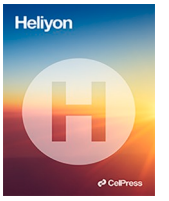
Heliyon 10 (2024) e36701

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon



Review article

Global trends and hotpots in standardised patients research in the last 30 years: A bibliometric analysis

Beilei Lin [a], Yujia Jin [a], Yunjing Qiu [b], Jing Chen [a,*], Zhiguang Ping [c], Lanlan Zhang [d]

[a] Nursing and Health School, Zhengzhou University, No 100 Science Avenue, Zhengzhou City, Henan Province, 450001, China
[b] School of Nursing & Midwifery, Faculty of Health, University of Technology Sydney, Australia
[c] Public Health School, Zhengzhou University, China
[d] Hangzhou Fuyang Sunshine Geriatric Hospital, China

ARTICLE INFO

Keywords:
Standardized patients
Medical education
Nursing
Bibliometric analysis

ABSTRACT

Background: The research trends regarding standardised patients(SPs) in the education of health professions students have not been systematically studied.
Methods: All published literature on SPs from January 1994 to January 2024 in Web of Science was screened by two reviewers. Bibliometric analysis and knowledge mapping visualisation analysis were performed using Cite Space software. The country, institution, journal, keyword co-occurrence, and keyword emergence were visualised.
Result: A total of 3259 records were analysed. The amount of relevant literature in the past 30 years showed an upward trend involving 109 disciplinary categories, with the United States dominating. The five central research teams were from the United States and Canada. Nursing education is increasingly using SPs, especially in advanced nursing practice. As for the hotspot and trend analysis, the results indicate that there is still continuous attention to the impact of applying standardised patients on improving the communication ability, competence and performance of medical students. Additionally, there is a growing interest in exploring the application of visual simulation or artificial intelligence in standardised patient-related research.
Conclusions: Research on SPs' has received continued attention. To cater to the diverse requirements of education and clinical context, there is a need for further exploration of SPs utilisation. AI-relevant SPs might be a new alternative for various scenarios in the future.

1. Introduction

Standardised patients (SPs) have been widely used in medical education to improve students' communication skills, optimise teaching resources, and promote simulation learning [1–3]. An SP is a simulated patient who is an ordinary person or a mildly ill patient engaging in non-medical or technical work [4]. After systematic and standardised training, SPs can accurately present clinical signs, symptoms, and medical history. They fulfil three essential roles: acting as patients, assessors, and teaching instructors [4,5]. To date, medical educators are exploring the role of SPs in various educational areas, including the Advanced Practice Nurses (APNs) curriculum [5], training of genetic counseling trainees [6], and health assessment courses [7]. Moreover, SPs have even been used to

* Corresponding author.
E-mail addresses: linbeilei@zzu.edu.cn (B. Lin), jinyujia00@163.com (Y. Jin), yunjing.qiu@uts.edu.au (Y. Qiu), chj@zzu.edu.cn (J. Chen), ping_zhg@163.com (Z. Ping), 21218084@zju.edu.cn (L. Zhang).

https://doi.org/10.1016/j.heliyon.2024.e36701
Received 13 February 2024; Received in revised form 5 August 2024; Accepted 20 August 2024
Available online 23 August 2024

assess the quality of diabetes care provided by primary care providers in rural areas [8], and the quality of tuberculosis care in hospitals [9]. Past research showed that standardized patients are still the most popular simulation approach(as role-play, virtual, manikin et al.) adopted for continuing professional development [10], healthcare quality research [11] and clinical practice [12]. It has been shown to effectively improve medical students' communication and empathy skills [13], and transgender cultural competence [14]. Meanwhile, the existing reviews have confirmed the effectiveness of the simulation design characteristics on students' communication competency, clinical skills and mental health outcomes.

However, the application of standardized patients in different countries and regions of the world is not synchronized. Since being introduced by Barrows and Abrahamson at the University of Southern California in 1964, SPs have been increasingly used in various fields of health professions education [15]. In many developed countries the United States of America (USA), Canada, and Australia [16,17], SPs have been widely used in medical education. This approach primarily address the growing shortage of educational resources relative to demand. Although ongoing research indicates promising developments in the application of SPs wordwide [11], it was not until 1993 that the first SPs were trained and used in low and middle-income countries(LMIC) like China [18].

The use of SPs as a supplement to teaching remains of widespread concern [5]; however, continuing challenges to their widespread adoption remain, including patients' recruitment, training, and application [19]. Additional challenges include determining compensation, maintaining confidentiality, and ensuring cultural competence [20]. From a survey of 94 medical institutions, 94.68 % supported nationwide standardisation of SP training to enhance their contribution to medical education, yet only 43.62 % of these units had implemented SP programs [21]. Therefore, SPs has been widely used, but its application scenarios, uses and effect evaluation are more diverse. Bibliometric analysis and mapping have developed rapidly in recent years, as the scientific community is increasingly interested in the results of various bibliometric analyses, which can help to create a comprehensive map of the available evidence in a field of study. Given the importance of SPs to medical instruction [4,22], it is necessary to understand the current state of research regarding SPs from a global and comprehensive perspective. And, to the best of our knowledge, no previous study has systematically analysed this field of research using bibliometric analysis. This study aim to provide an overview and cluster analysis of SPs relevant publications included in the Web of Science (WOS) database. This study seeks to reveal the development trends and research frontiers of this field and provide references for the reform and development of international medical education.

