

Research on safety in home care for older adults: A bibliometric analysis

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Funding information

This study was funded by Chongqing Science and Technology Committee key project (approval number: cstc2018jscx-maszdX00113).

Abstract

Aim: This study aimed to describe and visualize the current research state and collaborative networks in home care safety for older adults over the past 11 years to analyse the gaps of research and future research trends.

Background: The amount of research on safety in home care for older adults is increasing. It is necessary to understand the status of development and main research topics and identify the main contributors and their relationships.

Methods: A total of 2,631 publications were retrieved from the Web of Science. The external characteristics of the publications were summarized with the Web of Science and Histcite. Collaborative networks and keywords were analysed and visually displayed using analysis tools.

Results: The number of articles increased over the years. Articles were identified from 79 countries, 3,630 institutions, 647 journals and 11,691 authors, and complex cooperative relations among them and five research topics were identified.

Conclusion: Research on home care safety for older adults is developing steadily, and this field may be understood to a greater extent in the future. Countries, institutions and scholars need to cooperate more in this research field.

Implications for Nursing Management: This study contributes important information for understanding achievements in the research field of home care safety and provides insights into future research.

KEYWORDS

bibliometrics, home care, older adults, patient safety

1 | BACKGROUND

Global ageing is becoming severe, and an increasing number of older adults choose to stay in their homes as they age; internationally, the demand for health care in home or community settings has increased (Van Eenoo et al., 2016). However, safety in home for elderly people is a challenge. Although there is no clear definition of home care safety, safety related to home care generally includes two main aspects:

personal care and home health care. Scholars usually choose the incidence of adverse events in home care as an operational indicator to measure the safety of home care (Blais et al., 2013). In recent years, the healthcare system has continued to its shift away from its historically predominant focus on inpatient care. However, patient safety in the home care setting is less well understood than patient safety in other settings. Elderly people are at a higher risk of safety-related events than younger people due to the natural process of ageing and their

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health status due to multiple chronic diseases. Unique family situations, regarding the physical environment, caregiver knowledge, application of medical devices and availability of care resources, make home care safety in older adults complicated. The Joint Committee has been developing "home care safety goals" since 2002 and updates them annually to help caregivers address safety challenges. The World Health Organization devised an international classification system of patient safety concepts for all care settings, including the home in 2009 (World Health Organization, 2009). Research on the safety of home care for elderly people has gradually increased over the past decade.

Thus far, home care safety research related to older adults has been summarized in several studies that focused on adverse events (Doran et al., 2013; Lindblad et al., 2018), risk factors (Manabe et al., 2015; Tuunainen et al., 2014), fall prevention (Burton et al., 2018; Donath et al., 2016), medication safety (Freeland et al., 2012), device safety (Keller et al., 2017) and eHomecare and safety (Akerlind et al., 2018). Some studies have focused on specific populations, such as older women (Johansson et al., 2016), patients with Alzheimer's disease (Imai et al., 2020) and patients with spinal cord injury (Lala et al., 2014).

Although some studies have summarized important aspects of home care safety research related to older adults, there has been no attempt to map out the entire field of home care safety in a systematic manner. Bibliometric analysis is a quantitative and comprehensive method that is used for academic publications. When this method is used, the external characteristics of publications (such as the number of published articles, authors and journals), the development processes, distribution structure and relationships in a particular field are studied. In addition, mathematical and statistical methods are used to identify internal structures. To date, bibliometrics has been used to analyse progress in research fields and predict the development of disciplines due to its objectivity and quantitative and large-scale characteristics (Yu et al., 2017).

2 | AIM

This study aimed to describe the development process of home care safety research related to elderly people; summarize the main contributors, considering the countries/regions, institutions, journals and authors; determine the relationship structure; and clarify the mainstream research topics. The results will help researchers further their studies.

3 | MATERIALS AND METHODS

3.1 | Data acquisition and search strategy

Publications were retrieved from the Web of Science (WoS) Core Collection. The WoS core collection database is an important global database of academic information. Based on a rigorous selection process and an objective evaluation process, WoS collects the most authoritative and influential academic journals, conference proceedings and various academic works. At the same time, through the unique

