REVIEW ARTICLE

Application of patient identification to prevent fraud in health facilities: a bibliometric study

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ABSTRACT

Creative solutions to improve patient identification procedures can be developed through a better understanding of the current trends and challenges. The aim of this study was to assess the evolution of scientific contributions in the field of patient identification. This study explored various dimensions, including publication trends, core journals, authorship patterns, institutional affiliations, contributions by country, thematic distribution, author collaborations, keywords, and country statistics from 2018 to 2023. Data collection included searching the Scopus database using the relevant keywords "patient identification' and "patient safety". Next, the collected dataset underwent thorough analysis and visualization using VOSviewer software. This methodological approach facilitates the identification of key bibliometric metrics, offering valuable insights into the dynamics and characteristics of patient identification research over a specific period. There has been a significant increase in the number of publications, with a record high in 2022. Journal of Patient Safety has emerged as a significant publisher in this domain. Certain institutions such as Harvard Medical School, Universidade Federal do Rio Grande do Sul and Brigham and Women's Hospital show extraordinary productivity in scientific publications. The United States has emerged as the most productive country in terms of research output. Medicine had the largest number of publications. The keyword most frequently used by writers was human. In conclusion, the increase in international scientific publications on patient identification by 2022 highlights the growing importance of this topic in the medical field. The contributions of authors, such as Manzo and BF, from prestigious institutions further demonstrate the importance of research in this area.

Key words:
patients, identification, safety, people, fraud, bibliometrics

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INTRODUCTION

In recent years, the world of health has begun to follow the industrial revolution, and the medical industry has changed significantly from being limited to conventional devices to incorporating smart devices.[1–4] Continuous technological advances in the medical health industry can provide some of the best results in community health services.[5] Technological advances in the medical industry in the health services world are inseparable from digitalization. Digitalization in health services is a form of digital transformation. Digital transformation in the world of health services has emerged due to the need to improve the quality of health services, cost efficiency, and patient experience in receiving health services.[6] Technological advances, such as digitalization in health services, have also increased the utilization, effectiveness, and efficiency of the current health service industry.[7]

One proof of technological progress in the health industry is the use of patient identification techniques.[8] Patient identification is one of the processes in patient verification and is a very important process in hospitals; proper verification and identification will prevent the risk of patients experiencing failure in health services due to errors in patient identity, which ultimately leads to service delivery errors, procedural errors, and delivery errors, medication errors and the prevention of malpractice activities.[9] Currently, there are many techniques that make it possible to identify a person, in this case a patient, in real time in health services, where one of the techniques currently used is real-time identification using biometric techniques.[10]

Biometrics is a field of technological knowledge focused on verifying a person's identity based on an individual's physical, chemical, or behavioral characteristics.[11] Biometric systems generally consist of two main modes: the learning mode, which is also called the registration mode, and the recognition mode, which includes verification or identification. The learning or enrollment mode involves recording a person's physical or behavioral characteristics in a database in the form of a biometric model, also known as a template or signature. The second mode consists of testing the same characteristics and then comparing them with the biometric templates stored in the database. If there was a match between the tested data and biometrics registered in the template, the individual was considered valid and recognized.[12] Some characteristics that can be measured using biometrics include DNA characteristics, facial features or facial recognition, fingerprints, retina and iris patterns, palm geometry, handwriting, images of veins and voice.[13]

Biometric technology, particularly fingerprint scanning, offers a solution that is easier to implement because fingerprint scanners are readily available and easy to use, and have memory requirements with minimal databases. This technology has been effectively used in several public sectors.[14] The use of biometrics to identify patients in the healthcare system is very important and growing rapidly, and has a number of benefits, including helping to handle medical emergencies, preventing and reducing medical errors, and preventing and reducing fraud in health services committed by patients and health facilities.[13,15]

Implementing patient identification in health facilities is important for preventing fraud.[16] Without proper identification, there is a risk of misdirected medical services, the use of fake identity cards, and loss of medical data. Effective identification systems also help reduce medical errors, monitor the misuse of medications, and improve the security of

