Rede de colaboração científica sobre queda acidental e segurança do paciente
Network for scientific collaboration on accidental falls and patient safety
Red de colaboración científica sobre caídas accidentales y seguridad del paciente

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RESUMO

Objetivo: analisar a rede de colaboração de coautoria, organizações e países, a partir do perfil bibliométrico da produção científica sobre risco de queda na perspectiva da segurança do paciente. **Método:** pesquisa bibliométrica com abordagem quantitativa. Os dados foram tratados a partir da estatística simples com uso dos softwares Bibliometrix e VOSviewer. A pesquisa foi realizada em janeiro de 2023, na Web of Science. Os termos utilizados para a busca foram "accidental falls" e "patient safety". **Resultados:** a busca retornou com 194 documentos, em 128 periódicos. A taxa de crescimento anual foi de 11,25 %, idade média do artigo 8,13 anos. **Conclusão:** no que se refere à colaboração entre autores, organizações e países, nota-se um domínio dos Estados Unidos, mas a presença do Brasil através da UFRG e da USP, é um indicador de que a produção intelectual dos pesquisadores brasileiros tem importante abrangência e capilaridade no cenário internacional.

Descritores: Segurança do paciente, Risco de queda, Enfermagem, Bibliometria.

ABSTRACT

Objective: to analyze the collaboration network of coauthors, organizations, and countries, based on the bibliometric profile of scientific production on fall risk from the perspective of patient safety. **Method:** bibliometric research with a quantitative approach. The data were treated by simple statistics using the Bibliometrix and VOSviewer

softwares. The search was performed in January 2023, in the Web of Science. The terms used for the search were "accidental falls" and "patient safety". **Results:** the search returned 194

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documents, in 128 journals. The annual growth rate was 11.25%, mean article age 8.13 years. **Conclusion:** regarding collaboration among authors, organizations and countries, the United States dominates, but the presence of Brazil through UFRG and USP is an indicator that the intellectual production of Brazilian researchers has important reach and capillarity on the international scene.

Descriptors: Patient safety, Fall risk, Nursing, Bibliometrics.

RESUMEN

Objetivo: analizar la red de colaboración en coautoría, organizaciones y países, a partir del perfil bibliométrico de la producción científica sobre el riesgo de caídas desde la perspectiva de la seguridad del paciente. **Método:** investigación bibliométrica con enfoque cuantitativo. Los datos se trataron mediante estadística simple utilizando los programas informáticos Bibliometrix y VOSviewer. La búsqueda se realizó en enero de 2023, en la Web of Science. Los términos utilizados para la búsqueda fueron "accidental falls" y "patient safety". **Resultados:** la búsqueda arrojó 194 documentos, en 128 revistas. La tasa de crecimiento anual fue del 11,25%, la edad media del artículo fue de 8,13 años. **Conclusión:** en lo que se refiere a la colaboración entre autores, organizaciones y países, predominó Estados Unidos, pero la presencia de Brasil a través de la UFRG y la USP es un indicador de que la producción intelectual de los investigadores brasileños tiene importante alcance y capilaridad en el escenario internacional.

Descriptores: Seguridad del paciente, Riesgo de caídas, Enfermería, Bibliometría.

INTRODUCTION

Today, there is an increasing demand in academic and scientific circles for greater development of human potential and knowledge, with the aim of optimizing and expanding the production of knowledge, its development and communication, thus developing certain competencies.[1] In this context, higher education institutions and their stricto sensu postgraduate programs are the academic units that play a leading role in intellectual production, which allows these organizations to play a prominent role in the advancement of science, as a source of construction and dissemination of knowledge, since postgraduate programs train researchers, masters and doctors who will contribute to the production of new knowledge.[2]

The creation and operation of Research Groups (RGs) is an important instrument capable of leveraging science in the academic sphere, as it is the *locus for* the exchange of experiences and collaboration between authors, organizations, and countries. However, it is recognized for its ability to develop complex skills and achieve other results, including networking and contributing to the recognition and visibility of the organization, whether at national or even international level.[1]