2. Methods

2.1. Data collection

Data was retrieved from the WOS database using a subject term search for SPs with a search strategy of TS1= ("standardised patients" OR "role play" OR "acting OR mock clinic") AND TS2= ("education" OR "assessment" OR "learning" OR "exam" OR "competency"). The literature types were limited to articles, reviews, and early access. Publication language was limited to English, where TS was the subject and * was the truncated search wildcard. The search scope included the Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), and Emerging Sources Citation Index (ESCI). The search period was from January 1994 to January 2024. After applying the inclusion criteria and conducting thorough search and de-duplication processes, a total of 3259 valid records were included for analysis. All the bibliographic data was imported into the dataset for subsequent analysis.

2.2. Data analysis

This study used bibliometric analysis techniques to fulfil its purpose. CiteSpace can be translated as "citation space" and is a mapping and visualisation software program used for bibliometric analysis. Chaomei Chen's team from Drexel University developed it [23,24]. The software is embedded with various bibliometric analysis methods, such as co-occurrence analysis, buster word analysis, and co-citation analysis. These methods help researchers quickly extract general information from article titles, abstracts, keywords, authors, and publication institutions and visualise knowledge in the form of nodes and lines to obtain the mainstream research teams, research bases, research frontiers and development trends. In this study, CiteSpace version 5.8.R1 was used for data analysis.

2.2.1. Basic characteristics analysis

The basic literature information was exported and entered into an Excel spreadsheet. We conducted the general analysis from various attributes such as year of publications, subjects, disciplines, countries/regions, institutions, published journals, authors, and citation status.

2.2.2. Keyword co-occurrence analysis

The simultaneous occurrence of two or more keywords in the same literature is called keyword co-occurrence [23]. The frequency of any two keywords appearing together was calculated through pairwise statistics of keywords appearing in the literature. The co-occurrence of keywords describes a research field's composition and structure, enabling clustering and analysis. CiteSpace software was used to draw a knowledge map of keyword co-occurrence and combined high-frequency keywords to present a clearer picture of field research hotspots. This paper analyses the keyword co-occurrence analysis of SP research fields. We rank and cluster the co-occurring keywords and the research hotspots of SPs in the past three decades.

2.2.3. Burst word analysis

CiteSpace software can also detect and analyse trends at the frontiers of research [23,25]. Based on burst detection algorithms,

citation titles, abstracts, keywords, and index terms are scanned to identify terms that appear more frequently over a short period or experience a significantly higher growth rate in frequency of use. These bursts have dynamic change characteristics and can better reflect new perspectives, theories, or methods in the field of knowledge, which represents a frontier of disciplinary research [26]. We arrived at these measurements based on a search of highlighted terms in the subject literature to understand the current state and trends in the research around SPs.

2.2.4. Co-citation analysis

Co-cited literature in CiteSpace software represents the foundation of the research field [23,25]. Analyzing the citation frequency of literature of a field can indicate which literature is considered canonical at a high level. References cited more frequently were selected based on such clusters, and these articles were read closely to understand the current research frontiers around SPs [27].

3. Results

3.1. Trends of publications years

Since the first paper of SPs was published within WOS, the number of relevant studies has continuously increased in the last 30 years. Although the total number of publications per year is not very large (Fig. 1).

3.2. Distribution of countries/regions and cooperation network

The top 10 countries/regions in terms of article volume are shown in Table 1. In depth, we analysed the articles issued and cited in each country/region. American scholars published the most frequently cited article in the Quality & Safety in Health Care in 2004—a total of 1055 citations [28]. The mapping of national collaborative networks, obtained using visual analysis, confirms the USA's central role in research due to its pioneering role in the SPs teaching strategy. The USA remains dominant in international collaborations, boasting an extensive network of collaborative relationships with various countries (Fig. 2).

3.3. Distribution of research disciplines

With the analysis function of WOS, this study found that SPs involved 109 disciplines. These disciplines primarily focus on educational research, health care science, nursing, internal medicine, public environment occupational health, surgery, psychology, psychiatric science, social science, pharmacology, and more. The number of articles issued in the top 10 disciplines in the ranking is shown in Table 2.

3.4. Distribution of published journals

By analysing the published journals of the detected literature, we summarised the top 10 journals based on the number of articles issued. It can be seen that the overall quality of SPs relevant publications is high. The included journals were more authoritative (more information is available in Table 3).

3.5. Author cooperation analysis

The node type was set to the author, the threshold was Top 50, and the CiteSpace software was run to obtain the author partnership network. The overall map showed that the SPs relevant research power was more fragmented, so only the knowledge map that retained

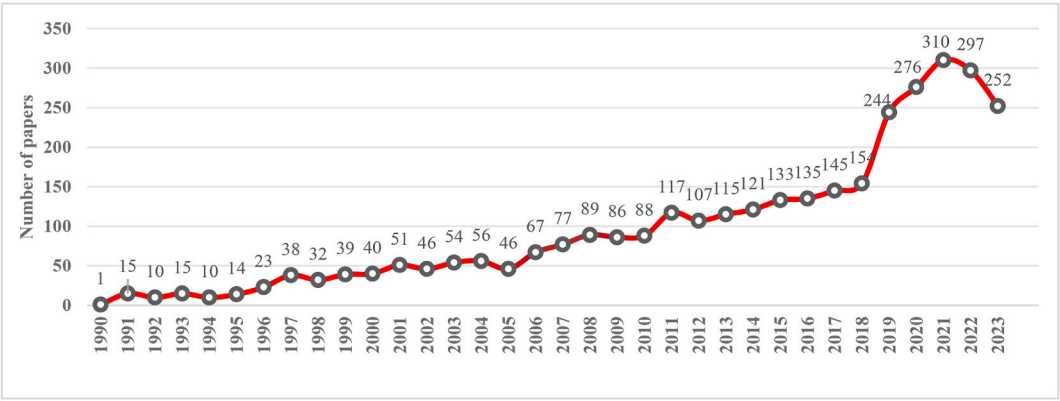


Fig. 1. Annual trend of publications in WOS from 1990 to 2023.