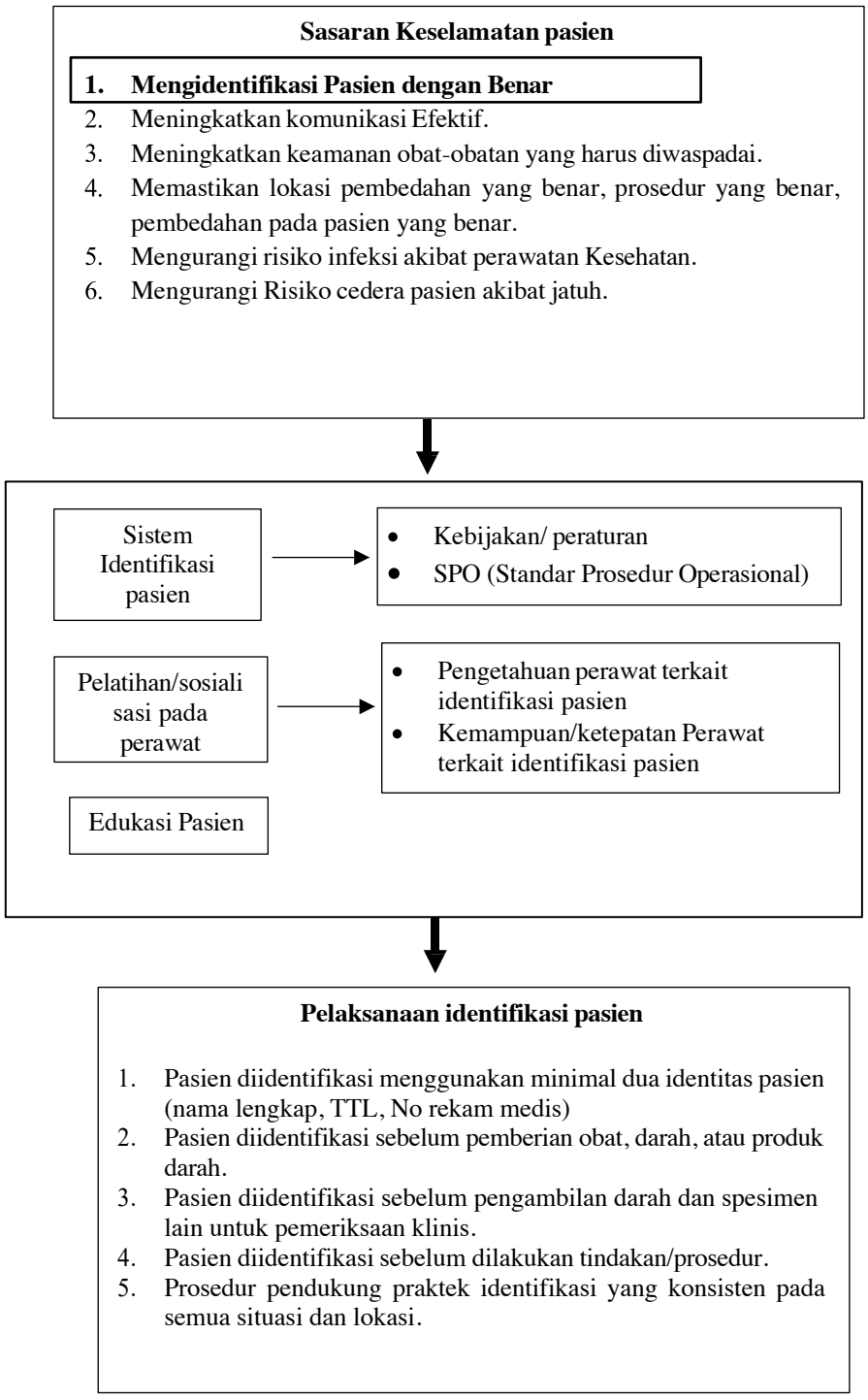
medical information. By implementing a robust identification system, healthcare facilities can improve the quality of their services, reduce fraudulent costs, and strengthen public trust in the healthcare system.[17]