Through the World Wide Web and access to national and international indexing databases and repositories, there has been a significant growth in studies on scientific collaboration (SC), from the perspective of various aspects: the contributions of collaborations in the academic sphere, the importance of combining knowledge from different areas, resulting in greater depth of study and a broadening of its scope.[3-4]

Scientific collaboration, or collaborative work, is not a recent phenomenon; however, its visibility has become increasingly visible as collaboration has gained ground in the academic field, especially in stricto sensu postgraduate programs.

CC can be defined as a social process and human interaction that can occur in different ways, at different levels and for different reasons. Collaborator can be either the researcher who cooperates at some stage of the research or the one who contributes directly to the research throughout its development.[5]

According to the Directory of Research Groups in Brazil, of the National Council for Scientific and Technological Development (CNPq), the aim of CC is to boost the creation of knowledge and the innovation process resulting from the exchange of information and, above

all, from the pooling of skills between groups that join forces in pursuit of common goals, whether or not facilities are shared.

It is in the context of CHD that we intend to study one of the main incidents, events or circumstances that can result in unnecessary complications for the patient and that arise from health care, such as the risk of patient falls in the hospital environment, understood here as one of several adverse events (incidents with harm to the patient). These events represent a high level of morbidity and mortality in the Unified Health System, as well as an increase in hospital costs due to longer hospital stays, thus causing a major problem for public and private managers.[6]

The National Patient Safety Program has adopted[6] international targets established by the World Health Organization (WHO) and recommended by Joint Commission International (JCI). Among the goals recommended by the WHO and included in the National Patient Safety Program, falls have been identified as an important adverse event, due to the unpredictable consequences they can have for the patient and the institution, depending on the outcome, such as increased length of stay and higher hospital costs.[7]

Patient falls cause injuries in 30% to 50% of cases, with 6% to 44% of these suffering serious injuries such as fractures, bruising and bleeding, which can lead to death.[8]

Understanding falls as an adverse event with a multifactorial cause, among the factors linked to the patient, the following should be highlighted: advanced age (especially over 85), recent history of falls, reduced mobility, urinary incontinence, use of medication and postural hypotension.[7]

In light of the above, a fall can be understood as an unintentional displacement of the body to a lower level than the initial position, caused by multifactorial circumstances, resulting or not in damage. It is considered a fall when the patient is found on the ground or when, during the movement, they need support, even if they don't reach the ground. Falls can occur from a height, from a stretcher/bed or from seats (wheelchairs, armchairs, chairs, toilet seats, bathtubs, diaper changers, baby cribs, etc.), including toilets.[7]

Hospitalization can increase the risk of falls, as patients are in unfamiliar surroundings, often suffer from diseases that predispose to falls (dementia and osteoporosis) and many of the therapeutic procedures, such as multiple prescriptions for medication, can all increase this risk.[9]

Therefore, this study aims to analyze the collaboration network of co-authors, organizations, and countries, based on the bibliometric profile of scientific production on the risk of falls from the perspective of patient safety.

METODOLOGY

This is a bibliometric, descriptive, and exploratory study of a quantitative nature. As it was carried out exclusively using secondary data in the public domain, it did not require approval by the Research Ethics Committee (CEP), in accordance with the recommendations of the National Health Council (CNS) in its Resolution No. 466/2012.

To obtain bibliometric data, we used the *Web* of *Science* (WOS) database as a source. The search terms were: "*accidental falls*" and "*patient safety*", in order to find the widest range of studies related to the risk of falls in patients. For greater precision, the *"Topic"* filter was used on all documents.

WOS was accessed via the Journal Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES), through the Cafe Network, which is an identity management federation whose main objective is to allow its users to access web services from a wide variety of sources using their own institution's login and password.

