki Y, Takeshima N. Unexpected result of minimally invasive surgery for cervical cancer. *J Gynecol Oncol* 2018;29.

7. van der Plas RCJ, Bos AME, Jurgenliemk-Schulz IM, Gerestein CG, Zweemer RP. Fertility-sparing surgery and fertility preservation in cervical cancer: The desire for parenthood, reproductive and obstetric outcomes. *Gynecol Oncol* 2021;163:538-44.
8. Wallin E, Falconer H, Radestad AF. Sexual, bladder, bowel and ovarian function 1 year after robot-assisted radical hysterectomy for early-stage cervical cancer. *Acta Obstet Gyn Scan* 2019;98:1404-12.
9. Chen C. A Glimpse of the First Eight Months of the COVID-19 Literature on Microsoft Academic Graph: Themes, Citation Contexts, and Uncertainties. *Front Res Metr Anal* 2020;5:607286.
10. Chen C, Song M. Visualizing a field of research: A methodology of systematic scientometric reviews. *PLoS One* 2019;14:e0223994.
11. Luo H, Cai Z, Huang Y, et al. Study on Pain Catastrophizing From 2010 to 2020: A Bibliometric Analysis via CiteSpace. *Front Psychol* 2021;12:759347.
12. Chen CM. CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *J Am Soc Inf Sci Tec* 2006;57:359-77.
13. Xie P. Study of international anticancer research trends via co-word and document co-citation visualization analysis. *Scientometrics* 2015;105:611-22.
14. Naik R, Jackson KS, Lopes A, Cross P, Henry JA. Laparoscopic assisted radical vaginal hysterectomy versus radical abdominal hysterectomy—a randomised phase II trial: perioperative outcomes and surgicopathological measurements. *BJOG* 2010;117:746-51.
15. Chang WC, Lee LC, Huang SC, Sheu BC. Application of laparoscopic surgery in gynecological oncology. *J Formos Med Assoc* 2010;109:558-66.
16. Min KJ, Kwon SH, Kim S, et al. Preventive vaccination against cervical cancer: Korean Society of Gynecologic Oncology Guideline. *J Gynecol Oncol* 2016;27.
17. Serrano B, Alemany L, de Ruiz PA, et al. Potential impact of a 9-valent HPV vaccine in HPV-related cervical disease in 4 emerging countries (Brazil, Mexico, India and China). *Cancer Epidemiol* 2014;38:748-56.
18. Marth C, Landoni F, Mahner S, et al. Cervical cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2017;28:iv72-iv83.
19. Stanca M, Capilna DM, Trambitas C, Capilna ME. The Overall Quality of Life and Oncological Outcomes Following Radical Hysterectomy in Cervical Cancer Survivors Results from a Large Long-Term Single-Institution Study. *Cancers* 2022;14.
20. Greimel ER, Kuljanic Vlasic K, Waldenstrom AC, et al. The European Organization for Research and Treatment of Cancer (EORTC) Quality-of-Life questionnaire cervical cancer module: EORTC QLQ-CX24. *Cancer* 2006;107:1812-22.
21. Fader AN, Huh WK, Kesterson J, et al. When to Operate, Hesitate and Reintegrate: Society of Gynecologic Oncology Surgical Considerations During the COVID-19 Pandemic. *Obstet Gynecol Surv* 2021;76:88-90.

22. Wright JD, Advincula AP. Gynecologic surgical considerations in the era of COVID-19. *Semin Perinatol* 2020;44.
23. Chang HY, Chu W, Li XD, Ma J, Li DG, Yuan N. Analysis of the Status and Tendency of R&D Input in the Field of Rare Diseases Funded by the National Natural Science Foundation of China. *Front Public Health* 2021;9.
24. Bizzarri N, Anchora LP, Ferrandina G, et al. Sentinel lymph node mapping with indocyanine green in cervical cancer patients undergoing open radical hysterectomy: a single-institution series. *J Cancer Res Clin* 2021;147:649-59.
25. Leblanc E, Bresson L, Merlot B, et al. A Simple Laparoscopic Procedure to Restore a Normal Vaginal Length After Colpohysterectomy With Large Upper Colpectomy for Cervical and/or Vaginal Neoplasia. *J Minim Invas Gyn* 2016;23:120-5.
26. Bogani G, Rossetti D, Ditto A, et al. Minimally invasive surgery improves short-term outcomes of nerve-sparing radical hysterectomy in patients with cervical cancer: a propensity-matched analysis with open abdominal surgery. *J Gynecol Oncol* 2019;30.
27. Ramirez PT, Frumovitz M, Pareja R, et al. Minimally Invasive versus Abdominal Radical Hysterectomy for Cervical Cancer. *New Engl J Med* 2018;379:1895-904.
28. Melamed A, Margul DJ, Chen L, et al. Survival after Minimally Invasive Radical Hysterectomy for Early-Stage Cervical Cancer. *New Engl J Med* 2018;379:1905-14.
29. Querleu D, Morrow CP. Classification of radical hysterectomy. *Lancet Oncol* 2008;9:297-303.