The aim of this study was to assess the evolution of scientific contributions in the field of patient identification. The novelty of this study is important for understanding current trends and potential new discoveries that can help improve patient identification practices in the medical world. In addition, this research can also provide valuable insights into the changing needs and challenges that health professionals face in accurately identifying patients. With a better understanding of existing trends and challenges, innovative solutions can be developed to improve patient recognition practices. This would have a positive impact on the quality of health services and overall patient safety.

METHOD

The research question is focused on the evolution of scientific contributions in the field of patient identification. Researchers used quantitative descriptive methods and a bibliometric approach to conduct this research. The unit of analysis used was a scientific article, and the research data source came from a scientific publication that reviewed patient identification. The Scopus database was deliberately selected, considering its internationally recognized quality and reputation. Scopus also provides aggregate data to show the level of influence of a journal or institution on the world of scientific publications. This is based on the relationship between citations of and from articles published in a journal or by researchers at an institution.[18]

This study used international publication data on patient identification sourced from the Scopus database (www.scopus.com). Data collection was carried out by searching for publications in Scopus using the keywords “patient identification", ”Fraud”, and "patient safety" in the categories of article title, abstract, and keywords from 2018 to 2023. After obtaining the search results, researchers began to delve deeper into the data in the Scopus database to examine research development trends, core journals, researcher productivity and collaboration, publication growth by institution or affiliation, and the number of publications by country. Next, we attempted to visualize the progress of patient identification research using VOSviewer software. This process involves creating a keyword map by exporting search results from the Scopus database into CSV format and then entering the CSV data into the VOSviewer software.



Bagan 2. Kerangka Teori

The data analysis method used in this study employs quantitative and qualitative descriptive approaches. The analysis begins with data processing using the Scopus database via the analysis menu. From this menu, researchers obtain results in the form of statistical data or processed statistics, which are presented graphically in image format (JPEG). Scopus also provides secondary data in CSV format.

Next, the data were processed using Microsoft Excel and VOSviewer. The reason for using VOSviewer is to visualize and analyze the relationship patterns between data obtained from Scopus in greater depth. By using this program, we can produce more comprehensive and detailed visualizations to support our research findings.[19]

The number of scientific publications on patient identification indexed in the Scopus database from 2018 to 2023, totaling 244 documents, is shown in Figure 1.