The terms were previously consulted and validated in the DeCS health-controlled vocabulary. These terms correspond to the Portuguese descriptors - fall risk and patient safety. The time frame covered the period from 1993 to 2022.

To prepare the environment for data analysis, the "R" *software* (version 4.0.3 - Windows 32/64 bits) was downloaded and installed. Next, *RStudio*® (version 1.3.1093 - Windows) was downloaded and installed. Once the software had been installed, it was started, and to access the web interface, proposed in R language to support bibliometric analysis, the following commands were entered into the *RStudio*® *software* console: *library* (*bibliometrix*), and then (*biblioshiny),* so that the *Biblioshiny* web interface was launched.

Once started, *Biblioshiny was used* via the default browser. The data file saved in*. CSV was retrieved and loaded so that the data could be analyzed. In order to classify the activity of scientific production on the subject, using the *Biblioshiny web* interface and *VOSviewer*®, charts, tables, graphs and maps were generated, allowing analysis and interpretation under the aegis of descriptive statistics. By taking a descriptive and

exploratory approach, the aim was to carry out analyses that allow us to learn about various aspects of the object as a scientific field.

Data analysis and interpretation of the results were carried out in the light of the theories that underpin the bibliometric analysis study, which have already been described here.

RESULTADOS E DISCUSSÃO

The research sought to present an analysis of different aspects related to the risk of falls, as a topic of interest to health professionals who deal directly with health care, but also to those engaged in scientific research.

The *WOS* search returned 194 documents, 880 authors and 128 media outlets. Nursing contributed 13.91% (n = 27). It should be noted that the quantification of authorship considered all the authors, therefore full authorship. Table 1 shows the main data obtained.

The predominant language was English, present in 97.42% of the publications (n = 189). Only 0.51% were in Portuguese (n = 1). When researchers submit their articles to journals, most of them do so in English, which is largely due to the fact that they have to follow the editorial policies of the journals, whether national or international. In Brazilian postgraduate programs, the level of demand is high for understanding, reading, and writing in English. Proficiency, which until recently could only be attested to by a letter from the supervisor, now needs to be proven by tests.

Table 1 - Key data information

Descrição	Resultados
Journals	128
Documents	194
Annual growth rate %	11,25
Average document age	8,13
Average citation per document	18,1
References	6160
DOCUMENT CONTENT	
Keywords plus (ID)	460
Author's keywords (DE)	501
AUTHOR	
Authors	880
Authors of single-author documents	2
COLLABORATION BETWEEN AUTHORS	

Single-authored documents	4
Co-authors per document	4,95
International co-authorship	15,98
TYPES OF DOCUMENTS	
Articles	157
Article; early access	3
Article; procedure document	4
Procedural documents	11
Review	19

Source: Survey data. Rio de Janeiro, 2023.

The distribution of production corresponds to 29 years, from 1993 to 2022. Graph 1 shows the performance of production over these years. With an annual growth rate of 11.25%, this graph shows the trajectory of the literature on the subject studied, and it can be seen that it rises slowly, so there is little dispersion in production. During this period, there was a minimum of 1 paper and a maximum of 22 publications per year, with an average of 6.466 papers and a standard deviation of 6.146 publications per year.

