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Bibliometric Analysis of Comprehensive Geriatric Assessment from 2004 to 2023

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Background: The global aging population necessitates specialized tools for complex geriatric health issues. Comprehensive Geriatric Assessment (CGA) provides multidimensional evaluations of elderly, integrating inputs from various professionals to create individualized care plans. This study aims to visually assess the research trends and hotspots in the field of CGA, review mainstream perspectives in this field, and provide a foundation for future research and treatment.

Methods: Original and review articles related to comprehensive geriatric assessment, published from 2004 to December 2023, were extracted from the Web of Science database. Four different software tools—CiteSpace, VOSviewer, Bibliometrix R package, and the Online Analysis Platform of Bibliometrics—were utilized for this comprehensive analysis.

Results: According to our retrieval strategy, we found a total of 4,411 related literatures. There has been a substantial increase in the research on comprehensive geriatric assessment in the past 20 years. These publications have been cited 157,366 times, with a mean of 35.68 citations per publication. The largest number of publications were from the US, and Italy ranked second (14.98%). Keyword burst and concurrence showed that "randomized trial", "adjuvant chemotherapy" and "breast cancer" were the top 3 most frequently occurring keywords.

Conclusion: Our bibliometric analysis reveals significant growth in CGA research over the past two decades, with a shift from cancer-focused studies to chronic conditions like frailty and sarcopenia. These findings highlight evolving priorities in geriatric care and underscore the need for future research to integrate technological advancements, such as AI, to enhance the precision, scalability, and cost-effectiveness of CGA in diverse settings.

Keywords: comprehensive geriatric assessment, frailty, bibliometric analysis, CiteSpace, VOSviewer

Introduction

The global population is aging at an unprecedented rate, with the proportion of individuals aged 60 and older projected to double by 2050.[1] This demographic shift presents unique challenges for healthcare systems worldwide, as older adults are more susceptible to a variety of chronic diseases and complex health conditions. The heterogeneity and multifaceted nature of geriatric health issues necessitate specialized assessment tools that go beyond the scope of traditional medical evaluations.[2] Conditions such as frailty, polypharmacy, cognitive decline, and multi-morbidity are prevalent among the elderly, underscoring the need for a comprehensive approach to their assessment and management.[3]

Comprehensive Geriatric Assessment (CGA) emerges as a crucial tool designed to address the unique needs of the elderly population. Unlike conventional assessment methods that often focus on single-disease paradigms, CGA provides a multidimensional evaluation of an older adult's medical, psychological, and functional status.[4] It integrates inputs from various healthcare professionals, including geriatricians, nurses, social workers, and therapists, to create a coordinated

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and individualized care plan.[5] This holistic approach has been shown to improve clinical outcomes, enhance quality of life, and reduce hospital admissions and institutionalization rates.[6] In recent years, research on CGA has expanded significantly, reflecting its potential to transform geriatric care.[7–9] Bibliometric analysis provides a unique lens through which the evolution of CGA research can be examined. By quantifying publication trends, citation patterns, and collaborative networks, bibliometric studies uncover key developments, emerging research hotspots, and shifts in scientific focus over time.[10] In the context of CGA, this method offers insights into how research priorities have transitioned. In addition to mapping historical trends, bibliometric analysis facilitates the identification of research gaps and underexplored areas, guiding future investigations.[11] Moreover, these analyses provide actionable evidence for policymakers and healthcare providers, supporting the development of targeted strategies to overcome barriers to CGA utilization and ensuring its integration into diverse healthcare settings.[12]

Our study aims to provide a comprehensive bibliometric analysis of CGA research from 2004 to 2023. By utilizing tools such as CiteSpace, VOSviewer, and Bibliometrix R package, we aim to uncover research trends, evaluate scholarly impact, and highlight key areas of focus. Specifically, we examine how bibliometric metrics—such as citation analysis, keyword trends, and collaboration networks—enhance our understanding of CGA's development and inform strategies to expand its adoption. Through this lens, the study offers actionable insights for clinicians, policymakers, and researchers to foster advancements in geriatric care strategies.

Materials and Methods

Data Sources

In this research, the primary publications from January 2004 to December 2023 were retrieved from the SCI-expanded database within the Web of Science Core Collection on June 30, 2024. To avoid bias, the search was conducted and concluded on the same day. We searched the database with the following search strategy: TS = comprehensive geriatric assessment. Only articles and reviews were included in the analysis, with conference papers, editorial materials, and conference abstracts explicitly excluded. Additionally, only papers published in English were considered. Detailed search methods are illustrated in Figure 1.

Data Collection

The initial raw data were extracted from the Web of Science SCI-expanded database. After the first search, all papers were screened and checked separately by 2 researchers (FZ and YJX) independently to ensure that all the papers used were relevant to the study topic. The screening process involved assessing relevance by reviewing the abstracts and, when necessary, skimming the full text of each paper They compared their findings and reached a consensus. Information on countries, institutions, journals, authors, year of publication, keywords and references were then analyzed.

Statistical Analysis

Microsoft Excel 2019 and the Online Analysis Platform of Bibliometrics (http://bibliometric.com/) were employed to examine article counts, total citations, average citations per article, countries, institutions, journal sources, and impact factor (IF). We then imported the data into CiteSpace, with time slices from 2004 to 2023, each slice being six years. Keyword cluster analysis, keyword timeline analysis and keyword burst analysis are performed by Citespace. The specific parameter settings of CiteSpace included that time-slicing was from 2004 to 2023 and six year per slice, selection criteria [g-index (k = 25), pathfinder was selected]. VOSviewer (version 1.6.18) was utilized for identifying countries, institutions, and keywords, constructing visual networks, and adding various graphical representations in bibliometric maps. Additionally, the distribution and frequency analysis of the collaboration between institutions and authors was done by VOSviewer (version 6.1.R3), thereby providing a comprehensive analysis of trends and main ideas. R (version 4.2.0) served as the programming language and environment for statistical computing and graphics. The Bibliometrix package in R further illustrated changes in the annual document output,[13] and the keywords extracted from the included literature were grouped into different clusters according to the results of the co-occurrence analysis, by Biblioshiny (4.1.4) package.