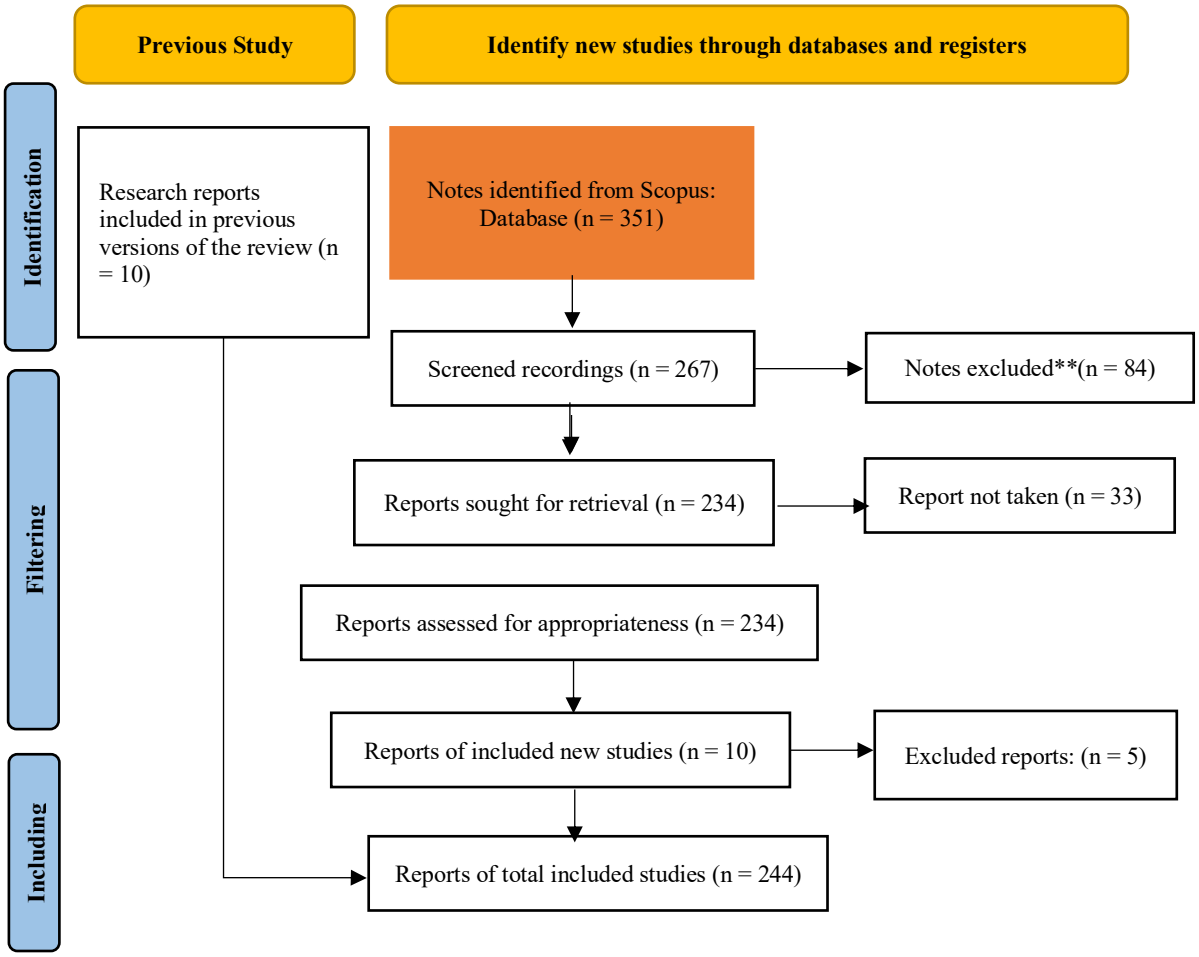


Figure 1. Selection of publications in Scopus [20]

In total, 351 journals were identified in Scopus. Then, a selection was made of the journals to be discussed, namely from 2018-2023, so that 84 journals were published, leaving 267 journals. Of the 267 journals, only journals published in English were selected for the next stage, resulting in 33 journals being released, leaving 234 journals. The latest journals included were 10, bringing the total number of journals that will be discussed to 244.

RESULTS

Table 1 shows that of the 244 publications identified by patients indexed in the Scopus database from 2018 to 2023, 160 were published in journals. Of the 160 journals, the majority were leading international journals. This shows that indexed patient research has received widespread attention from the global scientific community.

Table 1. Trends in Scientific Publications on Patient Identification

Year of Publication	Number of Publications	Percentage (%)
2018	33	13.52%
2019	40	16.39%
2020	43	17.62%
2021	38	15.57%
2022	49	20.08%
2023	41	16.80%
Total	244	100.00%

Table 2 presents the order of the five journals with the highest number of publications. The order of journals was Journal of Patient Safety with seven publications, Revista Brasileira De Enfermagem with six publications, Enfermagem Cogitare with five publications, Revista Gaucha De Enfermagem with five publications, and Transfusion with five publications.