Table 1
Top 10 countries/regions in terms of SP-related publications.

Rank	Country/Region	Number of publications
1	USA	1711
2	England	282
3	Canada	260
4	Australia	241
5	Germany	136
6	Netherlands	120
7	China-Mainland	75
8	South Korea	60
9	Spain	60
10	China-Taiwan	60

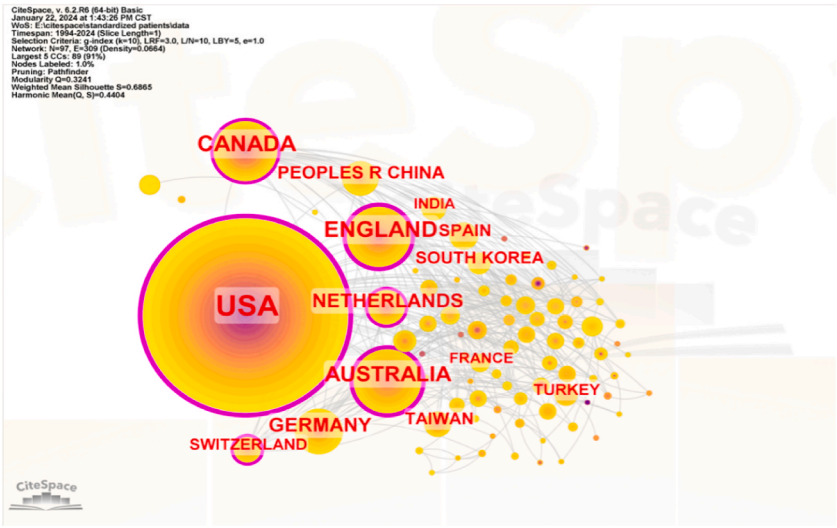


Fig. 2. Visual mapping of the cooperation network (Note: circle represents country/regions; link represents cooperation network).

Table 2
Top 10 disciplines in terms of SPs-related publications.

Rank	Disciplines	Numbers
1	educational research	1241
2	health care science	660
3	nursing	434
4	internal medicine	280
5	public environmental occupational health	238
6	surgery	136
7	psychology	233
8	psychiatric science	173
9	social science	124
10	pharmacology	105

the stable cooperative team relationship of more than five authors was extracted. The five extracted teams included four from the USA and one from Canada. The field of SPs research teams at New York University was more stable and had reported a series of research results, as shown in Fig. 3(a–e).

3.6. Keywords co-occurrence and burst

The analysis of high-frequency keywords provides insights into the research hotspots in the field. By setting the node type as 'Keyword' and configuring the appropriate parameters, we enabled keyword co-occurrence network mapping. This mapping was acquired using CiteSpace software (refer to Fig. 1 in the supplementary materials). There were 272 nodes and 1340 links. The node's size indicates the frequency of the keyword, and the thickness of the linkage between the nodes represents the frequency of the keyword. The larger the circle behind the word in the whole graph, the higher the word frequency. The log-likelihood ratio (LLR)

Table 3
Top 10 journals for total SPs-related research.

Rank	published journals/country	Numbers
1	ACADEMIC MEDICINE/USA	106
2	BMC MEDICAL EDUCATION/UK	97
3	MEDICAL TEACHER/UK	88
4	CLINICAL SIMULATION IN NURSING/USA	87
5	PATIENT EDUCATION AND COUNSELING/UK	74
6	MEDICAL EDUCATION/UK	65
7	AMERICAN JOURNAL OF PHARMACEUTICAL EDUCATION/USA	64
8	TEACHING AND LEARNING IN MEDICINE/USA	63
9	NURSE EDUCATION TODAY/UK	62
10	JOURNAL OF GENERAL INTERNAL MEDICINE/USA	54