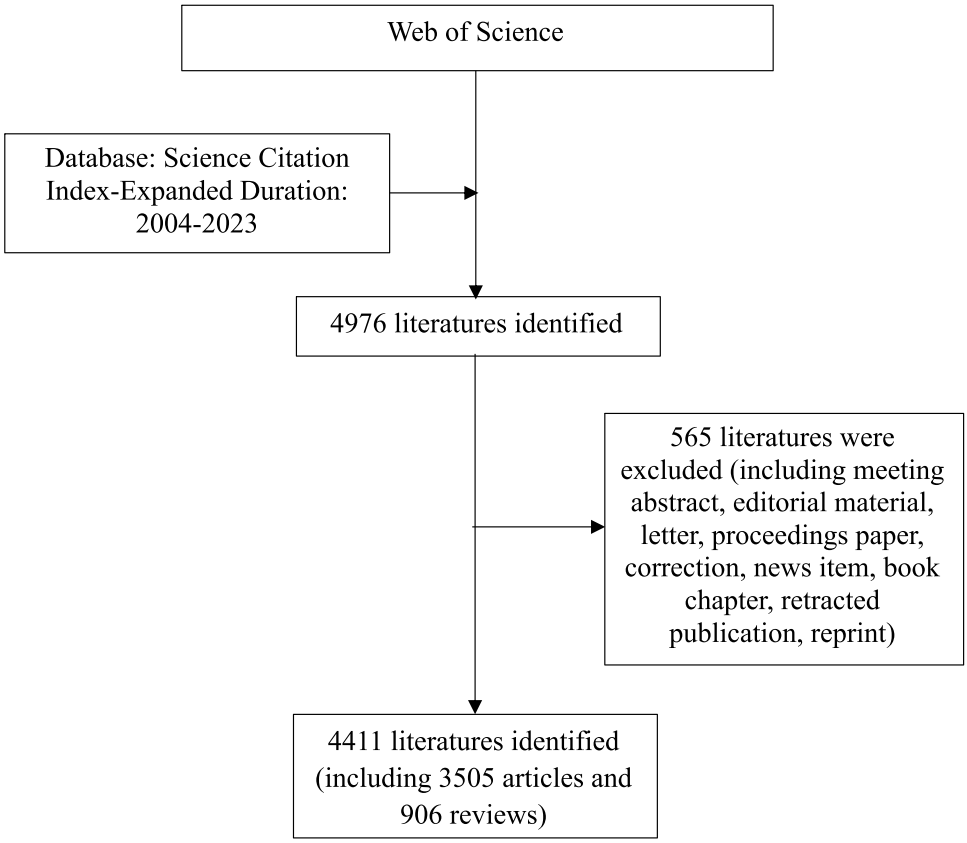

Figure 1 Flow chart of literature filtering.

Results

An Overview of Publications

A total of 4,411 publications were extracted from the Web of Science. Based on the inclusion criteria, all the publications related to comprehensive geriatric assessment were extracted from the Web of Science. The total number of citations was 157,366 (138,312 without self-citation), and the average citing frequency was 35.68 times per article. The H-index of all the publications related to comprehensive geriatric assessment was 152.

The Annual Publications of Comprehensive Geriatric Assessment

Figure 2 showed that the number of research articles on comprehensive geriatric assessment increased from 2004 to 2023. Between 2004 and 2022, the annual number of publications steadily increased, rising from 46 in 2004 to 415 in 2022, with a peak observed in 2022. This growth may be attributed to the rapid advancements in professional theories within the field, reflecting the increasing attention and interest in comprehensive geriatric assessment among researchers worldwide.

The Contributions and Collaborations of Countries and Institutions

In the past 20 years, the United States has made the most significant contribution to the study of comprehensive geriatric assessment, followed by Italy, UK, France, etc. (Figure 3).

The analysis of international collaboration indicates that the United States had the highest frequency of cooperation with other nations. Although Italy was second in the number of published articles, its primary collaborators were Spain and Germany, rather than the United States (Figure 4). In terms of research institutions, the top 10 were as follows (Table 1): UNIV TORONTO (243), SEOUL NATL UNIV (189), UNIV QUEENSLAND (151), DALHOUSIE UNIV (139), KATHOLIEKE UNIV LEUVEN (139), MEM SLOAN KETTERING CANC CTR (130), UNIV N CAROLINA

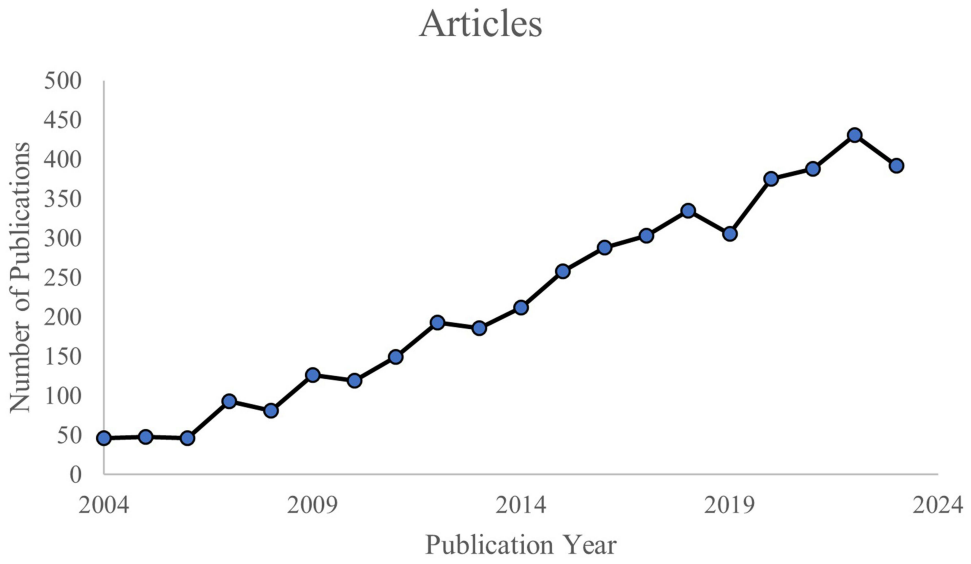

Figure 2 The number of annual publications.