citation index, the evolution of research content and research direction can be understood without being restricted by the change of key words. We developed search strategies by reading the relevant documents that we had previously identified and constantly optimized them during the search process. The search terms were as follows: (i) the target group ("older adults" OR "older people" OR "the elderly" OR "the aged" OR "geriatric"), (ii) the care setting ("home" OR "community") and (iii) safety associated ("patient safety" OR "safety" OR "adverse event" OR "medication error" OR "fall" OR "pressure ulcer/pressure sore/bedsore" OR "aspiration" OR "Catheter related*" OR "oxygen therapy" OR "infusion therapy" OR "dialysis" OR "burn" OR "device safety"). The terms were combined with Boolean operators ("OR" within the search domains, "AND" between the two search domains). Articles published from 2009 to the present (22 June 2020) were searched. To reduce errors caused by differences in the format in which data were presented, only articles were searched, and the language was limited to English. Therefore, to further eliminate errors, according to the database's own screening function, articles in non-life science fields in the "research direction" category, such as Plant Science, Veterinary Science and Agriculture, were manually removed, Figure 1 shows the paper selection and flow chart of research framework. This study did not involve animal or human experiments, so the ethical statement is not shown here.

3.2 | Analysis tool

The following software was used in this study: (i) Histcite 12.03.07, the history of citation, is a citation analysis tool developed by the SCI inventor Garfield. It can be used to summarize the development history of a field and help identify the most influential studies and authors (Garfield et al., 2006). It was used to present the distribution of the literature. (ii) VOSviewer 1.6.15 is a free Java software for document mapping, was developed by The Centre for Science and Technology in the Netherlands and has been widely used (Donohue, 2002). It is generally used to analyse collaborative networks and hot research topics. (iii) The Bibliometrix Online Analysis Platform (<https://bibliometrix.com/>) is an online analysis platform for bibliometrics, and it was used to present a cooperation network among countries in this study. (iv) Citespace 5.6. R5 is a scientific metering software tool developed by Professor Chaomei Chen (Chen, 2006). It is usually used to perform co-occurrence analysis and visualize the collaboration networks of authors/institutes/countries/keywords.

3.3 | Data analysis

Two researchers manually screened the extracted papers to ensure that they were related to home care safety for elderly people. In the event of a dispute, a third researcher was consulted. First, the analysis functions embedded in the databases were used to summarize the external characteristics, including the number of articles and average citations. Second, all document records and cited reference

