

## Original Article

# Bibliometric and Content Analysis of Research on Physical Restraint Applications: The Unseen Part of the Iceberg

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### Abstract

**Background:** Physical restraint practices are a common intervention method used in healthcare services, especially to ensure patient safety. However, there are significant debates in the use of physical restraint practices in terms of ethical, legal and patient care dimensions.

**Aim:** This study aimed to conduct a bibliometric and content analysis of studies related to physical restraint.

**Methods:** The Web of Science database was used for data collection. Initially, a search was conducted on Web of Science using the keywords "physical restraint" and "physical detection". Subsequently, searches were refined using the terms "nurse", "nursing", "nurses" or "nursing care". Articles and systematic reviews published in English between 1984 and 2024 were included in the study. Data were analyzed using VOSviewer and Bibliometrix software. Bibliometric analysis involved science mapping and content analysis methods.

**Results:** In this study, a total of 752 publications authored by 3085 researchers were analyzed. The journal with the highest number of publications on the topic was "Journal of Clinical Nursing" while the journal with the highest number of citations was "Critical Care Medicine". Additionally, it was determined that publications on physical restraint were produced in 74 countries, with the United States being the most productive in terms of the number of documents. The most frequently mentioned keywords by authors were "physical restraint", "care" and "seclusion". Seven themes were identified through thematic analysis. The study was prepared in accordance with PRISMA reporting guidelines.

**Conclusion:** The number of studies on the use of physical restraints in nursing care is increasing. This research is expected to contribute to the understanding of the current state of studies on physical restraint and to guide future publications.

**Keywords:** Bibliometric analysis, Nursing, Nursing care, Physical restraint, Thematic analysis

## Introduction

Physical restraint involves the use of physical or mechanical means to limit an individual's movements in situations where there is a risk of harm to themselves or others (Turna & GURSOY, 2021). Generally, physical restraint is applied to ensure patient safety, prevent patients from removing medical devices attached to them, and control disruptive behaviors (Canzan et al., 2021; Kilic & Polat,

2021). Currently, physical restraint is widely used in long-term care settings in many countries, with prevalence rates ranging from 6% to 85% (Ambrosi et al., 2021). These high prevalence rates have been attributed to the increasing elderly population and long-term care needs, nursing workforce shortages, the presence of low-quality safety systems, staff-related factors, and patient-related factors (Chien et al., 2022; Kong et al., 2024).

However, these factors have not prevented the application of physical restraint from being a controversial issue.

Previous studies have highlighted that individuals subjected to physical restraint experience various problems such as cognitive decline, skin damage, circulatory disorders, pulmonary diseases, pressure sores, psychiatric disorders, pain, and even sudden death (Cho and Min, 2024; Chong et al., 2024). Another study found that hospital mortality rates were 13.3% for restrained patients and 5.1% for non-restrained patients (Spennato et al., 2023). Additionally, because physical restraint is often used without the patient's consent, nurses applying these restraints may face ethical dilemmas and experience feelings of guilt (Cho & Min, 2024; Zhou et al., 2024).

Globally, despite the promotion of a "restraint-free" care model due to the many adverse physical and psychological effects, and the controversial ethical and legal dimensions of physical restraint, its application remains widespread (Canzan et al., 2021). Therefore, nurses who are primarily responsible for patient care must ensure the correct and appropriate use of physical restraints, which are known to have many adverse consequences. Nurses are expected to be knowledgeable about physical restraint practices and to apply effective alternative methods that minimize their use while adhering to existing legal and ethical principles (Kilic & Polat, 2021). The rapid increase in studies related to the use of physical restraints in nursing care makes it challenging for both nurses and researchers to access and follow the results of current research on the topic. Consequently, there is an increasing need to identify the trends, map the latest developments, and determine the gaps in the literature regarding physical restraint applications.

Bibliometric analysis is a tool used to measure the scientific output of various scientific elements (e.g., articles, citations, authors, keywords, journals, institutions, and countries) in any research area and to examine the intellectual, social, and conceptual structure of the research field (Donthu et al., 2021; Ozturk et al., 2024). Bibliometric

analysis visualizes the evolution and trends of scientific development in a field, providing an overview of the most influential studies (Ghamgosar et al., 2021). In recent years, the bibliometric analysis of publications in the field of nursing has been rapidly increasing (Cant et al., 2022). However, a review of the literature revealed no bibliometric analysis related to the use of physical restraints in nursing care. Therefore, this research employed bibliometric analysis, aiming to highlight the developments, trends, evidence, key authors, and journals in the literature on physical restraints and to make the potential topics and gaps on physical restraint visible.