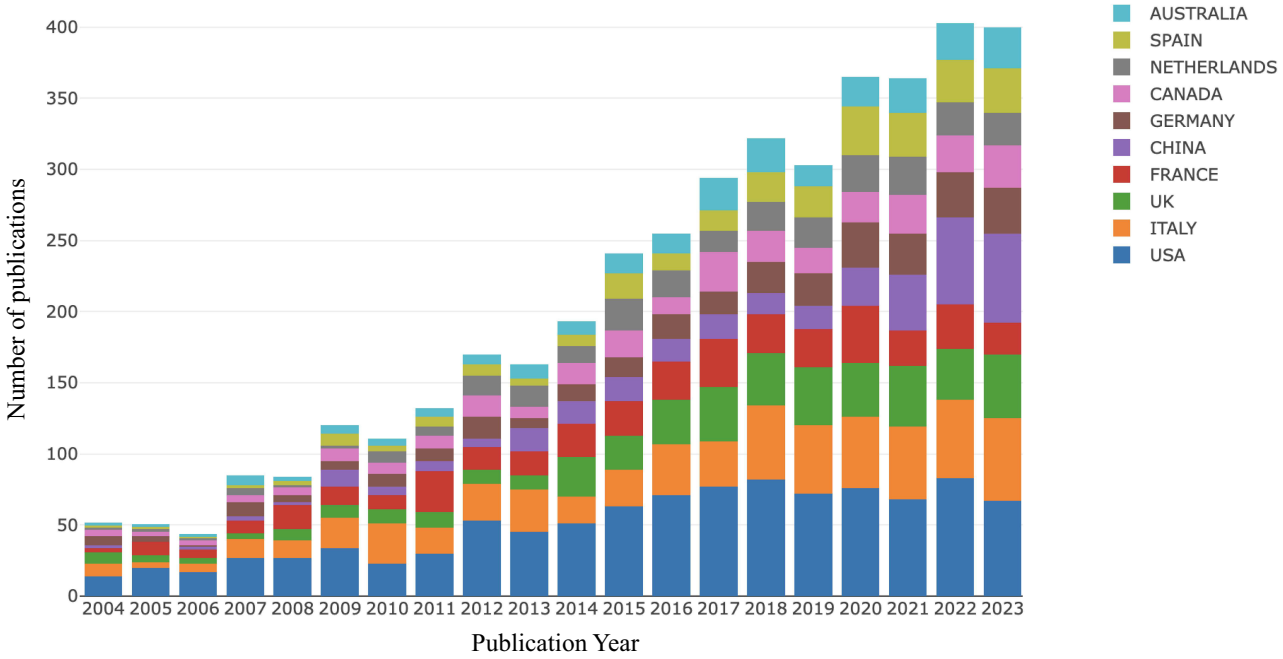

Figure 3 Growth trends of the top 10 countries (Conducted by online analysis platform of Bibliometrics).

(128), UNIV ROCHESTER (120), DUKE UNIV (117), and CAPITAL MED UNIV (116). The cooperation network depicted in Figure 5 shows that UNIV QUEENSLAND and CAPITAL MED UNIV collaborated frequently, while MEM SLOAN KETTERING CANC CTR often worked with CITY HOPE COMPREHENS CAN CTR.

Research Productivity by Journals and Authors

Over the past 20 years, 200 journals have published research in the field of comprehensive geriatric assessment. Among the 4411 articles analyzed, the top 10 journals accounted for 1197 publications (27.14%) (Table 2). The top three journals in terms of publication volume are JOURNAL OF GERIATRIC ONCOLOGY (IF=3.0), BMC GERIATRICS (IF=3.4),