Table 2. Scientific Journal Publications on Patient Identification

Journal Name	Number of publications
Journal of Patient Safety	7
Revista Brasileira De Enfermagem	6
Enfermagem Cogitare	5
Revista Gaucha De Enfermagem	5
Transfusion	5

From Table 3, it can be concluded that Manzo BF was the most productive researcher in terms of scientific publications. Meanwhile, Boni, FG, Caudrelier, J., Cazzato, RL, Coiera, E., Cruz, EddA, DeSimone, CV, Dunbar, NM, Echer, IC and Fong, A. were also quite productive researchers, each with two scientific publications.

Table 3. Number of Productive Researchers Who Have Scientific Publications on Patient Identification

Researcher Name	Number of Publications
Bryan Manzo	3
Fernando Boni	2
Jean-Michel Caudrelier	2
Roberto Luigi Cazzato	2
Enrico Coiera	2
Edda Cruz	2
Antonio DeSimone	2
Nancy M. Dunbar	2
Echer	2
Fong	2

Table 4 shows the affiliates/institutions that were productive in publishing scientific articles on patient identification. At the top of the list are Harvard Medical School with five publications, Federal University of Rio Grande do Sul with five publications, and Brigham and Women's Hospital with five publications. Following them are the Mayo Clinic with four publications, London Imperial College with four publications, University of Toronto with four publications, Federal University do Rio Grande do Norte with four publications, Erasmus MC with four publications, University of Pittsburgh School of Medicine with three publications, and Dartmouth-Hitchcock Medical Center with three publications.

Table 4. Affiliates/Institutions that are Productive in Scientific Publications on Patient Identification

Affiliation/Institution Name	Number of Publications
Harvard Medical School	5
Federal University of Rio Grande do Sul	5
Brigham and Women's Hospital	5
Mayo Clinic	4
Imperial College London	4
University of Toronto	4
Federal University of Rio Grande do Norte	4
Erasmus MC	4
University of Pittsburgh School of Medicine	3
Dartmouth-Hitchcock Medical Center	3

Table 5 shows the order of countries that are productive in publishing scientific articles on patient identification starting from the top: the United States with 74 publications, Brazil with 26 publications, England with 20 publications, Spain with 13 publications, Canada with 12 publications, Germany with 12 publications, China with 11 publications, France with 9 publications, South Korea with 9 publications, and Australia with 8 publications.

Table 5. Countries that are Productive in Scientific Publications on Patient Identification

Country	Number of Publications
United States of America	74
Brazil	26
Great Britain	20
Spanish	13
Canada	12
German	12
China	11
France	9
South Korea	9
Australia	8

Table 6 shows the subjects of scientific publications on patient identification, with the most publications coming from medicine with 211 publications, followed by nursing with 33 publications, biochemistry, genetics, and molecular biology with 16 publications, health professionals with 15 publications, pharmacology, toxicology, and pharmacy with eight publications, social sciences with eight publications, computer science with seven publications, neuroscience with seven publications, manipulation with six publications, and immunology and microbiology with six publications.

Table 6. Subjects of Scientific Publications on Patient Identification

Subject	Number of Publications
Drug	211
Maintenance	33
Biochemistry, Genetics and Molecular Biology	16
Health Professions	15
Pharmacology, Toxicology and Pharmacy	8
Social Sciences	8
Computer Science	7
Neuroscience	7
Manipulation	6
Immunology and Microbiology	6

Collaboration in research is highly expected, so cooperation between researchers and institutions is needed in terms of ideas, funding, facilities, and infrastructure, as well as opportunities to share specific knowledge and techniques in science.[21]. This study found 1500 authors, while there were 30 authors who had strong collaborative relationships with at least two document holdings. A visualization of the authors' collaboration network in this study is shown in Figure 2.