**Aim:** This study aimed to conduct a bibliometric and thematic analysis of studies related to physical restraint.

#### **Research Questions:**

- How have the publications and citation counts on physical restraint changed over the years?
- What are the top 10 most cited publications in the field of physical restraint?
- Who are the top three authors with the most publications and citations in the field of physical restraint?
- What are the dynamics of publications related to physical restraint in terms of countries and journals?
- What are the most frequently used keywords in the field of physical restraint?
- What themes emerged from the thematic analysis of physical restraint research?

#### **Methods - Search strategy**

This study utilized the "Web of Science (WoS)" database to obtain data. WoS was chosen for its inclusion of high-impact journals, extensive coverage of bibliographic data and citations, and accessibility (Kantek et al., 2023). On June 12, 2024, the Web of Science bibliographic database was searched using the keywords "physical restraint" and "physical detection". The initial search yielded 2113 results. These results were filtered using the keywords "nurse" "nursing" "nurses" and "nursing care" reducing the number of publications to 846. There were no time restrictions applied to the analyses.

**Inclusion Criteria:** Only articles published in English, including original research articles and reviews, were included in the study.

- Literature types such as editorials, conference abstracts, book chapters, and proceedings were excluded from the analysis. After applying these criteria, a total of 787 publications were selected for analysis, comprising 697 original research articles and 90 systematic reviews. Non-English publications (Spanish: 11, German: 8, French: 7, Italian: 6, Turkish: 2, Portuguese: 1) were excluded, resulting in 752 publications included in the bibliometric analysis.

**Ethical considerations:** Due to the absence of human participants in the study, ethical approval was not required.

**Bibliometric data analysis:** Academic studies in bibliometric analysis, which includes quantitative analysis, consist of two main components: performance analysis and scientific mapping. Performance analysis evaluates the productivity and performance of authors, institutions, and countries contributing to research in the field. Scientific mapping, on the other hand, reveals the themes, significant trends, and gaps in research within the field. This study employed both performance analysis and scientific mapping methods together (Lim & Kumar, 2024). In performance analysis, publication and citation numbers were used as parameters, while scientific mapping utilized co-occurrence analysis (Donthu et al., 2021). Prior to data analysis, all studies meeting the inclusion criteria were downloaded from the Web of Science database. Bibliometric software versions Bibliometrix 4.1.4 (K-Synth Srl, Academic Support Unit of University Federico II of Naples, <https://www.bibliometrix.org>) and VOSviewer 1.6.19 (Leiden University, Netherlands, <https://www.vosviewer.com>) were utilized for data analysis. Bibliometrix is an open-source bibliometric software written in R programming language, encompassing various bibliometric methods (The Comprehensive R Archive Network, <https://cran.r-project.org>) (Aria & Cuccurullo, 2017). Bibliometrix was employed in determining the most frequently used keywords and conducting content analysis in this study. VOSviewer 1.6.19

software was used to analyze data related to authors' names, article titles, journal names, and citation counts. Developed by Nees Jan van Eck and Ludo Waltman, VOSviewer aims to visualize relationships between items and construct maps. "Items" refer to concepts such as publications or researchers, while "connections" denote relationships between these items. VOSviewer establishes correlations or links between two items, expressed as Total Link Strength (TLS), a positive numerical value indicating the strength of relationships between items (Jan van Eck & Waltman, 2020).

**Content analysis:** Content analysis in this study was conducted using the synthetic information synthesis method developed by Kokol (2022). Synthetic information synthesis enables the quantitative and qualitative analysis of academic content and production. The following algorithm was used for synthetic information synthesis in this research:

Step 1. All publications meeting the inclusion criteria for research on physical restraint in nursing care were collected.

Step 2. Authors' keywords were selected as "codes" for their succinct presentation of publication content.

Step 3. Connections between identified codes were analyzed, and categories were defined accordingly.

Step 4. Categories were analyzed, and appropriate theme names were assigned to each cluster. The output of all steps is presented in Table 3.

## Results

In this study, the data obtained from the Web of Science database were presented in tables and figures in the findings section. The first study on the topic was published in 1984. Despite fluctuations in publication numbers, it can be said that the number of publications has increased over the years. The years with the highest number of publications are 2022 (n=72), 2021 (n=55), and 2023 (n=54), respectively. The changes in publication rates over the years are shown in Figure 1.