**Graph 1** - Annual distribution of production
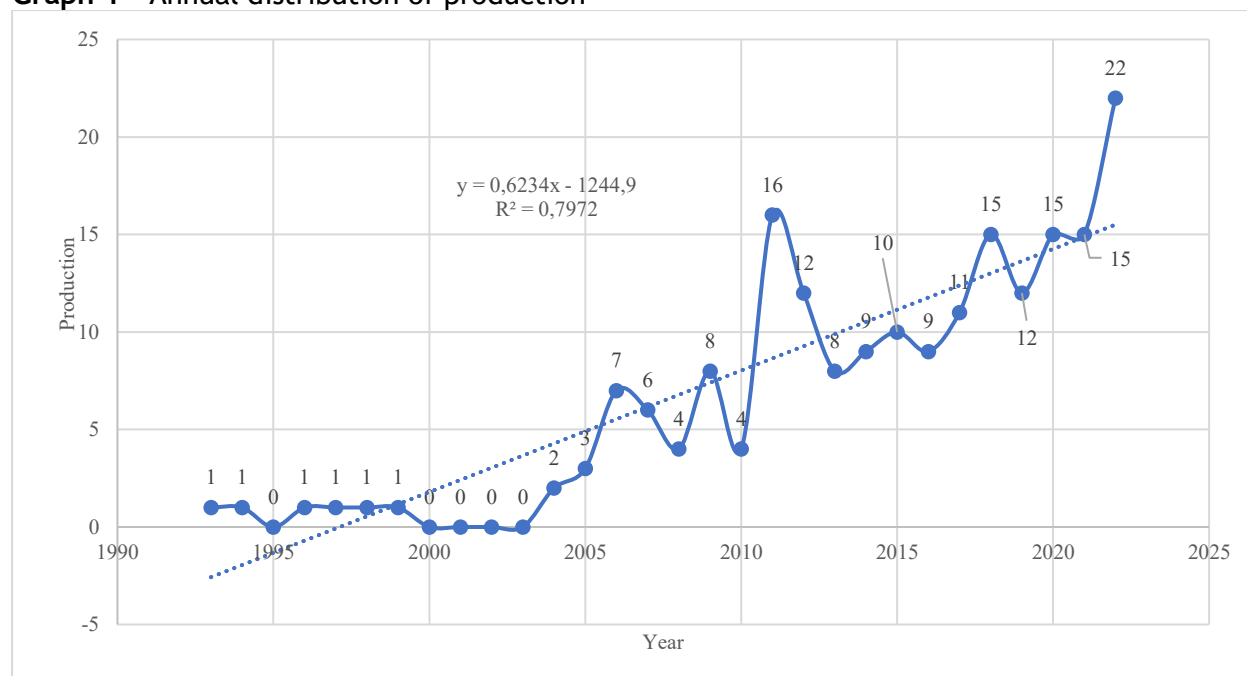
Source: Survey data. Rio de Janeiro, 2023.

The plot of accumulated production is shown in Graph 2 below. This plot shows a concave shape at the start of the distribution and rises slowly from 1993 to around 2005 and

more quickly after that. However, overall, the function is increasing and the initial curve is concave, rising as time, expressed in years, increases to become an almost straight line. The growth of the literature resembles exponential growth, as expected.