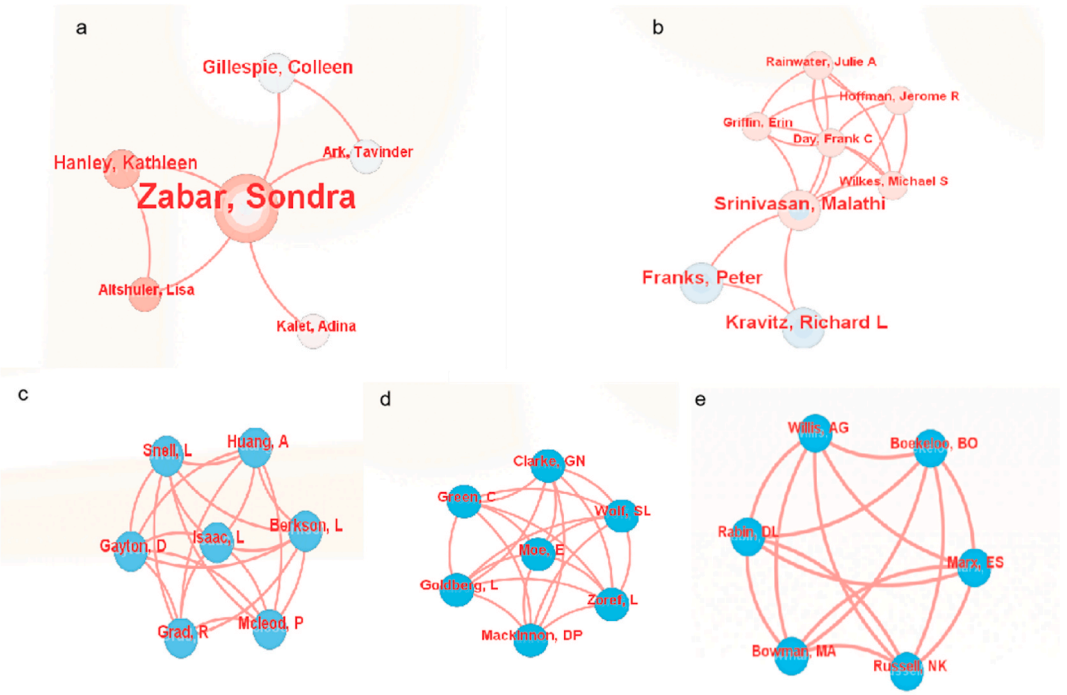


Fig. 3. Visualisation of authorship partnerships and research teams (Note: a, USA - (New York University); b,USA - (Stanford University); c,Canada - (McGill University); d,USA - (Oregon Health & Science University); e, USA - (University of Maryland).

algorithm was used to calculate the keyword co-occurrence network, and representative clusters were selected in numbered order (Fig. 4).

In addition, the Keyword timeline view was mapped in Fig. 5 to understand the changing trends of relevant studies. The keyword timeline view can reflect the change of research content in a specific research field over time. The results show that before 2010, the clustering keywords of related literature around standardised patients were the most intensive, including medical students, clinical competence, care, skill assessment, doctor-patient communication, OSCE, etc. After 2010, the number of clustering keywords decreased, but the research was more detailed. The research content from 2010 to 2020 mainly focuses on perception, palliative care, smoking cessation, nursing education, active learning and interprofessional education, nursing education, virtual reality, self-efficacy, etc. Since 2020, research on standardised patients has focused on virtual reality, mental health, pharmacy education, artificial intelligence, anamnestic interview and other directions.

3.7. Burst terms analysis

The synonym can be used to understand the research trends and the transfer of research hotspots in different periods, including the start time, end time, and intensity of mutation, with higher intensity indicating a more significant influence. This facilitated the analysis of the changing trends in SP research frontiers, as shown in Fig. 6.

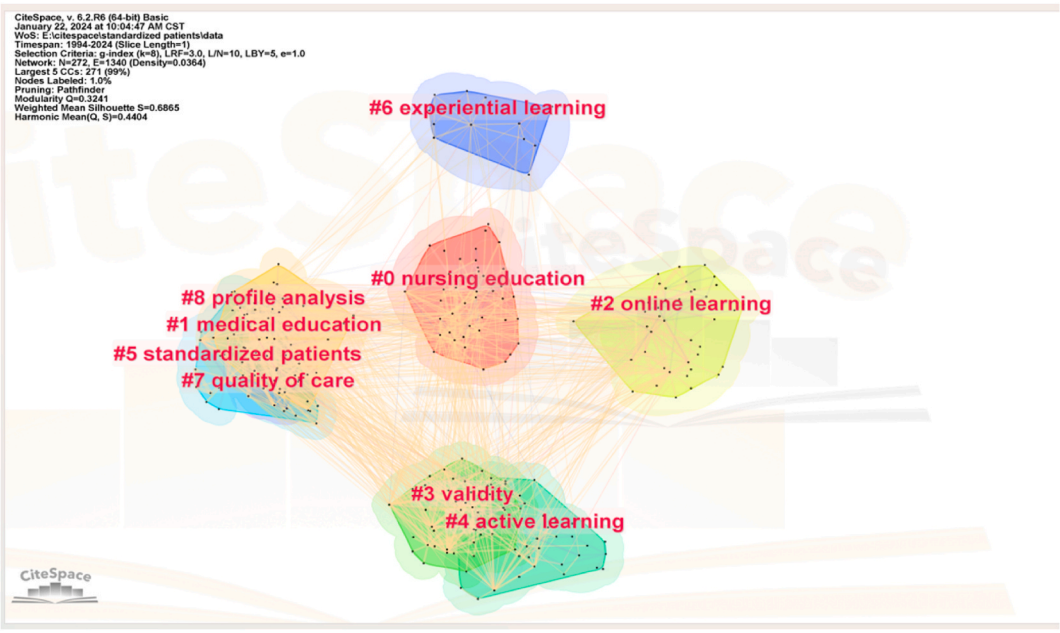


Fig. 4. Major clusters of keywords.