According to Figure 1, the year with the highest number of citations to publications

related to physical restraint was 2021, with 2356 citations. The included publications received a total of 19,653 citations over 40 years. 71 studies have not yet received citations. In terms of citation analysis, the h-index for publications related to physical restraint is 65. The annual growth rate of publications is 8.87%. The most cited article (n=908) is titled "Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU," authored by Devlin et al. (2018) and published in the "Critical Care Medicine" journal. Table 1 lists the top 10 most cited articles.

In nursing care, 3085 authors have published on physical restraint. 46 of these publications were authored by a single author. The top three most prolific authors are Castle (n=24), Capezuti (n=17), and Hamers (n=13). The top three authors with the most citations are Hamers (n=250), Capezuti (n=243), and Evans (n=241). The countries with the highest number of publications and citations related to physical restraint in nursing care are presented in Figure 2. Publications have been made in 74 countries on this topic. In terms of publication and citation numbers, the USA ranks first with 200 publications and 8,802 citations, which is significantly higher compared to other countries. Australia is second with 87 publications and 989 citations, while the UK ranks third with 79 publications and 1,484 citations. In Turkey, there have been 23 publications on the topic, cited a total of 241 times.

Table 2 and Figure 3 show the journals with the highest number of publications and citations in the area of physical restraint. According to this, it was determined that the 752 publications included in the study were published in 299 different journals. The journals with the highest number of publications are Journal of Clinical Nursing (n=39), International Journal of Mental Health Nursing (n=31) and Journal of The American Geriatrics Society (n=31), International Journal of Nursing Studies

(n=24). The journals most cited are Critical Care Medicine (n=1809), International Journal of Mental Health Nursing (1792), and Journal of Clinical Nursing (1054).

The most frequently used keywords by the authors in studies on physical restraint and the relationship between these words are given in Table 3 and Figure 4. Accordingly, the authors used a total of 1286 keywords. The most frequently used keyword was "physical restraint", which was used 132 times. In second place was "care", which was used 131 times, and in third place was "seclusion", which was repeated 93 times. The least used words are child and adolescence, empathy and gastrointestinal disease.

Visualization of co-occurrence analysis using VOSviewer is presented in Figure 5 and Table 4. In the red cluster, the most frequently used keywords are nursing (61), physical restraints (57), and delirium (29). This cluster focuses on risk factors that may lead to physical restraint. In the green cluster, keywords such as nursing home (103), dementia (45), and long-term care (23) emerge, emphasizing the use of restraints in long-term care facilities. The blue cluster highlights keywords like restraint (82), seclusion (27), and aggression (24), focusing on reasons for implementing physical restraint. In the yellow cluster, keywords such as physical restraint (202), nurses (29), and decision making (13) stand out, emphasizing ethical decision-making in physical restraint practices. The purple cluster features keywords like physical (20), quality improvement (14), and intensive care units (13), focusing on education and quality improvement. In the turquoise cluster, keywords like attitude (38), knowledge (18), and nurse (14) are highlighted, examining nurses' knowledge and attitudes towards physical restraint. Lastly, in the orange cluster, keywords such as hospital (15), education (9), restraint reduction (6), and risk management (5) are used, focusing on managing factors that could pose risks in physical restraint practices and reducing restraint use. Content analysis resulted in identifying a total of seven themes.

**Table 2. Most published articles and cited journals**

Rank	Journal Name	Publication Count	Citation Count	Link Strength
1	Journal of Clinical Nursing	39	1054	638
2	International Journal of Mental Health Nursing	31	694	565
3	Journal of the American Geriatrics Society	31	1792	243
4	International Journal of Nursing Studies	24	865	368
5	Journal of Psychiatric And Mental Health Nursing	23	581	186
6	Journal of Advanced Nursing	22	823	497
7	International Journal Of Environmental Research And Public Health	17	105	209
8	Nursing Ethics	12	218	159
9	Nursing In Critical Care	12	154	126
10	Gerontologist	11	491	119
11	Cochrane database of systematic reviews	10	600	68
12	International Journal of Geriatric Psychiatry	9	324	145
13	Medical care	9	708	154
14	Critical care medicine	6	1809	93