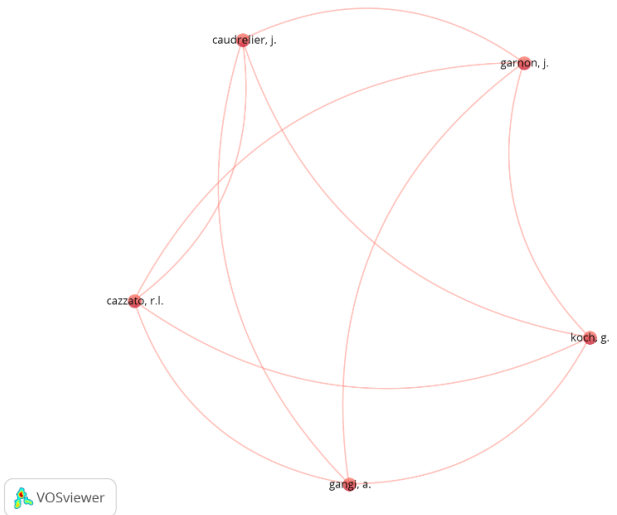


Figure 2. Visualization of Author Collaboration

Keyword analysis in this study was based on 3007 keywords. From these, keywords with a minimum number of occurrences of five were selected, resulting in 233 keywords that had a strong relationship. The keyword most frequently used by writers was human. A visualization of the keyword analysis used in this study is shown in Figure 3. It shows the search results using the keyword patient identification and presents a map depicting the development of research publications on indexed patient identification in the Scopus database from 2018 to 2023, forming four distinct clusters. Cluster 1 is red and consists of 114 keywords, with the top five details being falls due to accidents, adverse drug reactions, attitudes of health workers, awareness, and blood sampling. Cluster 2 is highlighted in green and consists of 70 keywords, with the top five details being adults, adverse device impacts, adverse events, age and aging. Cluster 3, shown in blue, consisted of 33 keywords, with the top five details being teenagers, side effects, articles, children, and clinical articles. Cluster 4, marked in yellow, consists of 16 keywords, with the top five details being blood, electronic medical records, emergency health services, emergency wards, and evidence-based practice. VOSviewer can display keyword density, as indicated by density visualization.

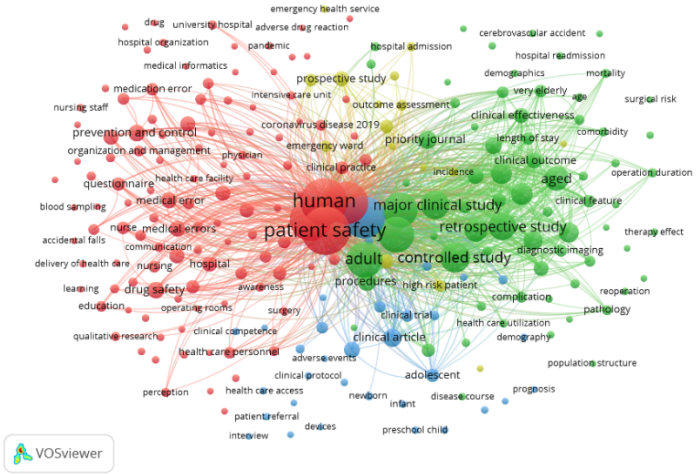


Figure 3. Keyword Visualization

DISCUSSION

Implementing patient identification in health facilities has a significant impact on fraud prevention. [22,23] With an appropriate identification system, health services can be provided to entitled people, thereby avoiding medical services without permission.[24] Patient identification also helps reduce the use of fake identities, which are often used as fraud tools in the healthcare system.[25,26] Effective patient identification can help prevent fraudulent practices such as false health insurance claims, obtaining drugs with fake prescriptions, or misuse of health facilities for personal gain.[27] Therefore, implementing patient identification is a key strategy for maintaining the integrity of the health system. However, challenges arise, particularly in managing and ensuring the accuracy of patient identification data. Ineffective or weak identification systems can create opportunities for fraudulent practice.[28,29] Therefore, it is important to strengthen the identification system with adequate technology, proper staff training, and strict regulations to ensure the security and integrity of the patient data. Implementing patient identification in

healthcare facilities is an important step in protecting patients, reducing financial losses, and ensuring the overall efficiency of the healthcare system as a whole.[28,29]