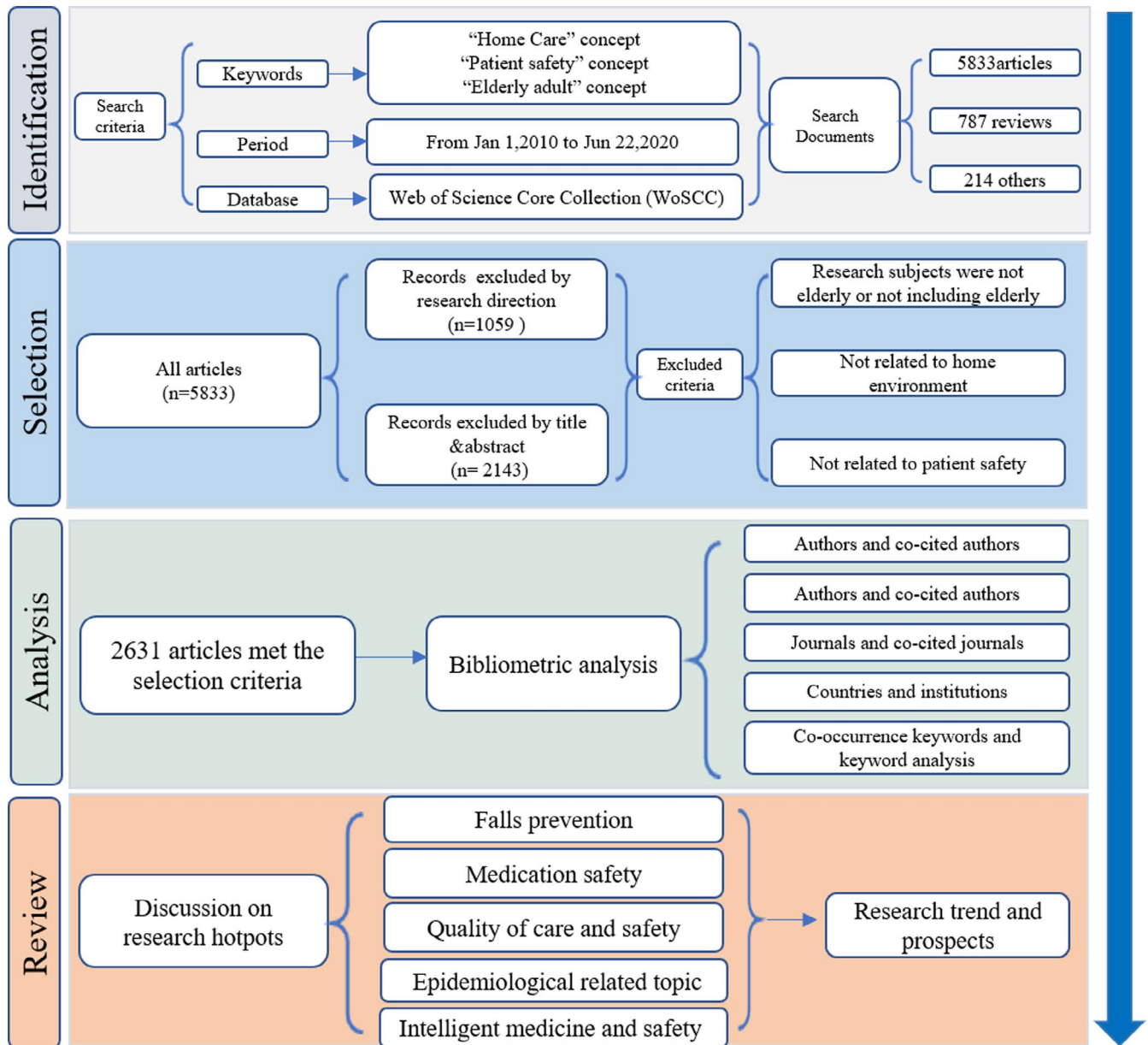


FIGURE 1 Paper selection and flow chart of research framework

data were downloaded in the TXT format, keywords with similar meanings but different writing were combined (e.g. older people and older adults), and versatile and meaningless keywords were deleted (e.g. population, time). Finally, the cleaned data were imported into the above software for internal structural analysis.

4 | RESULTS

4.1 | Publication outputs and total local citation score

A total of 5,833 articles were searched from 1 January 2009–22 June 2020 and 2,631 articles were included in the analysis after the data were cleaned. An average of 229 articles were published each year, and

the annual publications are shown in Figure 2. The number of publications on home care safety for older adults increased from 93 in 2009 to 358 in 2019, showing a steady trend in growth. However, the changes in the total local citation score (TLCS) were not stable. In general, TLCS refers to the number of times an article is cited in the current data set; the higher the TLCS, the more important this publication is in this area. Two notable peaks were identified in 2011 and 2015, which means that these two years were key years for the development of the field, and classic studies may have been published in these years.

Through further analysis, we found that the American Journal of Geriatrics Society published a Summary of the Updated Clinical Practice Guideline for Prevention of Falls in Older Persons in 2011 (Panel on Prevention of Falls in Older Persons & British Geriatrics, 2011). This summary pointed out the changes with respect to the guidelines reported in the 2001 edition of the guide and