**Table 3. Most frequently used keywords**

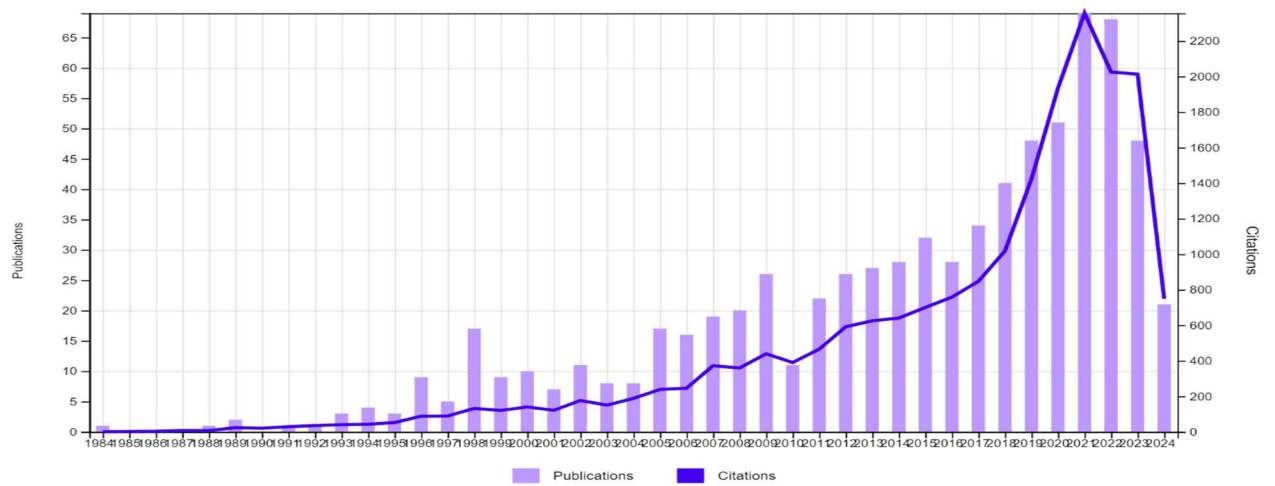
Rank	Key Words	Number (n)
1	Physical Restraint	132
2	Care	131
3	Seclusion	93
4	Residents	83
5	Prevalence	78
6	Staff	78
7	Nurses	73
8	Dementia	68
9	Reduction	67
10	Attitudes	65