Graph 2 - Cumulative number of publications per year
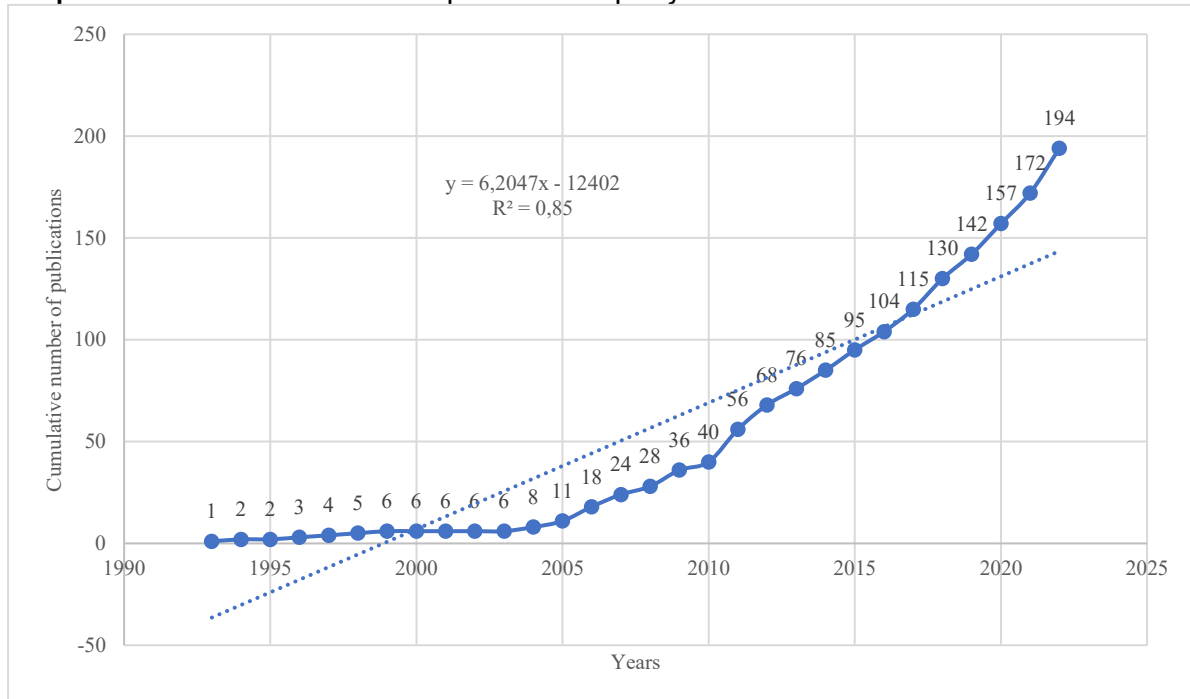
Source: Survey data. Rio de Janeiro, 2023.

The non-linear regression of the number of cumulative papers produced according to the years, run on Excel®, produced an R^2 equal to 0.85, meaning that 85% of the variation is explained by the years in which the papers were produced. This means that only 15% of the variation is not explained by the years in which the papers were produced. It can be said that this model follows Price's law of exponential growth. [10]

It is suggested that the growth of scientific literature almost always confirms exponential growth, and that this is reflected in the process of social interaction through which contact between scientists contributes to the cumulative growth of knowledge.[11] A typical growth curve is characterized by three stages of growth: the first is characterized by slow initial growth, with very few articles, institutions and scientists, characterized by the fact that information reaches scientists very slowly. There is a constant and permanent struggle to communicate research results. The second is a stage of rapid growth in the literature produced. The third is the stage of stabilization, saturation and decline in the growth of scientific literature production.

Based on these stages, Graph 2 shows that, until 2004, the growth of the literature produced was slow, not exceeding two digits, and therefore had the characteristics of the first stage, of slow initial growth with few works produced. A growth rate of 6.5% was estimated for this stage. However, from 2005 to 2015, the growth of the literature seems to have entered stage 2. During this period, the literature grew at an average rate of 12.79%.

The characteristics of the collaboration networks on the topic studied are shown in Figures 1, 2 and 3, respectively, which show the graph maps composing the relationships established between co-authors, organizations and countries. The parameters used in VOSviewer® relating to these figures were: minimum number of documents by an author (2), minimum number of citations by an author (1), which were used to gather the information relating to the topics analyzed in this section, in order to allow the scientific collaboration networks to be compared.

Figure 1 shows that the co-authorship collaboration map has 13 *clusters*. The first is made up of eight authors: Anderson A, Brehob M, Devecsery DA, Hu HM, Larson JI, Prakash A, Tzeng HM and Yin Chang-Yi. The second has five authors: Bressi B, Cagliari M, Costi S, Fugazzaro S and Iotti C. The third has five authors: Almeida MA, Lucena AF, Luzia MF, Severo IM and Villas Boas VD. The fourth has 4 authors: Gillespie LD, Robertson MC, Sherrington C and Tiedemann A. The fifth has 3 authors: Barros LM, Caetano JA and Rubenstein LZ. The sixth has 3 authors: Bulat T, Kang H and Zhou S. The seventh has 3 authors: Gong Y, Kang H and Zhou S. The eighth has 3 authors: Hwang H, Jung H and Park HÁ. The ninth has 3 authors: Dunton N, Shorr RI and Staggs VS. The tenth has 2 authors: Aranda GM and Carlos CSJC. The eleventh has 2 authors: Kitamura S and Otaka Y. The twelfth cluster has 1 author: Haines TP. The thirteenth and last cluster also has 1 author: Lundin OL.