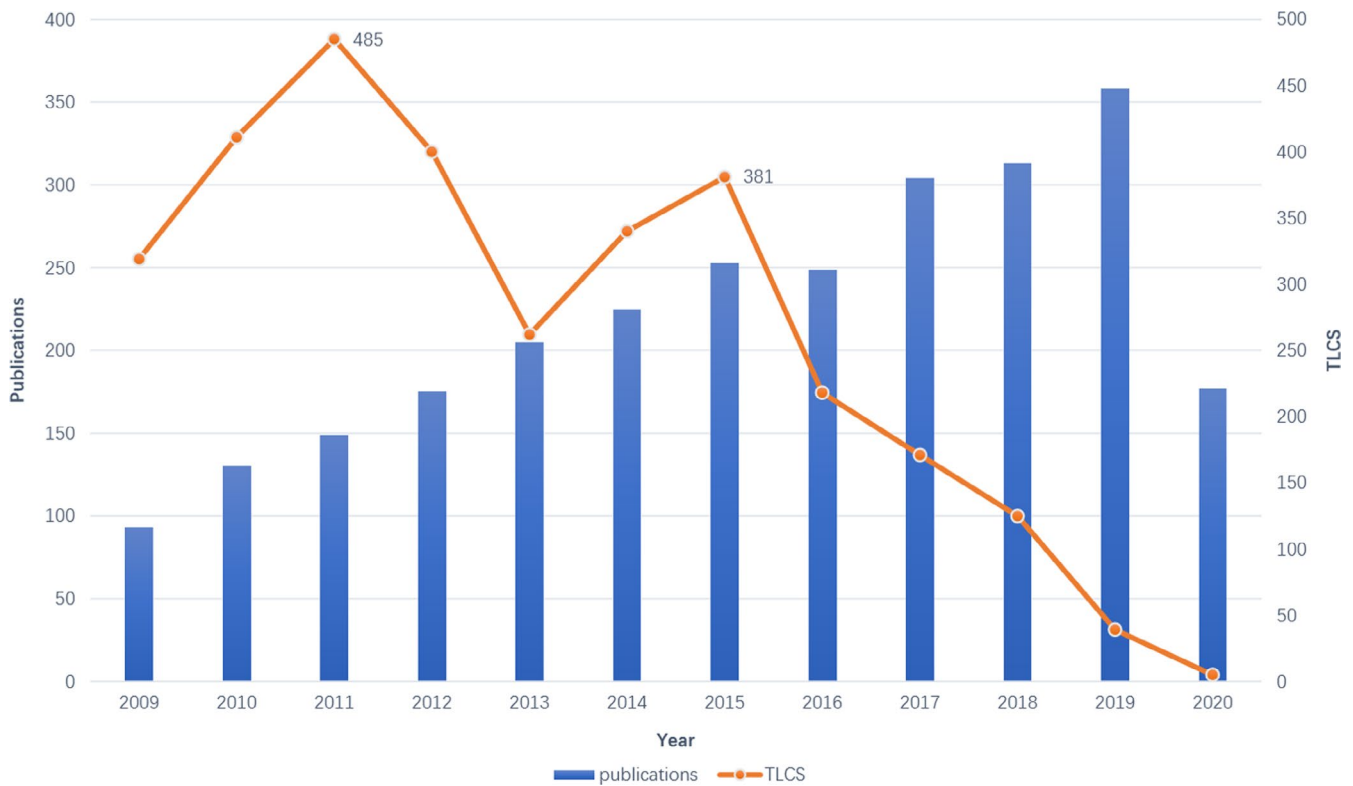


FIGURE 2 Publication output and TLCS over time

TABLE 1 Top 10 countries/regions and institutions by publications

No.	Countries	Publications, %	TLCS	No.	Institutions	Publications, %	TLCS
1	USA	508 (33.09)	407	1	University of Sydney (Australia)	85 (5.54)	89
2	Australia	262 (17.02)	241	2	Monash University (Australia)	48 (3.13)	46
3	UK	184 (11.99)	118	3	University of New South Wales (Australia)	37 (2.41)	54
4	Canada	138 (8.99)	69	4	University of Toronto (Canada)	36 (2.34)	22
5	Netherlands	84 (5.47)	69	5	University of Melbourne(Australia)	29 (1.89)	38
6	Germany	76 (4.95)	40	6	Johns Hopkins University(USA)	25 (1.63)	39
7	Spain	55 (3.58)	20	7	University of California San Francisco (USA)	25 (1.63)	5
8	Sweden	53 (3.45)	21	8	Karolinska Institute (Sweden)	23 (1.50)	7
9	France	49 (3.19)	32	9	University of Pennsylvania (USA)	23 (1.50)	33
10	Italy	46 (3.00)	70	10	The University of Queensland (Australia)	22 (1.43)	46

Abbreviation: TLCS: Total Local Citation Score

explained the recommended fall assessments and interventions. In 2015, the American Geriatrics Society Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults was released (By the American Geriatrics Society Beers Criteria Update Expert, 2015). The Beers Criteria is one of the most effective tools to ensure the safety of medication for older patients and is of great significance for clinical drug selection; it is updated every two years. The 2015 edition of the Beers Criteria not only revised the previous list of drugs but also added new content. It is widely used in many

countries and regions around the world to monitor and guide the rational use of drugs for older adults (Mo et al., 2017; Price et al., 2014).

4.2 | Countries/regions and institutions

A total of 79 countries/regions and 3,630 institutions were involved in the research. The top 10 countries and institutions are presented in Table 1. Among them, the United States of America (USA) ranked

first in the number of publications ($N = 812$), accounting for 30.86% of the total, followed by Australia (355,13.49%) and the United Kingdom (278,10.57%). The total number of articles published in the top 10 countries reached 90.00% of all articles.

Stefan et al. pointed out that teams usually publish more influential research than do individuals (Wuchty et al., 2007), and a systematic analysis of partnerships among different countries, institutions and authors can also reflect the exchange of disciplines in the field. Collaborations among countries are shown in Figure 3; there is cooperation among most countries, and countries with more frequent exchanges have more output, such as the USA, Australia and the UK.

Figure 4 shows collaborations among institutions, and several stable cooperation networks have been formed among institutions. The purple circle around nodes represents centrality and is usually regarded as a key point in the network (Chen, 2006). Figure 4 shows that the University of Sydney in Australia has the strongest centrality, followed by the University of New Wales and the University of Pittsburgh.