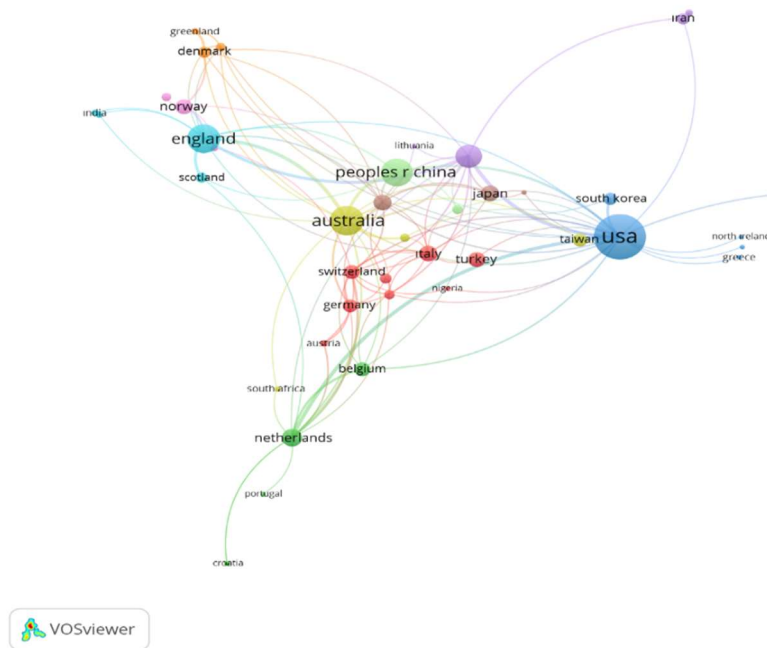
**Table 4. Co- occurrence analysis**

<b>Cluster number and color</b>	<b>Codes (keywords) *</b>	<b>Concepts/Categories</b>	<b>Cluster theme</b>
Red	agitation (12), chemical restraint (7), complications (5), critical care (25), delirium (29), intensive care (11), intensive care unit (28), mechanical ventilation (12), neurosurgery (5), nursing (61), nursing care (14), patient safety (17), physical restraints (57), prevalence (17), restraint, physical (6), risk factors (10), sedation (12)	Individual risk factors, treatment in the intensive care unit, factors related to patient safety	Risk factors
Green	acute care (7), aged (15), aged care (6), antipsychotics (9), dementia (45), elderly (15), falls (12), long-term care (23), nurse staffing (6), nursing home (103), outcomes (9), prevention (5), quality (13), quality indicators (8), quality of care (13), residential care (6), restraints (22), staffing (6)	Long-term care centers, risk of falling, age factor, mental changes in old age	Use of restraint in long-term care facilities
Blue	aggression (24), coercion (18), de-escalation (5), home care (8), inpatient (5), mechanical restraint (11), mental health (38), psychiatry (19), qualitative (11), restraint (82), restrictive practices (6), safety (7), seclusion (27), training (5), violence (18)	Psychological reasons, security issues, possibility of violence against self and caregiver	Reasons for applying physical restraints
Yellow	decision making (13), ethics (8), mental health nursing (8), nurses (29), older people (15), physical restraint (202), psychomotor agitation (5), qualitative research (25), qualitative study (7)	Ethical decision making in nursing practices, the necessity of physical restraint	Ethical decision making in the application of physical restraint
Purple	accidental falls (5), hospitals (9), intensive care units (13), nursing education (6), physical (20), quality improvement (14), systematic review (14), workplace violence (5)	Reducing falls in hospitals and intensive care units, providing quality improvement training to nurses, and eliminating the possibility of violence.	Training and quality improvement
Turquoise	attitude (38), knowledge (18), nurse (14), nursing practice (8), nursing staff (13), practice (8), psychiatric nursing (11)	Nurses' knowledge and attitudes towards physical restraint, Use of physical restraint in nursing practices, Psychiatric nurses' knowledge and attitudes towards physical restraint.	Nurses' knowledge and attitudes towards physical restraint
Orange	cognitive impairment (5), dementia care (5), education (9), hospital (15), older adults (8), restraint reduction (6), risk management (5)	Monitoring risk factors that require restrictions, managing identified risks, and organizing training for nurses.	Reducing the use of physical restraints and managing risk

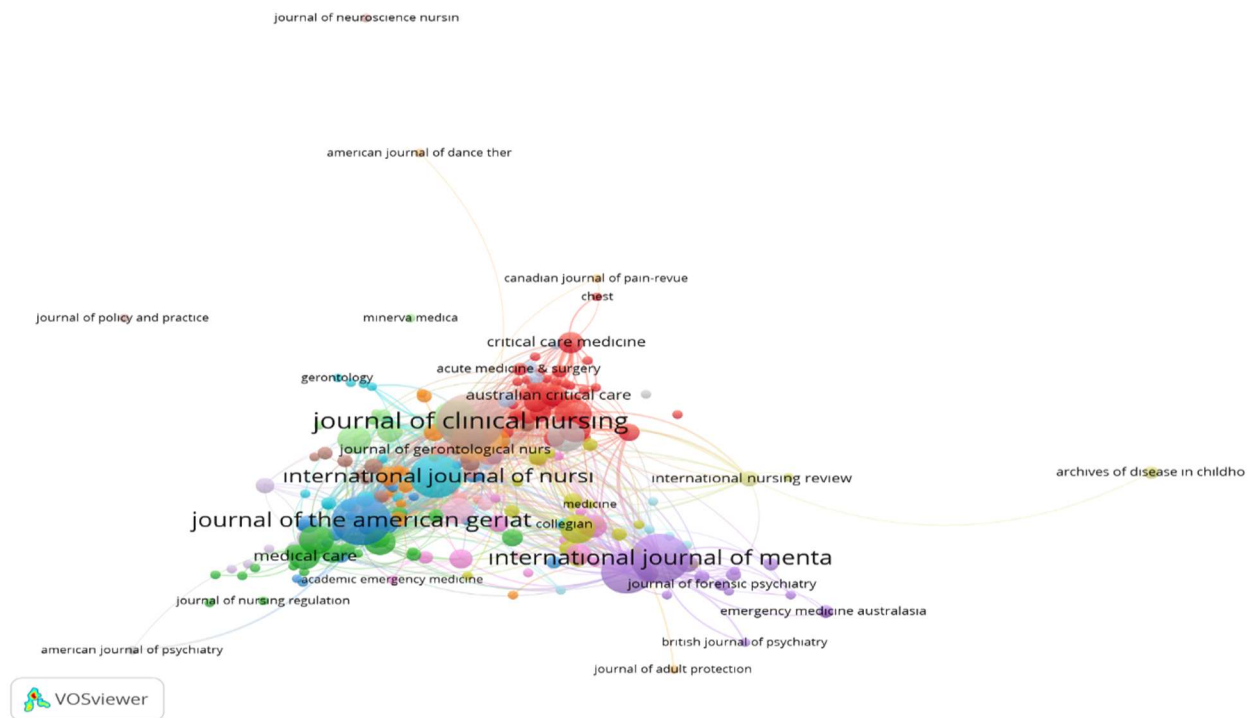
**\*Denotes the keywords used by the authors.**