Of the 244 publications related to patient identification indexed in the Scopus database from 2018 to 2023, 160 were published in journals. Of the 160 journals, the majority were leading international journals. This shows that indexed patient research has received widespread attention from the global scientific community has had a significant impact on both academic and global health. This also shows that collaboration between countries and institutions is becoming increasingly important for addressing complex health challenges. Indexed patient research also strengthens the scientific reputation and credibility of the institutions involved. With its publication in leading international journals, indexed patient research can make a valuable contribution to the development of science and clinical practice worldwide.[28,29] Collaboration across countries and institutions can also help exchange valuable knowledge and experience to improve global health.[30] Thus, indexed patient research is not only beneficial for the institutions involved but also for the wider community that will benefit from the results of the research.[31–34]

The order of journals was as follows: Journal of Patient Safety with seven publications, Revista Brasileira De Enfermagem with six publications, Enfermagem Cogitare with five publications, Revista Gaucha De Enfermagem with five publications, and Transfusion with five publications. Additionally, these journals demonstrate a high level of quality and relevance in the field of nursing. This shows that the topics discussed in these journals had a significant impact on the development of nursing science. Research published in these journals can be used as an important reference by nurse practitioners and researchers to continue developing this field. Collaboration among nursing experts from various countries can be further improved to achieve better global nursing standards.[35–39]

Countries leading in scientific publications on patient identification are the United States with 74 publications, Brazil with 26 publications, England with 20 publications, Spain with 13 publications, Canada with 12 publications, Germany with 12 publications, China with 11 publications, France with 9 publications, South Korea with 9 publications, and Australia with 8 publications. These countries have made significant contributions to patient identification research. Scientific publications from these countries can be used as references for further developing knowledge in this field. The information obtained from these scientific publications can help improve the understanding of patient identification in various countries. Collaboration among countries in research can also enrich knowledge and best practices in this regard. Collaboration between countries in patient identification research can strengthen international cooperation and knowledge exchange. Thus, efforts to improve the quality of health services related to patient identification can be undertaken globally.[40–45]

The medical discipline was the most prominent in publications related to patient identification. In addition, nursing has made a significant contribution in terms of the number of publications. From these data, it can be concluded that research related to patient identification tends to be dominated by the medical and nursing disciplines. This shows the importance of collaboration between these two fields in improving the quality of health services. Collaboration between medicine and nursing in patient identification research

can provide a comprehensive understanding of health problems.[46–49] Joint efforts between these two disciplines are required to develop more effective and efficient patient identification methods.

With collaboration, research can be of higher quality and have a positive impact on the development of science. The author's collaboration visualization also provides a clear picture of the relationships between the researchers in the project. Thus, collaboration between researchers is an important factor in producing high-quality research. In addition, visualization of the authors' collaboration can provide inspiration for other researchers to collaborate on future projects. Collaboration between researchers can also help in a wider exchange of ideas and knowledge, thereby enriching research results. Thus, visualization of author collaboration is not only important for showing relationships between researchers but also for encouraging closer collaboration in the future.[50–57]

CONCLUSIONS

The development of international scientific publications regarding patient identification from 2018-2023 in Scopus was the highest in 2022, reaching 49 publications (20.08%). Most of the scientific publications on patient identification were published in the Journal of Patient Safety, which featured seven articles; Manzo, B. F. is the most prolific author on patient identification, with three publications: Harvard Medical School, Federal University of Rio Grande do Sul and Brigham, and Women's Hospital are the most productive affiliates/institutions, which has five scientific publications on patient identification. The United States is the most productive country in scientific publications on patient identification with 74 publications. Medicine had the highest number of publications (211). Thirty authors had strong relationships with at least two document holdings. The keyword most frequently used by writers was human.

RECOMMENDATION

The recommendation was to further explore the relationship between patient identification and medical research, as well as to consider the impact of different countries and institutions on this topic. Additionally, it may be beneficial to investigate the reasons behind the strong relationships between certain authors in this field.

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