4.3 | Journals and citation analysis

Journal analysis is helpful to identify the core journal(s) in this field. All articles related to home care safety for older adults have been published in 647 journals since 2009. Table 2 shows the top 10 journals in terms of the number of publications and their respective TLCS and TGCS (total global citation score). The average impact factor of

these 10 journals is 3.1592. The Journal of the American Geriatrics Society contributed the highest number of publications ($N = 104$), followed by BMC Geriatrics ($N = 101$), and BMJ Open ($N = 65$), which suggests that these three journals may have a favourable view of studies related to home care safety in older adults. The highest TLCS was found in the Journal of the American Geriatrics Society, Age and Ageing, and Journals of Gerontology: Series A-biological Sciences, indicating that these three journals may be authoritative in this field.

4.4 | H index and authors

The H index is a single index used to measure the broad impact of researchers' scientific achievements. Based on the WoS database, the H index of all the included articles was 79, including 47,429 citations (43,432 when excluding self-citations), and the average number of citations per article was 18.03. A total of 11,691 authors were involved in related research in the past. Table 3 shows the top 10 authors in the number of published articles. The top 3 authors are Stephen R Lord, Keith D Hill, Lindy Clemson, and they are all located in Australia and engaged in fall-related research. Professor Stephen R Lord is at the top of the list and recognized as an international leading researcher in the field of fall-related research.

The collaboration network among authors is shown in Figure 5. The different colours represent different author clusters. Some authors formed a fixed cooperation network based on the same research topic. All the authors are mainly divided into 10 clusters. The first group was mainly dominated by Stephen R Lord, and the second group was dominated by Keith D Hill. The third group mainly included Lindy Clemson and Sherrington C.

4.5 | Articles and citation analysis

The citation rankings of the articles can also explain the research hot spots in this academic field to some extent. Based on TLCS, the 10 most highly cited articles are listed in Table 4. Of the top 10 articles, 6 articles focused on the safety of medication, and 3 articles focused on the prevention of falls, indicating that the safety of medication and the prevention of falls have always been the main issues in home care safety.

4.6 | Keyword Analysis

The topics involved in the research studies can be determined by the keywords. Keywords are also very effective in determining the knowledge structure of an academic field in terms of bibliometrics, which can help identify potential research hotspots (Romero & Portillo-Salido, 2019). Keyword co-occurrence networks were extracted using VOSviewer. By analysing the titles and abstracts of 2,631 articles, we extracted the keywords with the top 300 occurrence frequencies for a visual display. Figure 6