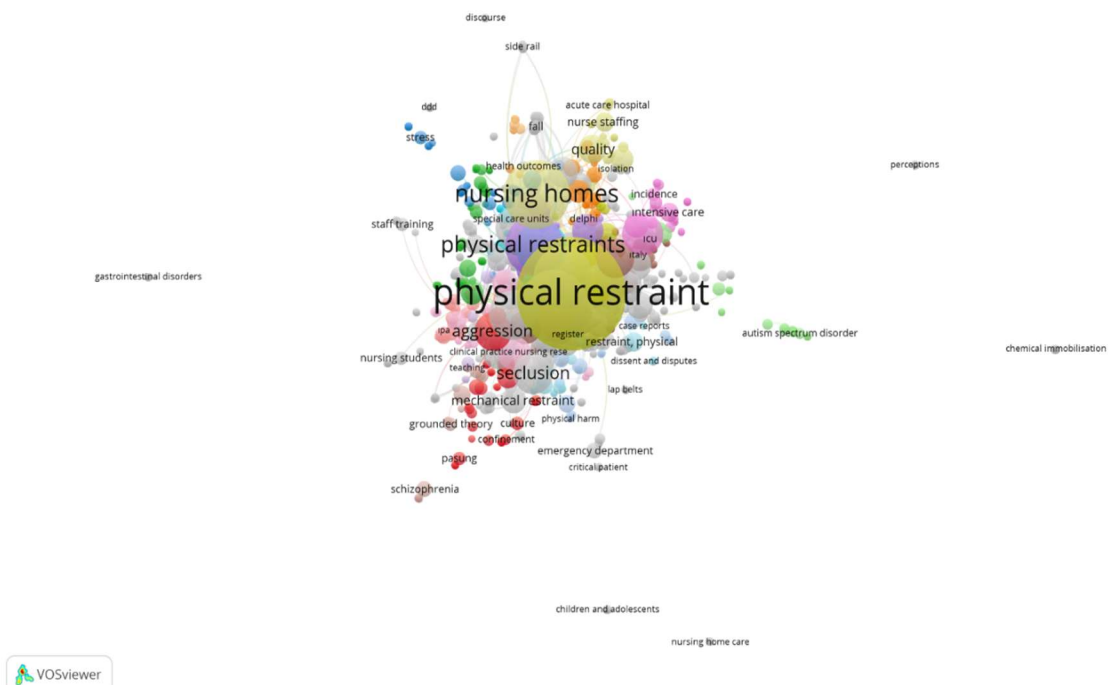
**Figure 1: Number of published articles and citations by year**



**Figure 2. Network connection map of countries with the most publications and citations in the field of physical restraint**