Tables

Table 1
The top 10 co-cited journals of surgery in uterine cervical neoplasms research

Ranking	Count	Centrality	Journal
1st	715	0.01	Gynecologic Oncology
2nd	493	0.01	International Journal of Gynecological Cancer
3rd	483	0.02	American Journal of Obstetrics and Gynecology
4th	451	0.01	Obstetrics and Gynecology
5th	348	0	Cancer
6th	330	0.03	Annals of Surgical Oncology
7th	324	0.01	Journal of Clinical Oncology
8th	311	0.01	Annals of Surgery
9th	284	0.02	The New England Journal of Medicine
10th	281	0	Lancet

Table 2
The top 10 countries/regions of surgery in uterine cervical neoplasms research

Ranking	Count	Centrality	Country/Region
1st	342	0.29	USA
2nd	145	0	People's Republic of China
3rd	135	0.05	Italy
4th	124	0.24	Germany
5th	105	0	Japan
6th	96	0.08	France
7th	70	0.01	South Korea
8th	61	0.04	Spain
9th	46	0.08	England
10th	42	0.01	Brazil

Table 3
The top 10 most productive authors of surgery in uterine cervical neoplasms research

Ranking	Count	Centrality	Author
1st	17	0.01	Scambia G
2nd	14	0.01	Leblanc E
3rd	11	0	Bogani G
4th	11	0.04	Cibula D
5th	11	0.05	Querleu D
6th	11	0.01	Narducci F
7th	10	0.04	Fagotti A
8th	10	0	Ramirez PT
9th	8	0	Frumovitz M
10th	8	0.02	Raspagliesi F