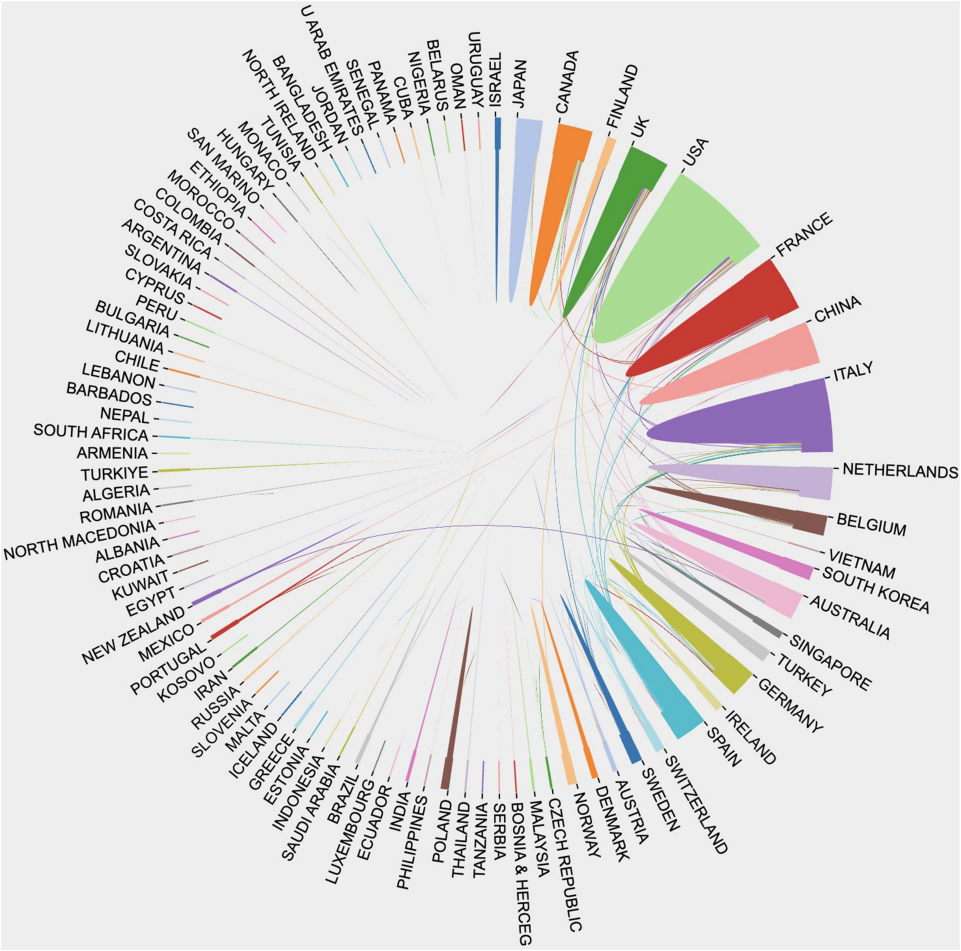

Figure 4 The distribution of countries/regions. Cooperative relations among countries/regions (The area represents the number of articles, and the connection represents the cooperative relationship. Conducted by online analysis platform of Bibliometrics).

Table 1 |The Top 10 Countries/Regions and Institutions Contributing to Publications in Comprehensive Geriatric Assessment Research (Sorted by Count)

Rank	Country	Article counts	Percentage	Institutions	Article counts	Percentage
1	USA	1012	25.02%	UNIV TORONTO	243	16.51%
2	ITALY	606	14.98%	SEOUL NATL UNIV	189	12.84%
3	FRANCE	411	10.16%	UNIV QUEENSLAND	151	10.26%
4	ENGLAND	409	10.11%	DALHOUSIE UNIV	139	9.44%
5	GERMANY	305	7.54%	KATHOLIEKE UNIV LEUVEN	139	9.44%
6	CANADA	291	7.19%	MEM SLOAN KETTERING CANC CTR	130	8.83%
7	NETHERLANDS	267	6.60%	UNIV N CAROLINA	128	8.70%
8	SPAIN	265	6.55%	UNIV ROCHESTER	120	8.15%
9	AUSTRALIA	246	6.08%	DUKE UNIV	117	7.95%
10	CHINA	233	5.76%	CAPITAL MED UNIV	116	7.88%

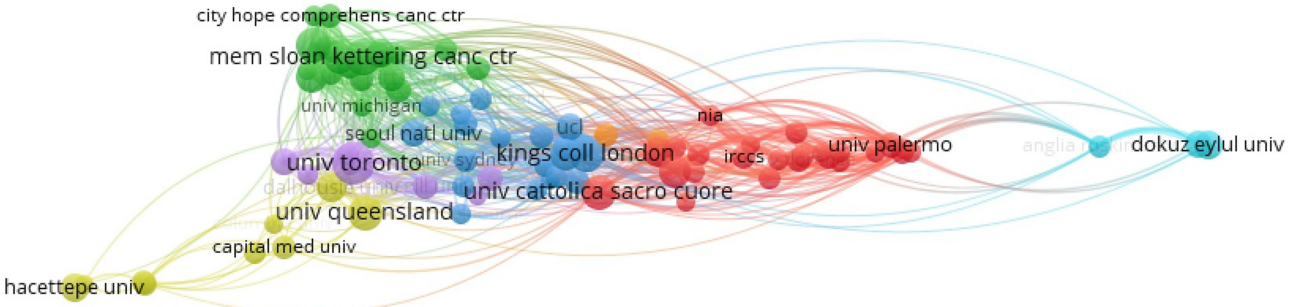

Figure 5 The distribution of institutions. Cooperative relations among institutions (The area represents the number of articles, and the connection represents the cooperative relationship. Conducted by VOSviewer).

Table 2 | the Top 10 Most Active Journals Published Articles in Comprehensive Geriatric Assessment Research (Sorted by Count)

Rank	Journal title	Article counts	Percentage	Total number of citation	Average number of citations	IF	JCR
1	JOURNAL OF GERIATRIC ONCOLOGY	257	21.47%	1241	4.83	3.0	Q2
2	BMC GERIATRICS	162	13.53%	426	2.63	3.4	Q2
3	JOURNAL OF THE AMERICAN GERIATRICS SOCIETY	121	10.11%	823	6.80	4.3	Q1
4	AGING CLINICAL AND EXPERIMENTAL RESEARCH	115	9.61%	369	3.21	3.4	Q2
5	EUROPEAN GERIATRIC MEDICINE	115	9.61%	144	1.25	3.5	Q2
6	AGE AND AGEING	91	7.60%	986	10.84	6.0	Q1
7	ARCHIVES OF GERONTOLOGY AND GERIATRICS	89	7.44%	322	3.62	3.5	Q2
8	JOURNAL OF THE AMERICAN MEDICAL DIRECTORS ASSOCIATION	85	7.10%	397	4.67	4.2	Q2
9	JOURNAL OF NUTRITION HEALTH & AGING	84	7.02%	478	5.69	4.3	Q1
10	GERIATRICS & GERONTOLOGY INTERNATIONAL	78	6.52%	172	2.21	2.4	Q2

and JOURNAL OF THE AMERICAN GERIATRICS SOCIETY (IF=4.3). According to the 2023 Journal Citation Reports (JCR), these three journals are classified in the Q1/Q2 quartiles.