FIGURE 3 Network map of scientific cooperation among institutions

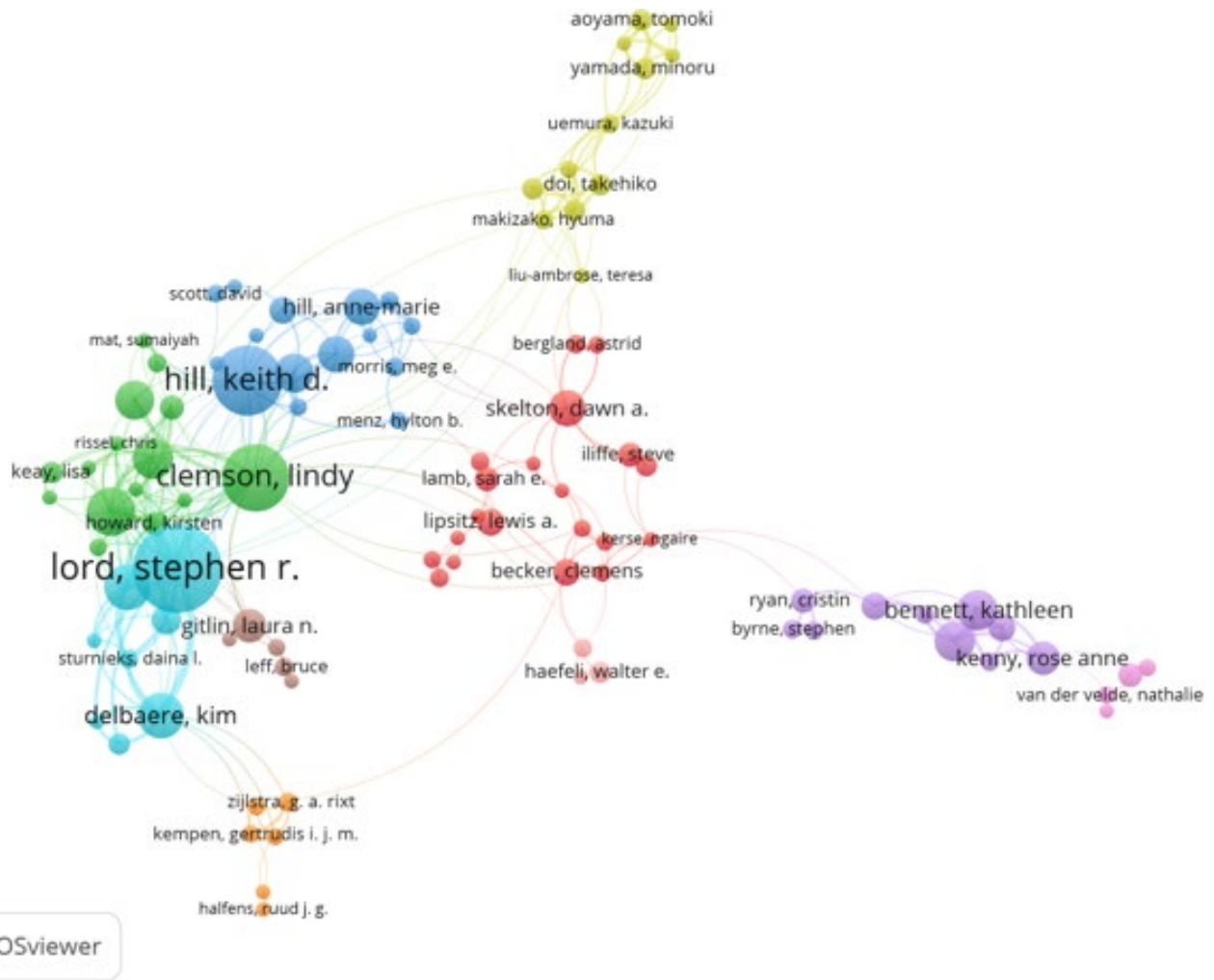


FIGURE 4 Network map of scientific cooperation among authors

TABLE 2 Top 10 journals that published research articles on home care safety for older adults

No.	Journal	Publications	TLCS	TGCS	IF ^a
1	BMC Geriatrics	75	0	828	3.077
2	Journal of the American Geriatrics Society	67	95	1,441	4.180
3	BMC Health Services Research	46	0	618	2.740
4	BMJ Open	40	0	278	2.496
5	Journal of the American Medical Directors Association	35	21	737	4.367
6	Plos One	26	53	308	1.987
7	Drugs & Ageing	24	36	577	2.824
8	Age and Ageing	23	71	858	4.902
9	Archives of Gerontology and Geriatrics	22	28	522	2.128
10	Journal of Clinical Nursing	22	12	311	1.972

Abbreviations: TGCS, Total Global Citation Score; TLCS, Total Local Citation Score.

^aIF = JCR2019).

is a network visual showing that although related studies may involve multiple themes, the keywords can be clearly divided into five categories, represented by five colours (red, green,

blue, yellow and purple), and these topics indicate mainstream research topics and frontiers in the field of home care safety for elderly people.

TABLE 4 Top 10 articles by the total citation score (TLCS)

No.	Title	Year	Journal	TLCS
1	Summary of the Updated American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons (Panel on Prevention of Falls in Older Persons & British Geriatrics, 2011)	2011	Journal the American Geriatrics Society	119
2	American Geriatrics Society Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults (Fick et al., 2012)	2012	Journal the American Geriatrics Society	79
3	American Geriatrics Society 2015 Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults (By the American Geriatrics Society Beers Criteria Update Expert, 2015)	2015	Journal the American Geriatrics Society	79
4	The Patient Who Falls "It's Always a Trade-off" (Tinetti & Kumar, 2010)	2010	Journal of the American Medical Association	77
5	Prevention of Potentially Inappropriate Prescribing for older adults Patients: A Randomized Controlled Trial Using STOPP/START Criteria (Gallagher, O'Connor, & O'Mahony, 2011)	2011	Clinical Pharmacology & Therapeutics	53
6	Potentially Inappropriate Medications Defined by STOPP Criteria and the Risk of Adverse Drug Events in Older Hospitalized Patients (Hamilton, Gallagher, Ryan, Byrne, & O'Mahony, 2011)	2011	Archives of Internal Medicine	52
7	Falls and Fall Injuries Among Adults Aged ≥ 65 Years - United States, 2014 (Bergen, Stevens, & Burns, 2016)	2016	Morbidity and Mortality Weekly Report	39
8	Potentially inappropriate prescribing in an Irish older adults population in primary care (Ryan, O'Mahony, Kennedy, Weedle, & Byrne, 2009)	2009	British Journal of Clinical Pharmacology	34
9	Potentially inappropriate prescribing and cost outcomes for older people: a national population study (Cahir et al., 2010)	2010	British Journal of Clinical Pharmacology	34
10	A Reengineered Hospital Discharge Program to Decrease Rehospitalization A Randomized Trial (Jack et al., 2009)	2009	Annals of Internal Medicine	31