Figures

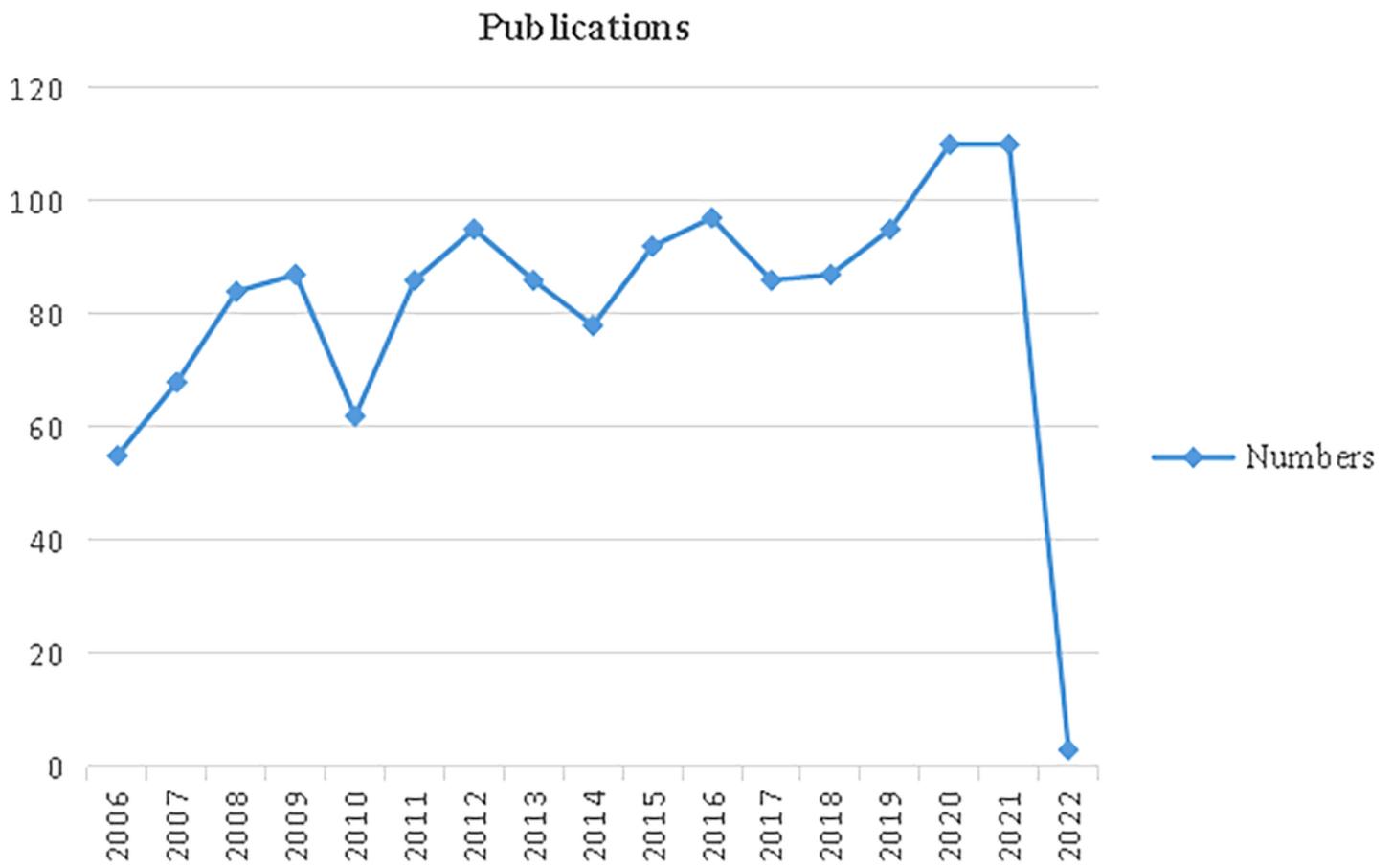


Figure 1

The number of publications from 2006 to 2022



CiteSpace, v. 5.8.R3 (64-bit)
 February 19, 2022 5:45:00 PM CST
 WoS: E:\xuxi
 Timespan: 2006-2022 (Slice Length=2)
 Selection Criteria: g-index (l=25), LRF=3.0, L/N=10, LBY=5, e=1.0
 Network: N=86, E=379 (Density=0.0831)
 Largest CC: 67 (69%)
 Nodes Labeled: 1.0%
 Pruning: None
 Modularity Q=0.8822
 Weighted Mean Silhouette S=0.5354
 Harmonic Mean(Q, S)=0.6664