The Contributions of Authors to Comprehensive Geriatric Assessment

The top 10 authors, ranked by the number of published articles, are listed in Table 3. Among them, *Pilotto Alberto* from Università degli Studi di Bari Aldo Moro holds the top position. This indicates that *Pilotto Alberto* has made significant contributions to geriatric research, with achievements spanning meta-analyses and multicenter clinical studies, including randomized controlled trials. Figure 6 illustrates clusters of collaborating authors. For instance, *Pilotto Alberto* closely collaborated with *Panza Francesco* and *Siri Giacomo*, while *Isik Ahmet Turan* frequently worked with *Bulut Esra Ates*.

Co-Cited Documents and Journal

To identify the most influential papers in this field from 2004 to December 2023, we shortlisted the top 10 publications with the highest citation counts. These publications are listed in Table 4, including the title, first author, journal, publication year, total citations, JCR, and impact factor (IF). The work by Cruz-Jentoft AJ et al ranked first, with the

Table 3 | the Top 10 Most Productive Authors and Corresponding Authors Contributed to Publications in Comprehensive Geriatric Assessment Research

Rank	Author	Article counts	Total citations	Average number of citations	Corresponding author number	Corresponding article citation counts
1	Pilotto, A	99	1364	13.78	39	763
2	Isik, AT	49	193	3.94	39	137
3	Soysal, P	47	191	4.06	20	67
4	Veronese, N	47	373	7.94	23	73
5	Rockwood, K	40	1083	27.07	22	552
6	Hurria, A	39	908	23.28	11	184
7	Cankurtaran, M	38	27	0.71	3	0
8	Maggi, S	35	273	7.8	1	0
9	Mohile, SG	34	457	13.44	10	144
10	Paillaud, E	32	429	13.41	4	199

highest number of citations (8210). This paper, published on AGE AND AGEING, mainly focused on practical clinical definition and consensus diagnostic criteria for age-related sarcopenia.[14] The paper "Frailty in elderly people", ranked second, which mainly talked about efficient methods to detect frailty and measure its severity in routine clinical practice.[15] The paper by Ngandu, T et al, "A 2-year multidomain intervention of diet, exercise, cognitive training, and

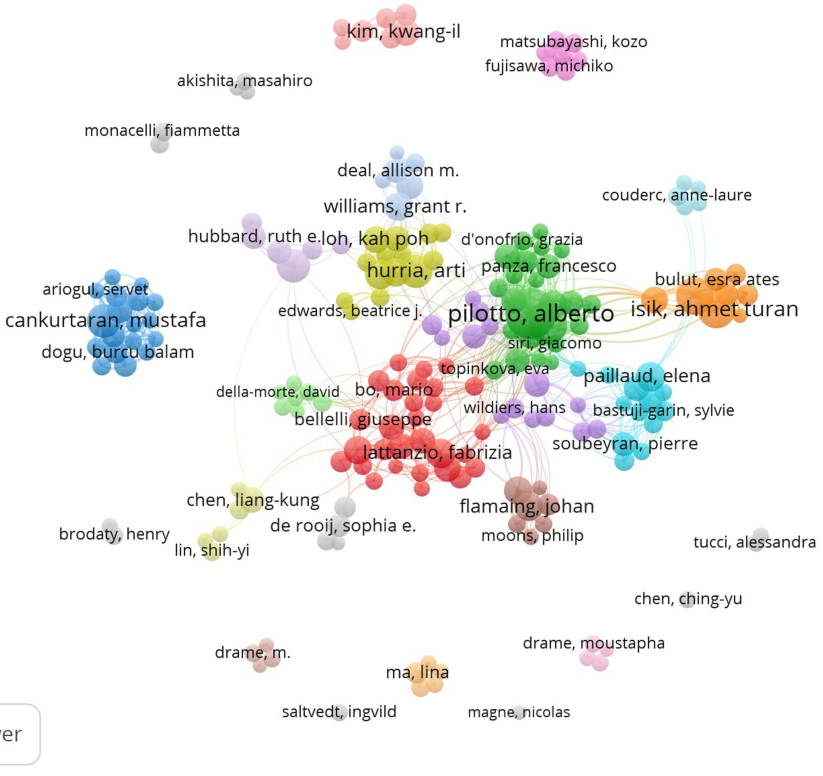

Figure 6 Cooperation map of authors in the studies of comprehensive geriatric assessment. Different colors represent different institutions that cooperate closely, the size of the circle is proportional to the total number of articles in that institution, and the distance between two institutions is inversely proportional to the degree of cooperation between them.

Table 4 | the Top 10 high-Cited Papers in Comprehensive Geriatric Assessment Research from 2004 to 2023

Rank	Title	First Author	Journal	Publication Year	Total citations	JCR	IF
1	Sarcopenia: European consensus on definition and diagnosis[14]	Cruz-Jentoft, AJ	AGE AND AGEING	2010	8210	Q1	6.0
2	Frailty in elderly people[15]	Clegg, A	LANCET	2013	3979	Q1	98.4
3	A 2-year multidomain intervention of diet, exercise, cognitive training, and vascular risk monitoring versus control to prevent cognitive decline in at-risk elderly people (FINGER): a randomised controlled trial[16]	Ngandu, T	LANCET	2015	1972	Q1	98.4
4	Frailty in relation to the accumulation of deficits[17]	Rockwood, K	JOURNALS OF GERONTOLOGY SERIES A-BIOLOGICAL SCIENCES AND MEDICAL SCIENCES	2007	1754	Q2	4.3
5	Metastatic non-small-cell lung cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up[18]	Novello, S	ANNALS OF ONCOLOGY	2016	1538	Q1	56.38
6	Updated Standardized Endpoint Definitions for Transcatheter Aortic Valve Implantation The Valve Academic Research Consortium-2 Consensus Document[19]	Kappetein, AP	JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY	2012	1490	Q1	21.7
7	Defeating Alzheimer's disease and other dementias: a priority for European science and society[20]	Winblad, B	LANCET NEUROLOGY	2016	1081	Q1	46.5
8	The Mini Nutritional Assessment (MNA®) review of the literature -: What does it tell us?[21]	Guigoz, Y	JOURNAL OF NUTRITION HEALTH & AGING	2006	853	Q1	4.3
9	Presbycusis[22]	Gates, GA	LANCET	2005	845	Q1	98.4
10	Use of comprehensive geriatric assessment in older cancer patients: Recommendations from the task force on CGA of the International Society of Geriatric Oncology (SIOG)[23]	Extermann, M	CRITICAL REVIEWS IN ONCOLOGY HEMATOLOGY	2005	832	Q1	5.5

vascular risk monitoring versus control to prevent cognitive decline in at-risk elderly people (FINGER): a randomised controlled trial", ranked the third.[16]