Abbreviation: TLCS: Total Local Citation Score.

analysis and structured information in this field. Through the analysis of highly cited studies in the literature, we found that falls and medication are the main focuses of research on home care safety for older adults. The cluster analysis of keywords also confirms this idea. In the U.S. Home Care National Patient Safety Goals, from 2009–2020, medication safety and fall prevention are listed every year.

Fall is a major and increasing safety risk in the family, threatening the health and independence of older people and leading to high medical expenses. Many studies have focused on the risk factors for falls, including their own health factors, environmental factors, improper medication management and malnutrition (Chien & Guo, 2014; de Jong et al., 2013), which leads to the difficulty and complexity of fall management. The literature also reported some strategies for family fall prevention. For example, family-based and group exercise programmes led by occupational therapists or nurses and comprehensive intervention programmes provided by multidisciplinary teams have reduced the incidence of falls. (Gouveia et al., 2016; Mikolaizak et al., 2017).

Medication management is another prominent patient safety issue in home care for older people. Drug therapy problems included multidrug therapy, potentially inappropriate medications, poor medication compliance and medication storage issues. Studies have

shown that drug review and intervention during transitions of care, home visits by pharmacists and cooperation between pharmacists and other personnel can effectively improve the safety of home medication for older people (Drks, 2019; Patterson et al., 2019). Regrettably, current human resources and regulations may pose barriers to widespread adoption of these strategies. Nursing staff are also the main groups involved in pharmacological management and are expected to play a greater role in future research.

The quality of care affects the home safety of older people, so it has also become a research hotspot. Providers of home care for older people include professionals and family caregivers. In the hospital environment, routine assessments and procedures were used to discover safety issues. However, in a home environment, provider contact may be episodic and care delivery may diffuse among several providers, who may lack methods to communicate. Family caregivers usually do not receive adequate training, and many elderly people are cared for by their spouses, which may pose risks to both the patient and themselves (Hignett et al., 2016). The literature has reported that some home care service projects have effectively improved the quality of home care and patient safety (McCurdy, 2012; Ruiz et al., 2017). Future research needs to pay attention to the communication and cooperation of professional care