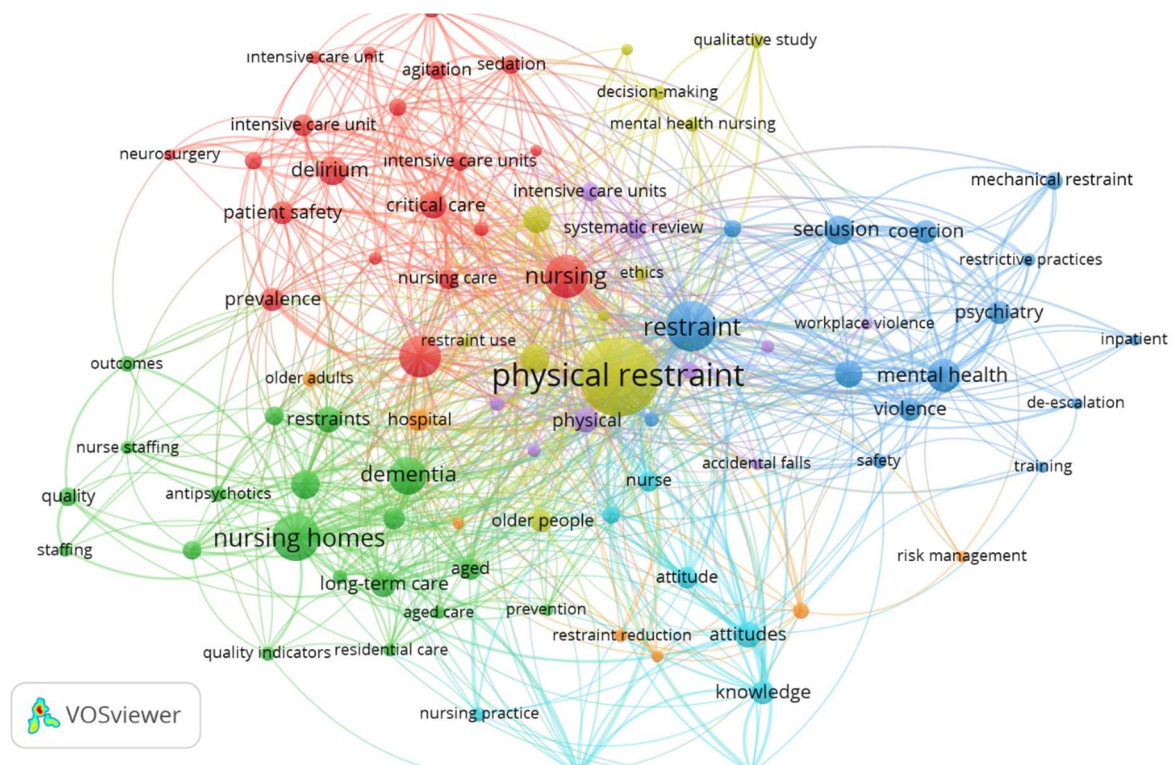


**Figure 3. Network map of journals with the highest number of published articles and citations**



**Figure 4. Network map of the most frequently used keywords**





### Figure 5. Co-occurring keyword analysis

## Discussion

In this study, data obtained from the Web of Science database regarding the use of physical restraints in nursing care were analyzed using Bibliometrix and VOSviewer programs. The analysis identified the most valuable publications on the subject, the most productive authors, publication trends, gaps in the literature, and current topics. The lack of bibliometric studies related to the use of physical restraints in nursing care in the literature reflects the original value of this study. Additionally, this research is expected to provide a broad perspective on publications related to physical restraints and bring to light the unseen aspects of the iceberg.

Over a period of forty years, 752 publications related to physical restraints were added to the literature, and these publications received 19,653 citations. The concept of physical restraint was first introduced in the publication "Behavioral problems among patients in skilled nursing facilities" by

Zimmer et al. (1984). Since then, the number of publications on physical restraints has continued to increase, despite occasional decreases in certain years. The annual growth rate of the publications is 8.87%. The increase in publications over the years, which is an important indicator of scientific productivity, may imply that authors are trying to fill gaps in the literature on the subject. The controversial ethical and legal aspects of the issue (Jang et al., 2024), the search for evidence-based alternative methods to replace the use of restraints, and the inability to translate evidence-based recommendations into clinical practice are among the reasons for the continued research on this topic (Via-Clavero et al., 2024).

The citation rate of the publications has increased proportionally with the number of published articles. Despite being published five years ago, the most cited publication is the study by Devlin et al., (2018). This study aimed to update and expand the clinical

practice guidelines for the management of pain, agitation, and delirium in critically ill patients, originally published in 2013. The high citation count for this publication indicates that researchers frequently utilize guidelines in their studies and prefer publications with high evidence value in their work. The fact that five of the ten most-cited publications are systematic reviews also supports this finding.

The research determined that the USA leads significantly in studies on the use of physical restraints. The USA is followed by Austria and the UK. This study found that the majority of research on physical restraints has been conducted in palliative care centers. In the USA, palliative care programs have grown by 150% in the last decade. Currently, 90% of hospitals with 300 or more beds and two-thirds of hospitals with 50 or more beds have palliative care programs (Kavşar & Sevimli, 2020). This situation may have contributed to the increase in studies on the subject. Furthermore, despite advances in care and efforts to reduce the use of physical restraints, the rate of physical restraint use remains high in the USA, particularly among certain groups (Gupta et al., 2024). On the other hand, considering the size of the USA, the number of educational and research institutions, the amount of funding in the research and education sectors, and its place in general scientific production and nursing, it is expected that the USA would be at the top (Ghamgosar et al., 2021).