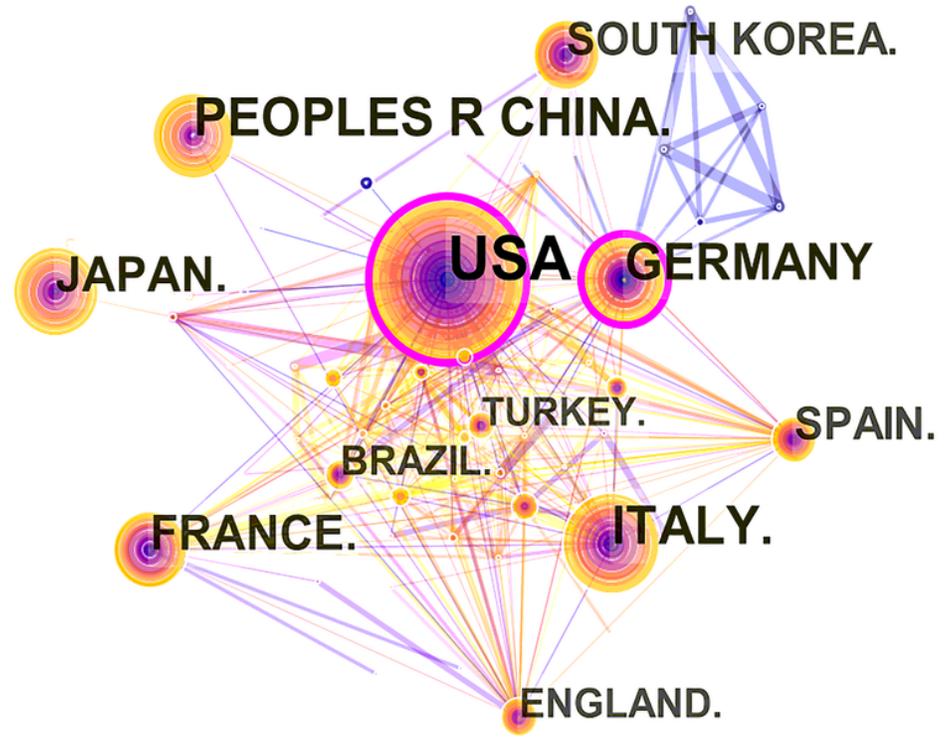


Figure 2

Countries in the field of surgery in uterine cervical