**Figure 1 -** Map of collaboration between authors
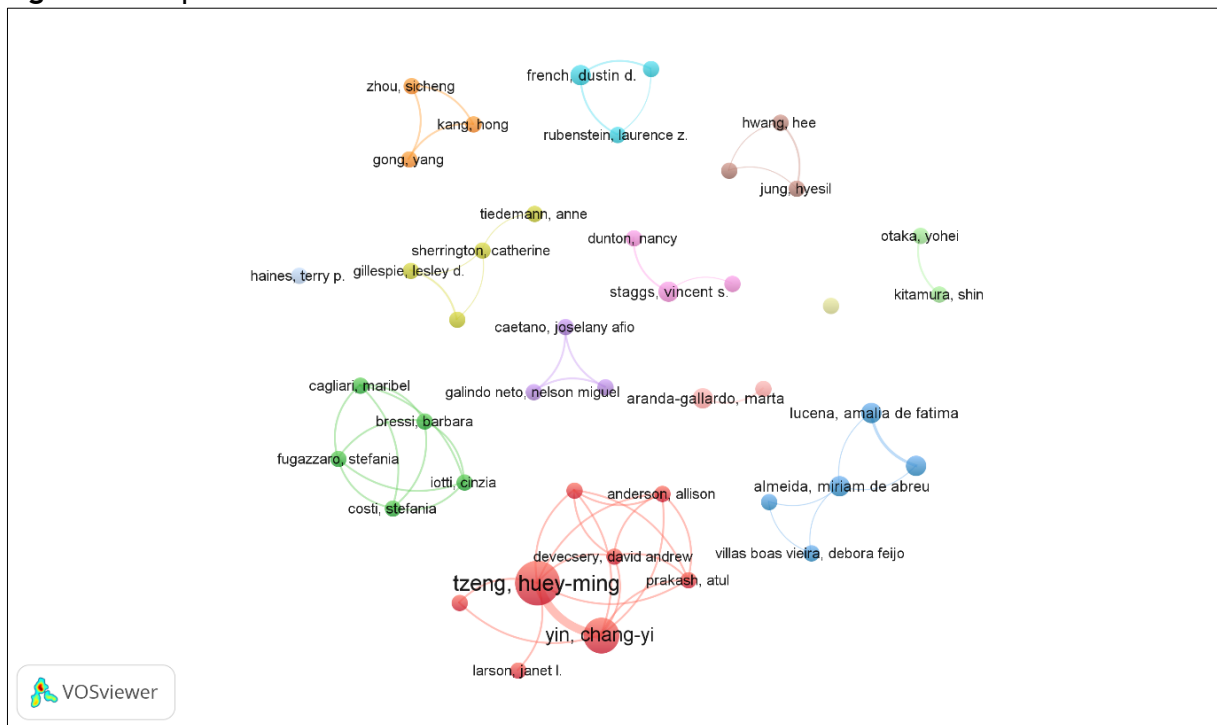
Source: Survey data. Rio de Janeiro, 2023

The process of building knowledge develops from collective work and is therefore a human activity driven by curiosity and socially constructed.[12] The construction of scientific knowledge needs to be increasingly aligned with the demands of a new *scientific spirit*, because the changes in this process are making the image of the solitary and solipsistic researcher less and less admissible - this image is part of the past - and this process requires associations, negotiations and strategies to interconnect as many elements as possible. The sharing of data, the pooling of skills and the joint efforts of researchers imbued with the same purpose - to boost the production of knowledge.[13-14]

A co-citation network deals with authors who are cited frequently in the same articles in the database searched and who have an influence on the constructs analyzed, i.e. articles that are a way of measuring the similarity between two publications.[15] It is clear that there is a considerable level of collaboration between authors, however, it should be noted that it is still incipient in the face of such an important topic for the health area, especially for nursing. The most prominent author was Tzeng Huey Ming, as he has several co-authorship links and a greater production, which can be verified by the size of the circle and the thickness of the lines that connect them.