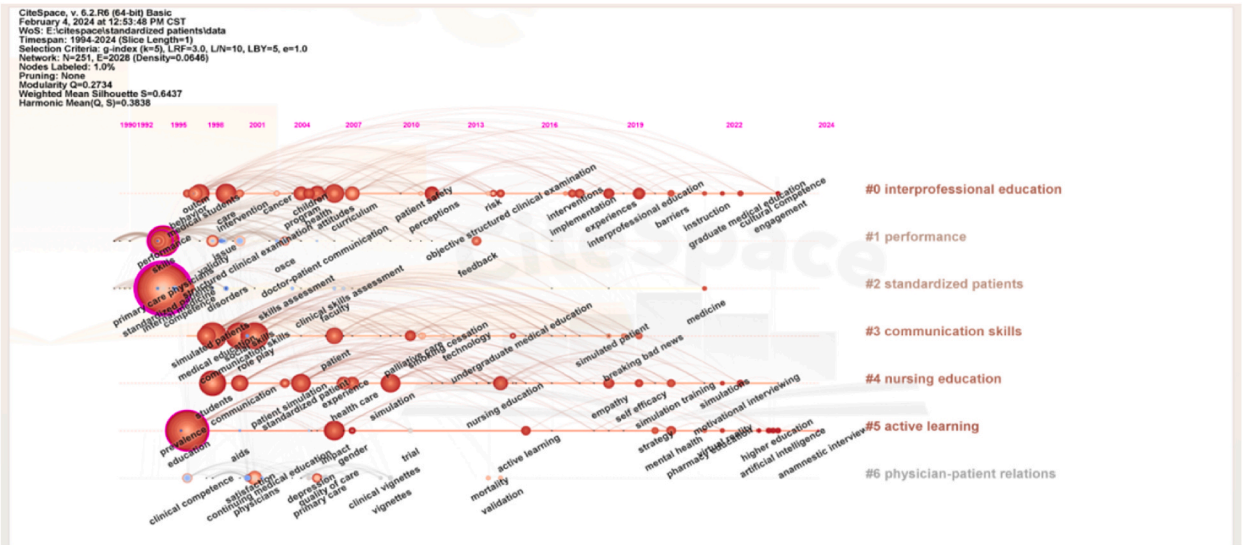


Fig. 5. Keywords timeline view.

3.8. Publications co-citation analysis

Fig. 7 shows the literature's co-citation network knowledge graphs. Based on the size of the nodes in the graphs, the most prominent was an article [29] by an American scholar published in *Advances in Simulation* in 2017 [30]. It defined the Association of Standardized Patient Educators (ASPE) Standards of Best Practice (SOBP) with 56 citations, indicating its significant scholarly impact.

4. Discussion

The overview of the number of annual publications and collaborations of SP-related research shows that the overall attention to SP-related research is still on the rise worldwide. This trend has been particularly notable since the coronavirus disease 2019 (COVID-19) pandemic, as most schools have reintroduced the use of SPs [2,31]. Since 1994, the distribution of research countries/regions in the USA has accounted for more than 50 %. This suggests that the USA is dominant in the SPs research field. Moreover, the top 10 journals

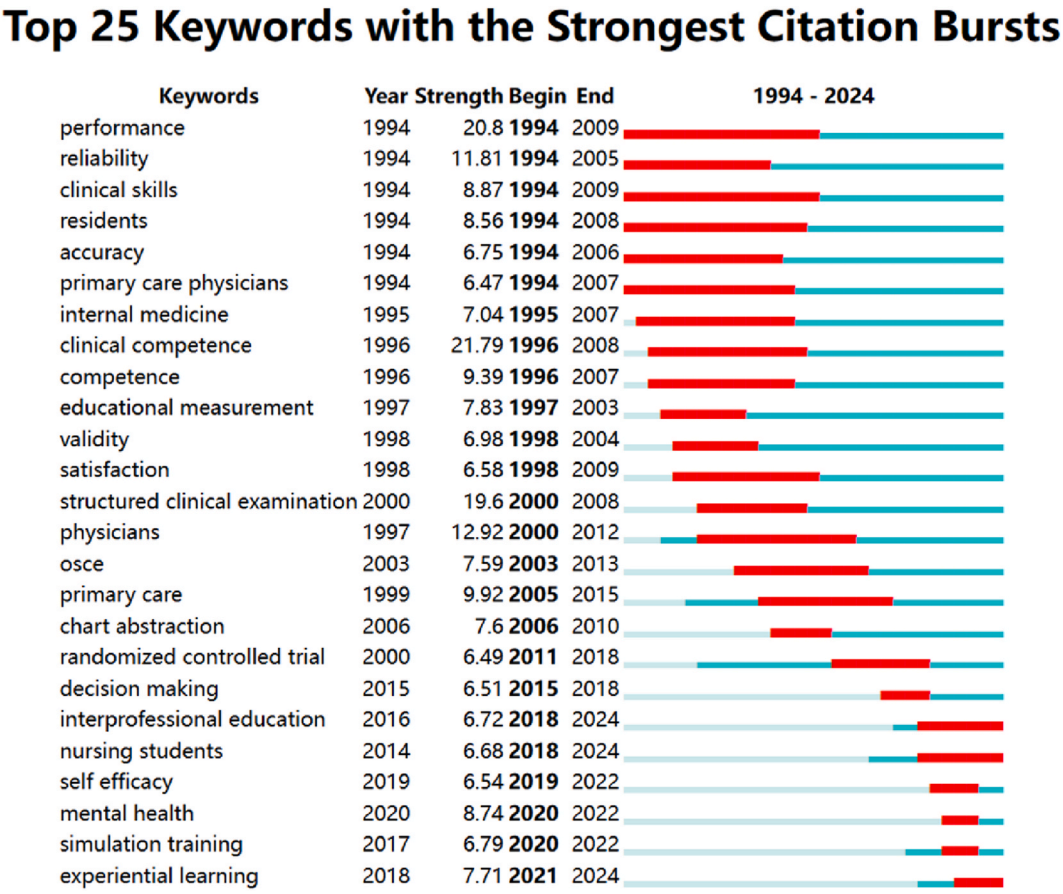


Fig. 6. Evolution of SP-related studies highlighting words.