Keyword Co-Occurrence, Clusters, and Burst

In Figure 7, a blue line represents the timeline. The red segments on this line indicate burst detections, showing the start year, end year, and duration of each burst. Our goal was to identify keywords of research significance to reflect the evolutionary trends in this field. "Randomized trial" exhibited the strongest burst strength, followed by "adjuvant chemotherapy", and "breast cancer". While initial research heavily emphasized cancer, chemotherapy, and clinical trials, the past few years have seen a significant shift towards frailty and sarcopenia as key areas of interest. This transition aligns with the growing recognition of these chronic conditions as central to the health and functional outcomes of older adults.

Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2004 - 2023
randomized trial	2004	15.88	2004	2013	
adjuvant chemotherapy	2004	14.41	2004	2011	
breast cancer	2004	12.8	2004	2011	
alzheimers disease	2004	11.38	2004	2007	
controlled trial	2006	10.49	2006	2015	
women	2007	10.21	2007	2015	
task force	2011	12.02	2011	2017	
frailty	2008	15.19	2020	2023	
sarcopenia	2020	14.58	2020	2023	
consensus	2020	14.24	2020	2023	

Figure 7 Top 10 keywords with the strongest citation bursts in the studies of comprehensive geriatric assessment.

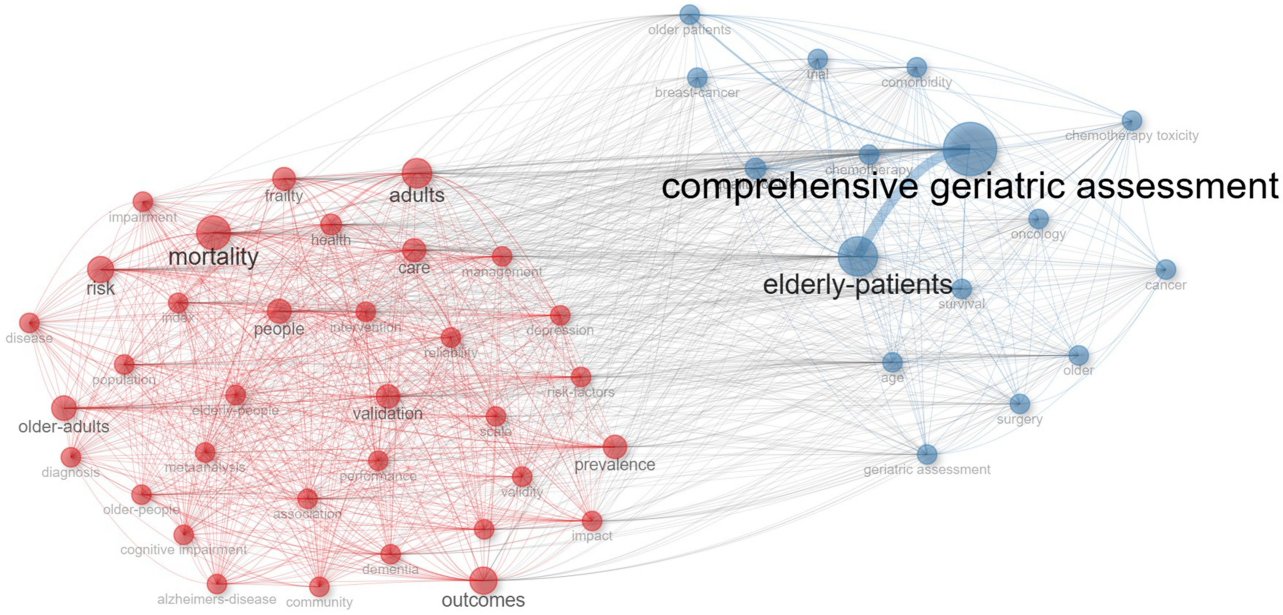

Figure 8 Analysis of keywords.

Our keyword analysis revealed that “frailty” and “sarcopenia” have emerged as dominant terms since 2020, representing a paradigm shift in geriatric care priorities. Unlike earlier studies that primarily relied on clinical observations, this bibliometric approach quantitatively validates the expanding prominence of frailty and sarcopenia in the academic discourse. For instance, recent highly cited studies explore not only the prevalence and impact of frailty but also its integration into predictive models for adverse outcomes in aging populations. Similarly, sarcopenia research has advanced beyond basic definitions to include interventions targeting muscle preservation and functional improvement.

As illustrated in Figure 8, “comprehensive geriatric assessment”, “mortality”, and “frailty” were the most frequently occurring keywords, divided into two clusters. The first cluster (blue circles) focused primarily on elderly patients, surgery, and chemotherapy within comprehensive geriatric assessment research. The second cluster (red circles) concentrated on risks, outcomes, and mortality in older adults.