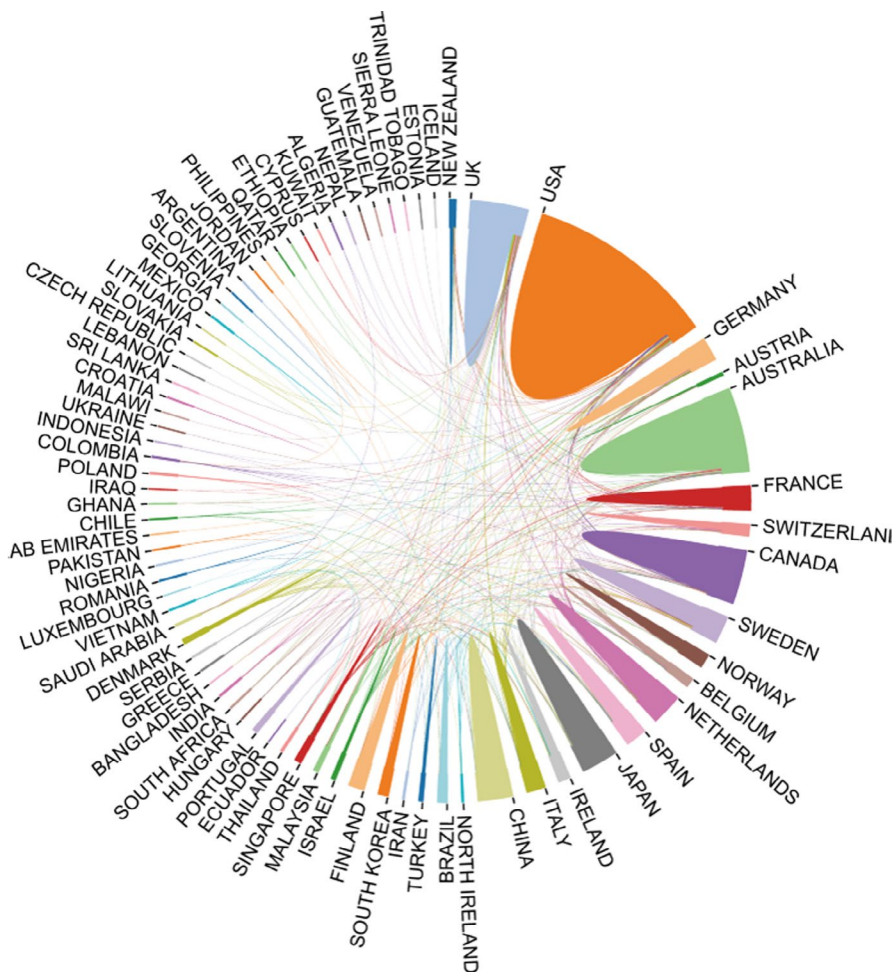


FIGURE 6 Scientific cooperation among countries/regions involved in home care safety for older adults

teams to promote the construction of home care safety culture; in addition, as a home caregiver for the second patient, its safety also needs more attention.

Extra attention was given to the current epidemiology and patient safety of dementia. Compared with elderly people with normal cognition, elderly people with dementia have a heavier care burden and cause more adverse events, such as accident loss, fall resulting in death and other events. It was reported that nurses played an important role in the prevention and safety management of elderly people with dementia at home. (Duane et al., 2015). In 2017, the WHO released the global action plan on the public health response to dementia: 2017–2025 (World Health Organization, 2017). In the future, nurses should integrate the nursing support system, develop a scientific care path for older people with dementia at home and become the leader, manager, trainer and supervisor to improve the quality of dementia care to ensure the safety of home care for older people.

In addition, with the development of information technology, telemedicine and smart home care are increasingly used in home care (Li & Borycki, 2019; Moo et al., 2020), and smart apps, wearable smart devices and smart elderly care products on the market are increasingly abundant, which contributed to improving the quality and safety of home care. However, will these products have new security risks? Can older people use it? how can the "digital gap" be filled in smart home care to ensure safety? This requires further research in

the future. In addition, technology does not exist independently. To fill the "digital gap" in smart elderly care, it is necessary to realize resource integration and effective integration with management on the basis of understanding the real needs of older people to solve the real difficulties and safety problems of older people. Another issue brought about by the development of information technology, such as identity verification and patient privacy, also needs to be addressed.

Through literature analysis, we also found fewer studies of adverse events in home care than in hospitals. According to reports, from 2008–2018, only 2% of the more than 9,000 sentinel incidents that were reported to the Joint Commission were reported by home care organizations, suggesting that the current research on the safety of home care remains only the tip of the iceberg ("Home Care bulletin,"). It may be difficult to report adverse incidents in home care, but reporting adverse incidents can reduce the risk of similar events in the future, as incident analysis can be performed, and improvements can be made; it is important to encourage the reporting of hazards in home care and foster a culture in which more research is expected in the future.

Nevertheless, this study has several potential limitations that should be acknowledged. One of the limitations is that we searched the WoS database only due to the applicability of the software. Although this database is one of the most popular sources among

researchers and academics for assessing the levels of importance and influence of scientific publications, it might have several disadvantages (Falagas et al., 2008), which may have caused us to miss some important research results. In addition, keyword cleaning and statistics are customized, which may be limited by our professional knowledge and experience. In future research, we will further expand the research data sources and standardize keywords to help us improve the overall article quality and prediction accuracy.

6 | CONCLUSION

This bibliometric study showed that there has been a growing trend in research on home care safety for old adults over the past 11 years. Compared with patient safety research conducted in hospitals (GAO et al., 2020), home care safety research is relatively limited, and the research content is not abundant enough. Fall and drug safety, care quality management and safety-related epidemiology are the focus of research. We have also identified deficiencies and gaps in this field through bibliometric analysis.

7 | IMPLICATIONS FOR NURSING MANAGEMENT

This study contributes important information for nursing managers to understand research achievements, collaborative networks and main topics in the research field of home care safety for older adults. It provides insights for determining future research direction and seeking cooperation to improve the efficiency of scientific research management.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ETHICAL STATEMENT

Not applicable.

DATA AVAILABILITY STATEMENT

Data that underlie the results reported in this article will be shared. Proposals should be directed to qh20063@163.com.

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How to cite this article: Cao S, Huang H, Xiao M, et al.

Research on safety in home care for older adults: A bibliometric analysis. *Nurs Open*. 2021;8:1720–1730. <https://doi.org/10.1002/nop2.812>