The journals with the most publications on physical restraints are the Journal of Clinical Nursing (n=39), International Journal of Mental Health Nursing (n=31), Journal of the American Geriatrics Society (n=31), and International Journal of Nursing Studies (n=24). Researchers can prioritize these journals when submitting their studies on physical restraints. The most cited journals are Critical Care Medicine (n=1809), International Journal of Mental Health Nursing (1792), and Journal of Clinical Nursing (1054). Critical Care Medicine is the journal where the most cited study by Devlin et al. (2018) (n=908) was published. The fact that the Journal of Clinical Nursing is the journal with the most publications on physical

restraints and is among the top in terms of citation count suggests that the journal is highly regarded and influential among scientists working in this field. Researchers can examine these journals to contribute to the literature on the subject, study authors' research tendencies, and gain insight into popular topics.

It was determined that "physical restraint," "care," and "seclusion" are the most frequently used keywords by authors. There is a significant amount of literature on the knowledge, attitudes, and experiences of nurses regarding physical restraints. However, the scarcity of studies that directly use the concept of empathy is noteworthy. Additionally, studies on the use of restraints in gastrointestinal diseases and among children and adolescents are limited. These findings can provide ideas for future research. Based on the keywords used by the authors, seven themes were created through content analysis.

**Risk factors:** The first study to address the risk factors for physical restraint was conducted by Evans and Strumpf (1989). In this study, cognitive impairment was identified as the most important risk factor for physical restraint. Studies conducted on this topic to date highlight agitation, delirium, intensive care units, and mechanical ventilation as significant risk factors for physical restraint (Pu et al., 2023).

**Use of physical restraints in long-term care facilities:** A significant portion of studies on this topic have been conducted with elderly patients residing in nursing homes (Wang et al., 2023). However, there has also been a significant increase in studies conducted in psychiatric clinics and intensive care units in recent years.

**Reasons for the application of physical restraints:** Studies indicate that physical restraints are used to reduce aggression, prevent violence, and ensure patient safety. It is noteworthy that studies investigating the reasons for restraints are generally observational studies (Kawai et al., 2022; Thomann et al., 2022).

**Ethical decision-making in the application of physical restraints:** The ethical aspect of physical restraints was first addressed by

Hopton in 1995. Discussions on this topic continue to this day. The latest contribution to the field is the study by Jang et al. (2024) titled "Is physical restraint unethical and illegal?: A qualitative analysis of Korean written judgments."

**Education and quality improvement:** Studies have organized educational programs for patients, their relatives, or nurses to reduce the use of physical restraints and examined the effectiveness of these programs through experimental studies (Shibuya et al., 2022; Yilmaz et al., 2021). Only one study examined the effect of a web-based educational program for nursing students on their knowledge and perceptions regarding physical restraints (Kong et al., 2021). More studies can be conducted in this area to increase the awareness of nursing students.

**Nurses' knowledge and attitudes towards physical restraints:** There are numerous studies investigating the knowledge, experiences, and attitudes of nurses working in long-term care facilities and psychiatric clinics, where physical restraints are most commonly used. Therefore, the number of studies conducted in acute care settings can be increased (Thomann et al., 2022). It has been determined that studies on this topic have intensified in recent years and generally use qualitative research methods (Lao et al., 2023).

**Reduction of physical restraint use and risk management:** It is noteworthy that studies under this theme are generally systematic reviews. The publications emphasize that the rate of physical restraint use decreased as a result of intervention studies, but long-term outcomes could not be observed (Aloztaz et al., 2022). Another gap in the literature is the lack of high-evidence studies that investigate methods to reduce physical restraints involving multidisciplinary and patient/family perspectives and contribute to the development of effective strategies and policies to overcome barriers to reducing physical restraints. This point can guide future researchers (Abraham et al., 2022; Aloztaz et al., 2022).

**Conclusion:** According to the research, this study is the first in the field of physical

restraint. It presents the publications, authors, and countries contributing to this field through visualization. The most frequently used keywords by the authors are "physical restraint," "care," and "seclusion," while the least used and areas needing further development are "empathy," "gastrointestinal diseases," and "children and adolescents." The content analysis revealed that the publications are built around seven main themes based on the keywords used by the authors. Accordingly, future studies should focus on less-explored topics, conduct randomized controlled trials to examine the long-term outcomes of strategies to reduce the use of physical restraints, and carry out multidisciplinary and patient/family-centered studies.

**Limitations:** This research has some limitations due to its bibliometric method. The first limitation is that only the Web of Science database was used. Future studies could also include databases like Scopus, Google Scholar, and PubMed. Secondly, although VOSviewer and Bibliometrix software are reliable for bibliometric analysis, other software such as R, Gephi, and CiteSpace could be used in future research.

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