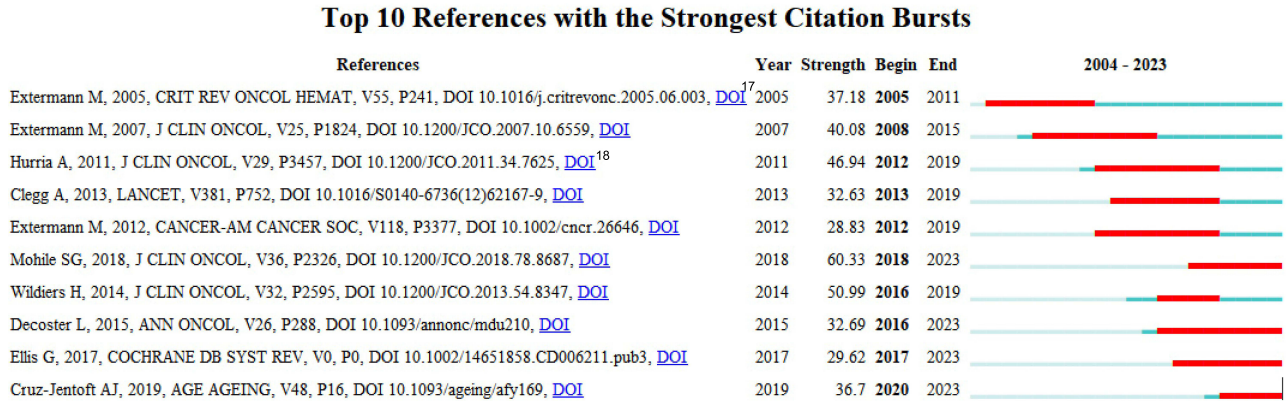

Figure 9 Top 10 most cited references with strong citation burstiness (MD = 6). The red bars mean some references are cited frequently; the blue bars represent references cited infrequently.

References with the Strongest Citation Bursts

We used CiteSpace to investigate citation burstness, shown in Figure 9, highlighting references that experienced a surge in citations from scholars during specific periods. Figure 9 shows the top 10 most cited references, with a minimum outbreak duration of 4 years. The red line segments indicate the start and end years of each citation burst, reflecting periods of heightened academic interest.

Among the top 10 references, the strongest burstiness was caused by the paper, "Use of comprehensive geriatric assessment in older cancer patients:: Recommendations from the task force on CGA of the International Society of Geriatric Oncology (SIOG)", authored by Martine Extermann et al with citation burstiness from 2011 to 2023.[23] This was followed by the paper, "Comprehensive Geriatric Assessment for Older Patients With Cancer" published in the journal Journal of Clinical Oncology by Martine Extermann et al. Besides, the research titled "Predicting Chemotherapy Toxicity in Older Adults With Cancer: A Prospective Multicenter Study"[24] published in 2011 emerged third. In this article, the author discovered that a risk stratification schema can determine the likelihood of chemotherapy toxicity in older adults. Variables from the geriatric assessment independently predicted this risk.

Discussion

This bibliometric analysis provides a comprehensive overview of global research on CGA over the past two decades. By quantitatively analyzing trends, collaborations, and research hotspots, the study elucidates both the evolution of CGA research and its alignment with broader clinical priorities.

Hotspots and Frontiers

A notable finding is the recent shift in CGA research focus from cancer and chemotherapy to chronic conditions such as frailty and sarcopenia. While this shift reflects well-documented clinical realities, our bibliometric approach adds value by quantitatively confirming these trends and mapping their development over time. For example, the keyword analysis highlights the rising prominence of frailty and sarcopenia as key terms, underscoring their role as both research priorities and practical challenges in geriatric care.

This study also identifies gaps in existing literature. Although frailty and sarcopenia are increasingly studied, many of the cited works focus on risk factors and descriptive analyses rather than actionable strategies for integration into CGA frameworks. For instance, the comparative effectiveness of interventions targeting sarcopenia, such as resistance training or nutritional supplementation, remain uncertain in large-scale systematic reviews.[25] Future studies should focus on incorporating predictive models for frailty and sarcopenia into CGA workflows, utilizing advancements in big data analytics and artificial intelligence (AI). Machine learning algorithms can process large, multidimensional datasets to enhance the precision of frailty and sarcopenia assessments,[26] identifying subtle patterns that might otherwise be

overlooked. This approach would enable the development of individualized intervention strategies by tailoring recommendations to each patient's unique clinical profile. By integrating these technologies, CGA can evolve into a more dynamic and adaptive framework, optimizing intervention selection and improving outcomes through precise, data-driven personalization. Moreover, the development of targeted therapies for sarcopenia, such as resistance training, nutritional supplementation, and pharmacological agents, alongside multi-dimensional approaches to frailty, will enhance the clinical utility of CGA.[27] Current research, however, remains disproportionately focused on Western cohorts,[28] emphasizing the need to expand investigations into diverse populations, particularly in underrepresented regions like Asia, Africa, and Latin America. Cultural, genetic, and socioeconomic variations must be considered to create context-specific CGA models.

CGA plays a pivotal role in the effective management of elderly patients, particularly those with complex health needs. Utilizing formal assessment tools and streamlined methodologies can significantly alleviate the burden on clinicians initiating CGA.[29] For instance, implementing pre-visit questionnaires administered through secure electronic health record portals offers a systematic approach to gathering extensive patient data.[30] These questionnaires encompass a broad spectrum of health domains, ranging from medical history and functional abilities to psychosocial aspects and advanced care planning preferences, including the completion of legal health directives such as Physician Orders for Life-Sustaining Treatment.[31]

Moreover, the structured nature of these questionnaires not only facilitates the collection of pertinent information but also enhances efficiency by allowing office staff to administer initial screening instruments.[32] This approach not only saves clinician time but also ensures that assessments focus on critical areas requiring further evaluation. By systematically addressing functional status, fall history, continence issues, pain management needs, social support availability, and mental health concerns like depression, CGA can tailor interventions to mitigate specific disabilities and enhance overall patient well-being.[33]

CGA has advanced as a cornerstone of geriatric care, integrating multidimensional evaluations to address frailty, sarcopenia, and cognitive decline.[15,16] Landmark developments, such as the revised European guidelines for sarcopenia (EWGSOP2), emphasize standardized diagnostic criteria and practical interventions, which are pivotal for incorporating sarcopenia management into CGA.[14] Similarly, frailty frameworks like the phenotype and cumulative deficit models provide theoretical underpinnings that enhance CGA's predictive capabilities and clinical utility.[15] However, barriers to implementation persist, particularly in primary care and community settings, where resource constraints hinder the broad adoption of CGA protocols. Trials like FINGER demonstrate the potential of multidomain interventions (diet, exercise, cognitive training) to prevent decline in at-risk populations, highlighting the need for scalable CGA models that integrate these approaches.[16] Just as previously stated, future research must prioritize AI-driven solutions and tailored strategies to adapt CGA for diverse populations while exploring its long-term impact on functional and cognitive health outcomes.