This panorama shows that collaborative work in scientific production on the subject, although growing, is still poorly consolidated, as most of the researchers who make up the *clusters* have established collaborations with fewer than four authors.

Figure 2 - Map of collaboration between organizations
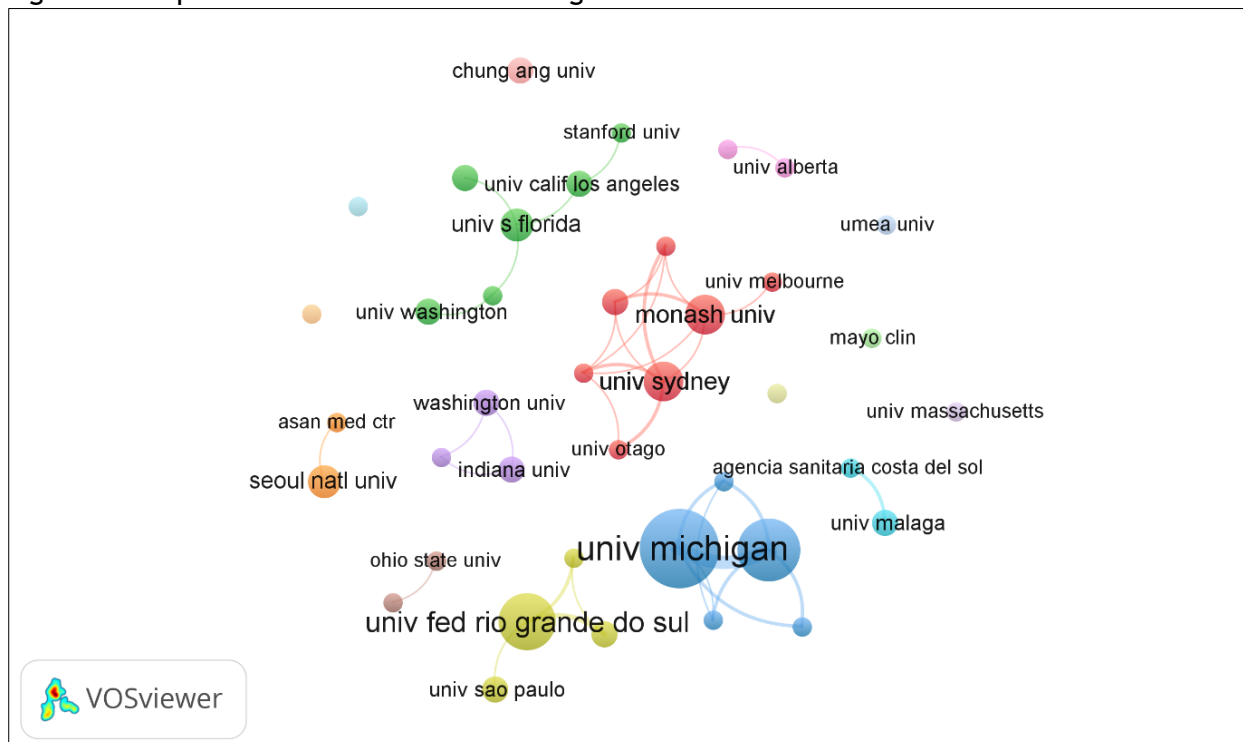
Source: Survey data. Rio de Janeiro, 2023.