neoplasms research

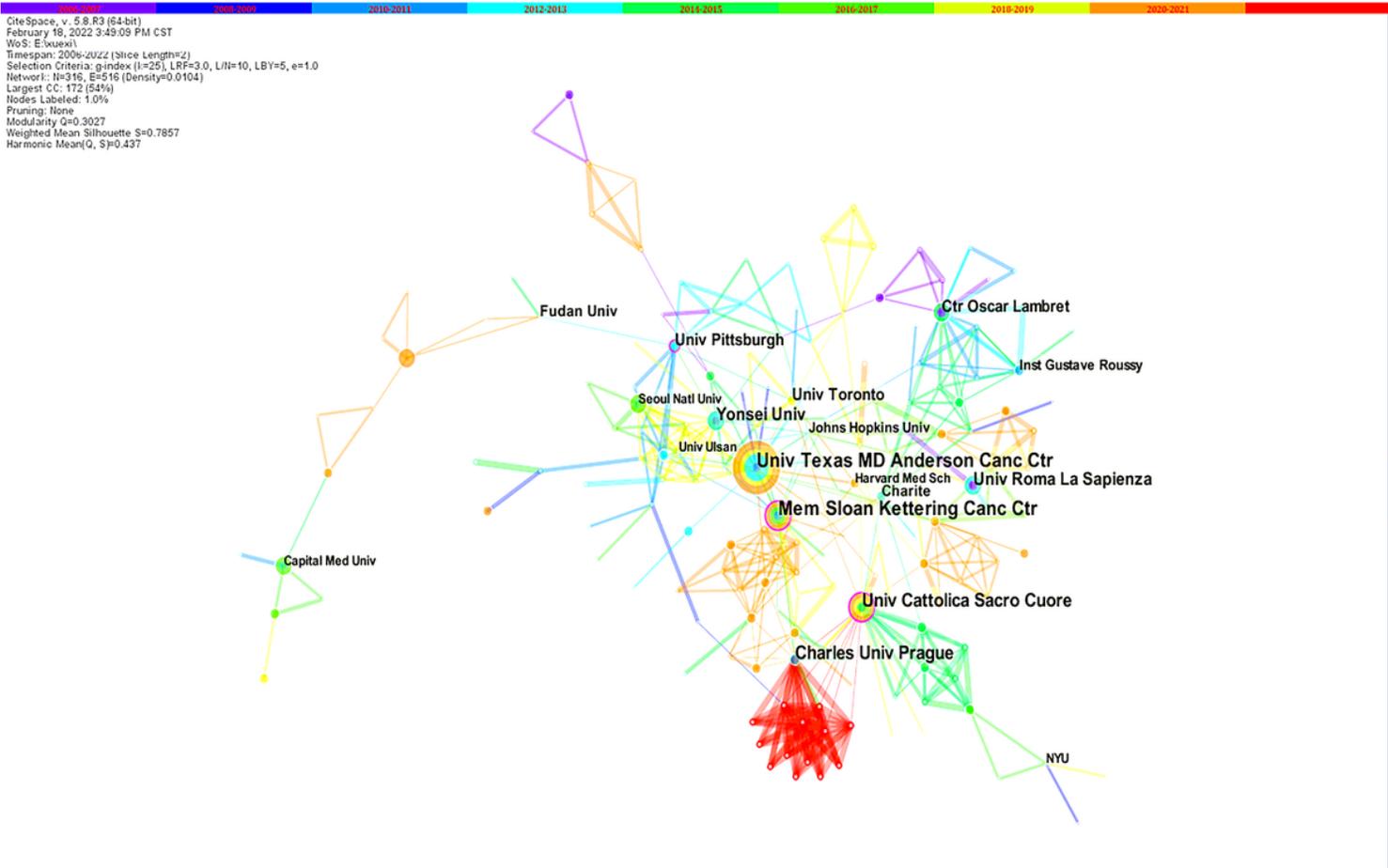
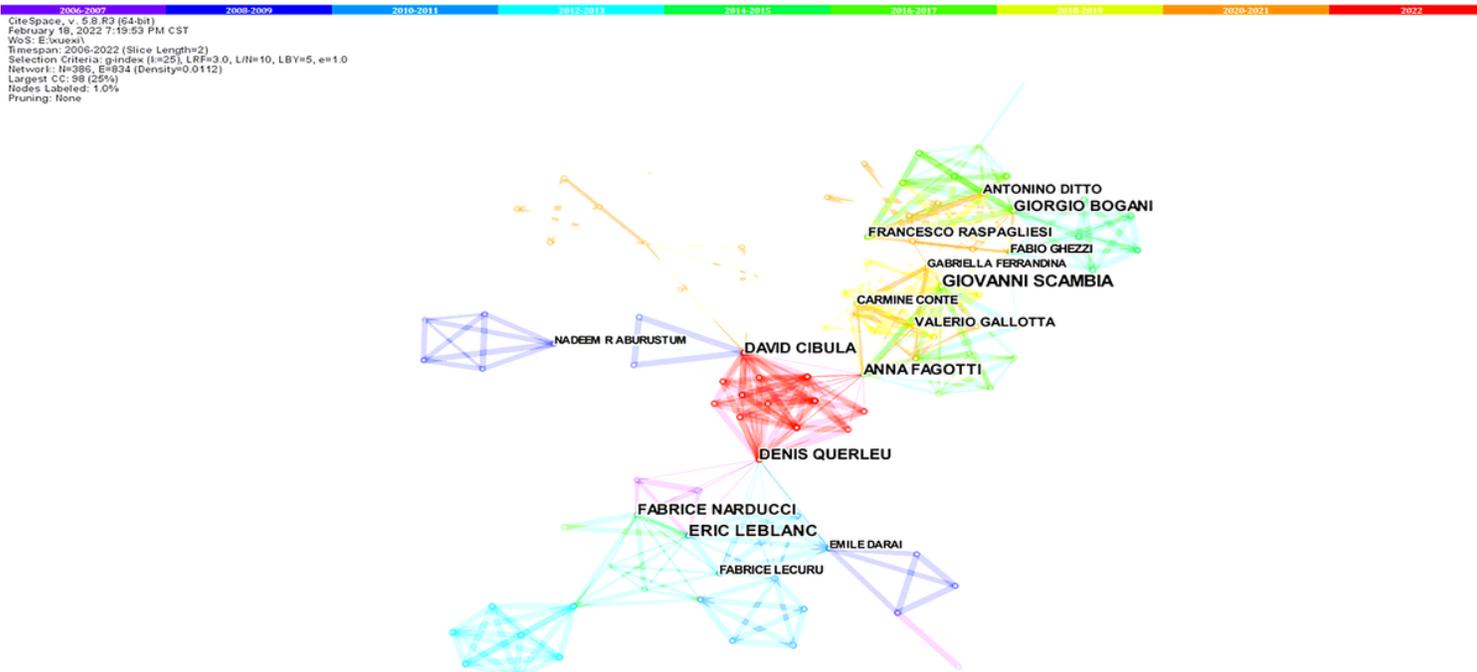