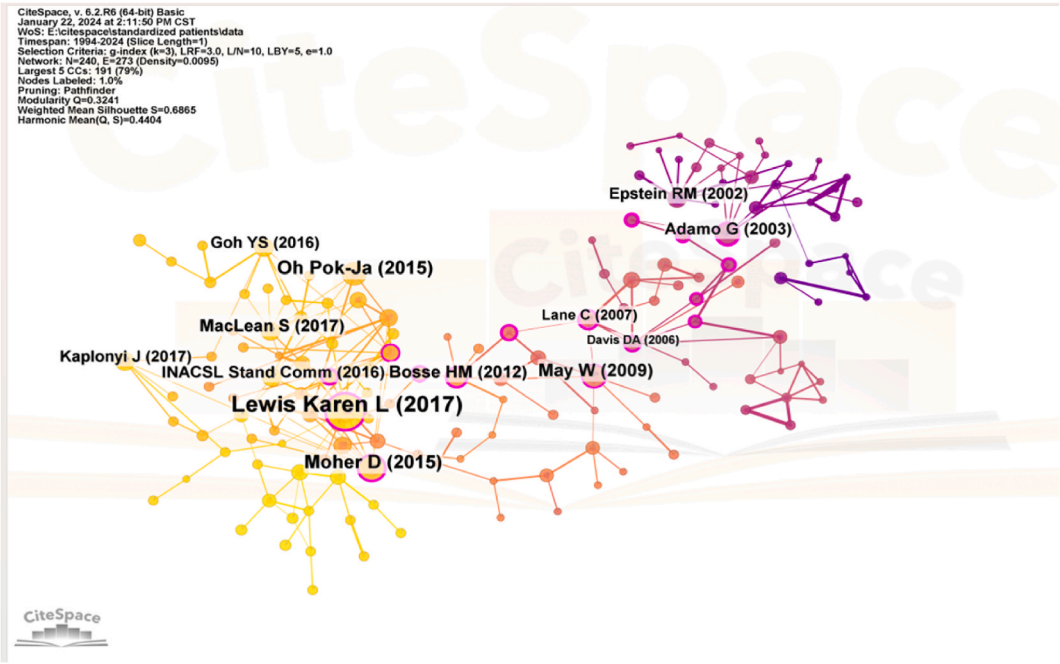


Fig. 7. Publications co-citation map.

with the most publications are all from the USA(50 %) and the UK(50 %), reflecting the close link between their origin and the prominence of medical education in developed nations [32,33]. In addition, only two nursing-specific journals are in the top ten list, and this noticeable distinction persists in the perceived value and recognition of related research between the medical and nursing fields. This disparity could be attributed to the early adoption of SPs in medical education compared to nursing education [5]. The small number of nursing journals in the international arena could contribute to this divergence [33]. Additionally, what stands out from the analysis is the increasing use of technology, like virtual reality, artificial intelligence, anamnestic interview, etc. However, the gradual increase in the variety of disciplines involving SPs indicates that this educational model is not limited to research in medicine or pedagogy but is also an interdisciplinary research topic [31].

As for research teams, it is evidence that the USA holds a dominant position. This WOS-based analysis found only a few stable collaborative teams globally. Countries with substantial publication output include the USA and Canada. Among them, two representative teams with the most collaborative publications are based in the USA, boasting eight and six publications, respectively. While the most frequently cited article (1055 times) published in 2003 was also written by American scholars [28]. Notably, among these publications, the work by Triola, M et al. [34] garnered the highest citation count at 151, followed by the study by Fiscella, K et al. [35] with 80 citations. Countries with concentrated efforts in nursing research and substantial publication output include Turkey [36], Canada [37], and USA [38], with only 2, 1, and 2 collaborative publications, respectively, and Canadian scholars with 113 citations. The visualisation of inter-country collaborations further supports the central and dominant position of the USA in SPs research while also highlighting the urgency to establish collaborative relationships with other countries/regions.

The existing research evidence also emphasizes the need to establish more stable research groups around SPs. Corresponding with the developmental trends of SPs in developed countries, SPs have also been favoured and widely used by medical educators in LMICs. Chinese scholars began to focus on SPs' training research in 2002 to address the lack of SPs [21]. A recent survey found that approximately 50 % of colleges and hospitals are conducting SPs programs [22], and upwards of 94 % of surveyed units expressed the need for SPs. However, notable issues such as the absence of a prominent research team continue to draw attention. The quality and depth of research still need to be improved. Therefore, there is a high demand but a lack of standardised training mechanisms and application models [21,22,31,39].