Figure 2 shows the collaboration between organizations, mostly teaching and research institutions, such as universities. It was generated with the following parameters: a minimum of two documents per organization and a minimum of five citations. The collaboration map has 16 *clusters*. The first is made up of seven organizations: Monash University, University Auckland, University of Melbourne, University New South Wales, University Otago, University Queensland, and University Sydney. The second has six organizations: Standford University, University Calif los Angeles, University Florida, University Illinois, University S Florida, and University Washington. The third has 5 organizations: Chinese Culture University, University Michigan, University Michigan HLT, Univrsity Michigan Hospital and Washington State University. The fourth has 4 organizations: Hospital das Clínicas de Porto Alegre, PUC, UFRGS and USP. The fifth has 3 organizations: Indiana University, University Rochester, and Washington University. The sixth has 2 organizations: Costa del Sol Health Agency and Malaga

University. The seventh has 2 organizations: Asan Med Ctr and Seoul Nati Iniv. The eighth has 2 organizations: Nationwide Childrens Hospital and Ohio State University. The ninth has 2 organizations: University Alberta and University Toronto. From the tenth to the sixteenth, all have a single organization: Chung Ang University; Mayo Clinic; Umea University; University Kansas; University Massachusets; University Modena e Reggio and University Newcastle.

The Federal University of Rio Grande do Sul and the University of São Paulo - USP stand out on this map, both of which have, albeit very discreetly, collaborations with the University of Michigan, which is an important *hub* for scientific collaboration. Most likely, the participation of the two Brazilian and Latin American universities on this map is directly related to their postgraduate programs.

The scientific output of an institution is an indicator that should be considered in bibliometric research, as it is an indicator of quality and can characterize the expertise of the study groups to which its members belong, as is the case with the possible programs of these two important Brazilian universities.

When the densities and connected components in the organizations' networks are analyzed, they present a similar profile to the co-authorships: the networks are largely fragmented and their density is very low, which means that the network would need to produce a high number of edges to be complete, reducing the number of connected components.

Figure 3 shows the collaboration between countries. It was generated with the following parameterizations: a minimum of two documents per country and a minimum of five citations. The collaboration map has 12 *clusters*. The first is made up of 4 countries: Brazil, Japan, Taiwan, and the United States. The second has 3 countries: Austria, Germany, and the Netherlands. The third has 3 countries: Australia, England, and New Zealand. The fourth has 3 countries: Italy, Portugal, and Spain. From fifth to tenth, there is only one country. They are, successively: Canada; Finland; India; Iran; South Korea; Sweden; Switzerland and Turkey.

The map shows that Brazil has a great advantage over countries in Europe, Oceania and the Middle East. Brazil has a strong capacity to collaborate with the United States on the subject under study, but it is unable to demonstrate its vocation as a *hub* country for scientific production on this subject. Even though Brazil belongs to a *cluster* with four other countries, only the United States has managed to establish several links with other countries

in other *clusters*, thus demonstrating its level of capillarity and interconnection of network nodes with Italy, the Netherlands, Germany, India and Canada.

CONCLUSION

The analysis of scientific collaboration networks made it possible to understand the characteristics and impacts of collaborative work on accidental falls and patient safety. Scientific collaboration as collaborative work is an important measure for assessing collaboration in the academic field. Scientific production on the risk of patient falls, using the descriptors "*accidental falls*" and "*patient safety*" on the Web of Science, from 1993 to 2022, proved to be in line with the exponential model postulated by Price, thus suggesting that this topic is still very relevant and has not yet reached the stage of stabilization, saturation and decline in the growth of scientific literature production. As for the historical evolution of the researched productions, the theme has been recurring since mid-2005, the year in which the theme surpassed the double-digit mark. Production peaked between 2015 and 2021.

As far as collaboration between authors, organizations and countries is concerned, the United States dominates, but the presence of Brazil through UFRG and USP is an indicator that the intellectual production of Brazilian researchers has an important reach and capillarity on the international scene, perhaps due to the high-quality intellectual production coming from stricto sensu postgraduate programs, in the person of their professors and students.

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