Figure 3

Institutions in the field of surgery in uterine cervical neoplasms research



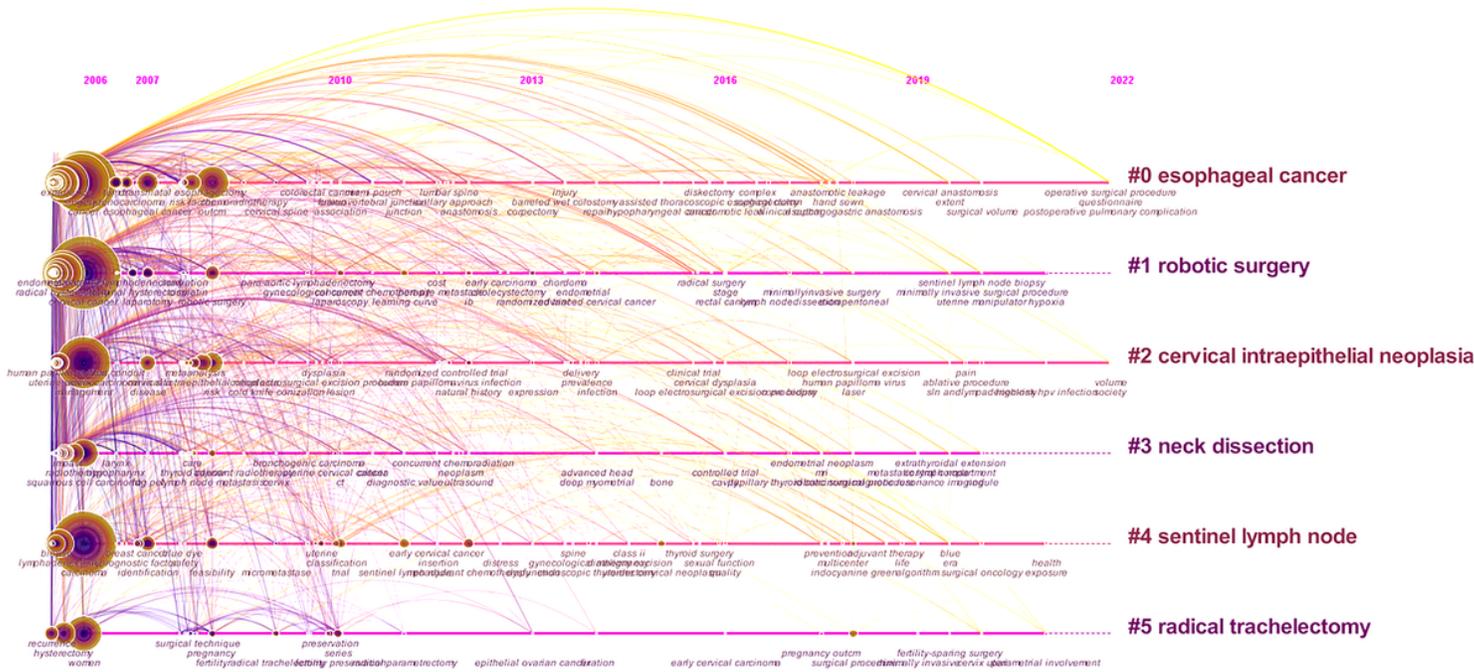


Figure 6

Timeline view of co-occurring keywords of surgery in uterine cervical neoplasms research

Top 15 References with the Strongest Citation Bursts

References	Year	Strength	Begin	End	2006 - 2022
Spirtos NM, 2002, AM J OBSTET GYNECOL, V187, P340, DOI 10.1067/mob.2002.123035, DOI	2002	7.74	2006	2007	█
Steed H, 2004, GYNECOL ONCOL, V93, P588, DOI 10.1016/j.ygyno.2004.04.003, DOI	2004	7.4	2006	2009	█
Pomel C, 2003, GYNECOL ONCOL, V91, P534, DOI 10.1016/j.ygyno.2003.08.035, DOI	2003	7.35	2006	2009	█
Hertel H, 2003, GYNECOL ONCOL, V90, P505, DOI 10.1016/S0090-8258(03)00378-0, DOI	2003	6.37	2006	2009	█
Abu-Rustum NR, 2003, GYNECOL ONCOL, V91, P402, DOI 10.1016/S0090-8258(03)00518-3, DOI	2003	6.37	2006	2009	█
Ramirez PT, 2006, GYNECOL ONCOL, V102, P252, DOI 10.1016/j.ygyno.2005.12.013, DOI	2006	6.33	2006	2011	█
Sonoda Y, 2003, GYNECOL ONCOL, V91, P326, DOI 10.1016/j.ygyno.2003.07.008, DOI	2003	5.51	2006	2007	█
Querleu D, 2008, LANCET ONCOL, V9, P297, DOI 10.1016/S1470-2045(08)70074-3, DOI	2008	8.03	2008	2013	█
Frumovitz M, 2007, OBSTET GYNECOL, V110, P96, DOI 10.1097/01.AOG.0000268798.75353.04, DOI	2007	5.64	2008	2013	█
Plante M, 2011, GYNECOL ONCOL, V121, P290, DOI 10.1016/j.ygyno.2010.12.345, DOI	2011	6.52	2012	2015	█
Jemal A, 2011, CA-CANCER J CLIN, V61, P134	2011	6.35	2012	2017	█
Haugen BR, 2016, THYROID, V26, P1, DOI 10.1089/thy.2015.0020, DOI	2016	7.99	2016	2021	█
Shazly SAM, 2015, GYNECOL ONCOL, V138, P457, DOI 10.1016/j.ygyno.2015.06.009, DOI	2015	7.25	2016	2021	█
Ramirez PT, 2018, NEW ENGL J MED, V379, P1895, DOI 10.1056/NEJMoa1806395, DOI	2018	23.77	2018	2022	█
Melamed A, 2018, NEW ENGL J MED, V379, P1905, DOI 10.1056/NEJMoa1804923, DOI	2018	12.48	2018	2022	█

Figure 7

The top 15 strongest citation bursts references in the co-citation references network