Analysing research trends and keywords helps understand the research hotpots and development process and predict future research topics [23,24]. The co-occurrence of keywords showed that" standardised patients" appeared most frequently, followed by their more frequent occurrence in words such as education, communication skills, medical education, role play, competencies, performance, etc. The representative categories include nursing education, medical education, online learning, validity, active learning, standardised patients, experimental learning, etc. Then, the temporal variation characteristics of keywords were further analysed. Before 2010, specific keywords such as medical students, clinical competence, care, skill assessment, doctor-patient communication, and OSCE were frequently used. While between 2010 and 2020, the research mainly focuses on perception, palliative care, smoking cessation, nursing education, active learning and interprofessional education, virtual reality, and self-efficacy. After 2020, researchers focused on virtual reality, mental health, pharmacy education, artificial intelligence(AI), anamnestic interview, etc. This suggests that the SPs research field is relatively broad, especially around situations, sites, and populations where the risk is high or the clinical environment is inaccessible to start practice. However, SPs are consistently being focused and developed. The emergence of hotspots such as interprofessional, AI, and virtual models suggest innovative approaches for interprofessional cooperative education and distance learning models [40].

Besides keyword co-occurrence, burst terms analysis could provide insight into trends and development [23,24]. Performance, clinical competence, physicians, and reliability were extracted with higher strength, representing continued strong influence and attention. This also represents that the application of standardised patients is still more concerned about improving students' ability and pays more attention to its practical application effect. These results are similar to those reported in reviews [4,31]. In addition, some terms that emerged recently could represent the research trends as well, and it is clear that the topics of interprofessional education, nursing students, self-efficacy, mental health, simulation training and experimental learning have aroused new attention in the last five years since 2018. The analysis of emergent words suggests that future research can continue exploring innovative studies around these areas to meet teaching and learning needs better.

5. Strengths and limitations

In this study, we collected data and analysed it from a global perspective, thus obtaining the overall distribution and hotspots of SPs relevant research. However, it is essential to acknowledge that this study still has some limitations. First, this study's bibliometric and content analysis represents only one aspect of the scholarly debate on this topic. The publications in other databases were not included in the sample. Lastly, the methodology of the bibliometric and content analysis approaches may have missed certain types of publications or trends that are outside their scope, which might affect the comprehensiveness and integrity of the research results.

6. Conclusions

This study interpreted and visualised the relevant literature in SPs over the last 30 years. It examined the foundation, hot spots, and trends in medical education. This research helps clarify the pulse of relevant theoretical research, grasp the research frontier, and provide a reference to carry out in-depth SPs-related research and promote the global development of medical education research teams. Currently, the research, application, and promotion of SPs programs are relatively limited, and it is necessary to carry out a comprehensive survey to evaluate the current situation, needs, obstacles, and bottlenecks of the application of SPs in institutions. This

adopted hybrid research method evaluates the current situation, needs, obstacles, and bottlenecks of SPs in institutions for multiple medical specialities. The expansion of SPs applications and the rapid advancement of medical information have prompted a significant challenge. As the investigation into SPs utilising novel technologies gained prominence, emerging as a focal point of interest within medical education and various academic disciplines. Although the systematisation of foreign studies is not ideal, their in-depth and representative studies are more authoritative. This research systematically analyses the latest developments in global SPs education research, which is beneficial for readers to understand the whole picture of SPs research and provides references for researchers to conduct further and targeted research.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Funding

This work was supported by Postgraduate Education Reform and Quality Improvement Project of Henan Province (Grant number YJS2024AL011/YJS2024KC05).

Data availability statement

Data will be made available on request.

CRediT authorship contribution statement

Beilei Lin: Writing – review & editing, Writing – original draft, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Yujia Jin:** Formal analysis, Data curation. **Yunjing Qiu:** Writing – review & editing. **Jing Chen:** Writing – review & editing, Project administration, Funding acquisition, Conceptualization. **Zhiguang Ping:** Methodology. **Lanlan Zhang:** Software, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We would like to thank funder and research teams that were included.

List of abbreviations

SP	standardised patient
USA	United States of America
UK	United Kingdom
APN	Advanced Practice Nurse
WOS	Web of Science
SCI-EXPANDED	Science Citation Index Expanded
SSCI	Social Sciences Citation Index
ESCI	Emerging Sources Citation Index
LLR	log-likelihood ratio

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e36701.