Insights from Policies and Economics

From a policy perspective, the successful integration of frailty and sarcopenia into CGA necessitates supportive frameworks at multiple levels. Governments and healthcare organizations must establish standardized guidelines for CGA implementation, with a focus on early screening and management of these conditions.[34] Policy reforms that incentivize CGA adoption through reimbursement mechanisms will be crucial, as they can demonstrate its cost-effectiveness in reducing hospitalizations and long-term care expenditures.[35] At the same time, targeted investments in education and training programs will empower healthcare professionals to apply CGA effectively across various settings. Social awareness is equally important; public campaigns can educate older adults and their caregivers on the importance of proactive health assessments, encouraging earlier engagement with CGA.[36] Collaborations with community organizations can further expand CGA's reach, especially in underserved areas where access to specialized geriatric care remains limited.

The standardized implementation of CGA offers significant economic benefits, but its long-term cost-effectiveness requires rigorous evaluation through gerontoeconomic research. Ekerstad et al evaluated the cost-effectiveness of acute care in a cohort of 408 participants, including 206 individuals receiving intervention. Their analysis encompassed

expenses related to hospital services, primary care, and municipal healthcare. The findings indicated that managing acutely frail older adults in units dedicated to CGA could be a cost-efficient approach.[37] More future studies should assess the financial advantages of reducing acute care episodes, hospitalizations, and long-term care dependency while improving functional independence and quality of life for older adults. Equitable access must also be prioritized by directing resources to underserved regions to address disparities limiting its widespread adoption. On the other hand, integrating AI and digital health technologies, such as wearable devices and telemedicine platforms, into CGA workflows can enhance precision, streamline assessments, and enable predictive modeling for frailty and sarcopenia.[38] These advancements allow for targeted, cost-effective interventions and continuous monitoring, significantly reducing resource burdens on healthcare systems. As aging populations increase pressure on global healthcare infrastructure, adopting AI-driven CGA solutions is essential for achieving economic sustainability and optimizing outcomes.

Citation Burst Analysis

The analysis of the top 10 references (Figure 9) indicates a notable shift in scholarly focus over the past twenty years from cancers to chronic diseases such as frailty and Alzheimer's disease. According to WHO guidelines, frailty, Alzheimer's disease, and sarcopenia are now prominent health challenges among the elderly, with their prevalence exceeding that of cancer in this demographic.[39–42] Frailty, marked by diminished physiological reserves and increased vulnerability to stressors, leads to adverse health outcomes including falls and functional decline.[43] Alzheimer's disease, a progressive neurodegenerative disorder, causes cognitive impairment and behavioral changes, significantly reducing independence and quality of life.[44] Additionally, sarcopenia, characterized by the loss of muscle mass and strength with aging, further contributes to physical frailty and functional deterioration in older adults.[45]

Recent research trends have shifted focus from cancer to frailty and Alzheimer's disease, particularly in older age groups. This demographic shift underscores the urgent need for research and interventions targeting these conditions to improve outcomes and quality of life for aging populations. Efforts to better understand the pathophysiology, risk factors, and effective management strategies for frailty and Alzheimer's disease are crucial in addressing the complex healthcare needs of elderly individuals.

Emerging technologies, particularly AI, have the potential to revolutionize CGA practices, although their widespread adoption remains limited. Traditionally, CGA research has concentrated on clinical settings such as hospitals and specialized geriatric units. Recently, however, there has been a noticeable shift towards implementing CGA in a wider range of environments, including nursing homes and community-based settings.[46] While its utility in nursing homes is well-established, the quantitative evidence for CGA's health outcomes in community-dwelling older adults remains inconclusive.[47] Barriers to effective implementation include a lack of collaboration among stakeholders, limited acceptance of preventive measures, and operational challenges faced by healthcare providers.[33] Integrating CGA into routine workflows with the aid of digital health technologies offers a promising solution. Wearable sensors and remote monitoring devices can provide real-time insights into residents' health metrics, such as mobility and nutritional status, enabling timely interventions. Additionally, interdisciplinary teams in nursing homes could utilize AI-enhanced CGA tools to refine care plans and improve health outcomes for residents.[48]

Strengths and Limitations

Bibliometric analysis serves as a powerful tool for examining the development of research fields, providing insights into emerging trends and the evolution of specific topics. Applying these methods to CGA allows for the systematic exploration of historical progress, identification of research gaps, and prediction of future directions. This approach supports evidence-based decision-making for researchers and policymakers, particularly in addressing the demands of aging populations. However, this study has certain limitations. The analysis was confined to data retrieved from the Web of Science Core Collection, potentially excluding relevant literature indexed in other databases. Additionally, citation metrics are subject to temporal delays, which may affect the accuracy of citation-based evaluations. To achieve a more comprehensive understanding of CGA research, future studies should consider integrating data from multiple databases and employing more diverse methodologies.

Conclusion

Interest in comprehensive geriatric assessment has surged in recent decades. The United States leads this field, with the highest number of publications (1,012) and extensive international collaborations. The focus has shifted from cancers to chronic diseases like frailty and sarcopenia related clinical trials and meta-analysis. Over the past 20 years, key research areas have included clinical trials, adjuvant chemotherapy, and breast cancer. In summary, our results provide a thorough scientometric analysis of global research on comprehensive geriatric assessment, offering valuable insights for future research directions.

Data Sharing Statement

The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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