References

[1] L. O'Kane, J.V. Guarrera, K.E. Lunsford, Standardized patient-centered approach to perioperative antibiotics in liver transplantation, Transplantation 108 (5) (2024) 1068–1069.
[2] T. Rutherford-Hemming, A. Herrington, T.P. Ngo, The use of standardized patients to teach communication skills-A systematic review, Simul Healthc 19 (1S) (2024) S122–S128.
[3] L. Zhang, et al., Quality in screening and measuring blood pressure in China's primary health care: a national cross-sectional study using unannounced standardized patients, Lancet Reg Health West Pac 43 (2024) 100973.
[4] H.S. Barrows, An overview of the uses of standardized patients for teaching and evaluating clinical skills, AAMC. Acad Med 68 (6) (1993) 443–451. ; discussion 451-3.
[5] C.M.S. Chua, et al., Content and characteristics of evidence in the use of standardized patients for advanced practice nurses: a mixed-studies systematic review, Nurse Educ. Today 120 (2023) 105621.
[6] C. Lowe, D.L. Roter, Genetic Counseling Students' Use of Patient-Centered Communication Skills Predicts Standardized Patient Satisfaction during Virtual Simulated Sessions, 2022.
[7] T. Zerilli, B.D. Fidler, C. Tendhar, Assessing the impact of standardized patient encounters on students' medical history-taking skills in practice, Am J Pharm Educ (2022) 8989.
[8] Y. Wu, et al., Using standardized patients to assess the quality of type 2 diabetes care among primary care providers and the health system: evidence from rural areas of western China, J Genet Couns 10 (2022) 1081239.
[9] J. Das, et al., Use of standardised patients to assess quality of tuberculosis care: a pilot, cross-sectional study, Lancet Infect. Dis. 15 (11) (2015) 1305–1313.
[10] L. Bray, T.B. Krogh, D. Østergaard, Simulation-based training for continuing professional development within a primary care context: a systematic review, Educ. Prim. Care 34 (2) (2023) 64–73.
[11] A. Kwan, et al., Use of standardised patients for healthcare quality research in low- and middle-income countries, BMJ Glob. Health 4 (5) (2019) e001669.
[12] J.J. Rethans, et al., Unannounced standardised patients in real practice: a systematic literature review, Med. Educ. 41 (6) (2007) 537–549.
[13] C.E. Grossman, et al., Improv to improve medical student communication, Clin. Teach. 18 (3) (2021) 301–306.
[14] A.X. Mukund, et al., Teaching transgender cultural competency with standardised patients, Med. Educ. 58 (5) (2024) 648–649.
[15] H.S. Barrows, S. Abrahamson, The programmed patient: a technique for appraising student performance in clinical neurology, J Med Educ 39 (1964) 802–805.
[16] A. Gamble, M. Bearman, D. Nestel, A systematic review: children & Adolescents as simulated patients in health professional education, Adv Simul (Lond) 1 (2016) 1.
[17] K. Wilbur, A. Elmubark, S. Shabana, Systematic review of standardized patient use in continuing medical education, J Contin Educ Health Prof 38 (1) (2018) 3–10.
[18] X. Zhao, et al., Application of standardized patients to the assessment of clinical skills of medical students, China Higher Medical Education (2) (1993) 10–13+48.
[19] H.X. Yang, Y. Xu, N.X. Liang, Standardized patient methodology in mainland China: a nationwide survey 19 (1) (2019) 214.
[20] A. Kwan, Implementing quality of care measures: lessons from a standardized patient study in seven provinces of China, Am J Public Health 112 (6) (2022) 818–820.
[21] M. He, et al., Investigation on present status and problem analysis of standardized patients and standardized patient educators in China, Chinese Journal of Medical Education Research 20 (6) (2021) 718–722.
[22] J. Li, et al., Progress in the applications of standardized patients in medical education and healthcare research, Chinese Journal of Hospital Administration 36 (1) (2020) 72–76.
[23] M.B. Synnestvedt, C. Chen, J.H. Holmes, CiteSpace II: visualization and knowledge discovery in bibliographic databases, AMIA Annu Symp Proc 2005 (2005) 724–728.
[24] C. Chen, et al., Citespace I: detecting and visualizing emerging trends and transient patterns in scientific literature, J. China Soc. Sci. Tech. Inf. (28) (2009) 401–421.
[25] J. Li, C. Chen, Citespace Technology Text Mining and Visualization, second ed., Capital University of Economics and Business Press, Beijing, 2017.
[26] C. Chen, et al., Emerging trends in regenerative medicine: a scientometric analysis in CiteSpace, Expert Opin Biol Ther 12 (5) (2012) 593–608.
[27] S.P. Upham, H. Small, Emerging research fronts in science and technology: patterns of new knowledge development, Scientometrics 83 (1) (2010) 15–38.
[28] E.A. McGlynn, et al., The quality of health care delivered to adults in the United States, N. Engl. J. Med. 348 (26) (2003) 2635–2645.
[29] K.L. Lewis, et al., The association of standardized patient educators (ASPE) Standards of best practice (SOBP), Adv Simul (Lond) 2 (2017) 10.
[30] J.W. Peabody, et al., Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality, JAMA 283 (13) (2000) 1715–1722.
[31] O.L. Flanagan, K.M. Cummings, Standardized patients in medical education: a review of the literature, Cureus 15 (7) (2023) e42027.
[32] Y. Wang, et al., Visualization analysis of teaching research literatures on nursing teachers of China and America, Chinese Journal of Medical Education Research 39 (10) (2019) 743–748.
[33] X. Ma, Visualization analysis on global medical education research situation, Sci-Tech Information Development & Economy 4 (7) (2019) 64–72.
[34] M. Triola, et al., A randomized trial of teaching clinical skills using virtual and live standardized patients, J. Gen. Intern. Med. 21 (5) (2006) 424–429.
[35] K. Fiscella, et al., Ratings of physician communication by real and standardized patients, Ann. Fam. Med. 5 (2) (2007) 151–158.
[36] U. Karabacak, et al., Examining the effect of simulation based learning on self-efficacy and performance of first-year nursing students, Nurse Educ. Pract. 36 (2019) 139–143.
[37] J. Watt-Watson, et al., An integrated undergraduate pain curriculum, based on IASP curricula, for six health science faculties, Pain 110 (1–2) (2004) 140–148.
[38] N. Chaudhary, et al., Assessment of abilities of gastroenterology fellows to provide information to patients with liver disease, Clin. Gastroenterol. Hepatol. 15 (7) (2017) 1095–1123.e3.
[39] J. Liu, Y. Xiao, Current status of development of domestic standardized patients in assessment applications, China Higher Medical Education 3 (2021) 55–56.
[40] E.L. Unrue, et al., Effect of a standardized patient encounter on first year medical student confidence and satisfaction with telemedicine, J. Osteopath. Med. 121 (9) (2021) 733–737.