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Social Accountability in Medical Education: A Bibliometric Analysis

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ABSTRACT

Social accountability (SA) in medical education is the obligation to direct health professionals' education to address the priority health needs of communities. Despite the extensive SA-related literature, trends in its prevalence and scope remain unexplained. This study aimed to analyse trends in SA in medical education publications, information clusters and any paucity in integrating SA into medical education. The PubMed and Scopus databases were searched for publications from 1995 to 2023 without language restrictions. VOSviewer was used to conduct the bibliometric analysis. We retrieved 1292 articles on SA in medical education, which showed an increasing trend in SA research year by year. The United States had the most publications (512), and the University of British Columbia had the most publications (n = 39). Bibliographic coupling analysis identified five clusters of information related to SA in medical education: SA indicators and medical school accreditation, medical students' attitudes towards underserved populations, the role of physicians in translating SA into medical education, the impact of socially accountable medical education and preparing medical students for achieving SA in medical education. The findings demonstrate a rising trend in SA research in medical education. However, collaboration networks were stronger in developed countries, indicating the need to enhance research networks with developing countries. The five clusters of SA-related information could serve as a foundation for future research. The study highlights the importance of investigating obstacles to the adoption of SA in medical education and implementing initiatives to foster its comprehensive integration.

Keywords: *Social accountability, medical education, Bibliometric analysis*

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INTRODUCTION

Social accountability (SA) in medical schools has been defined as their “obligation to direct health professions education schools’ education, research, and service towards addressing the priority health needs of the community, region, and/or nation they are mandated to serve” (1–3). As expounded by the Global Consensus for Social Accountability of Medical Schools, a socially accountable medical school “responds to the current and future health needs and challenges in society; reorients its education, research, and service priorities; strengthens governance and partnerships with other stakeholders and uses evaluation and accreditation to assess their performance and impact” (4).

In the last century, medical schools and faculty spent a significant amount of time attempting to delineate and deliver the required competencies for lifelong learning in a practice world virtually exploding with novel information. In the current century, the world is struggling with the challenge of creating not only skilled learners and competent medical practitioners but also practitioners with the ability to transmit thoughtful tenets of service to the welfare of underserved populations (5, 6). Studies relating to SA in medical education have been undertaken since 1995, and there has been a steady stream of robust publications focusing on various definitions of SA in medical education, frameworks used in its integration and in teaching methodologies and strategies for assessing socially accountable medical education curricula. To clearly demonstrate the progress made so far in incorporating SA into medical education and determine the broad trends in the prevalence and scope of SA in medical education, a bibliometric analysis was deemed the most appropriate methodology for conducting the current study (7, 8). Bibliometric analysis is a type of quantitative research that uses statistical analysis to examine patterns and trends in the published literature. Bibliometric studies can offer several benefits, such as identifying emerging research trends, evaluating research impacts, assessing research collaborations, informing journal selection and benchmarking research performance (9).

These studies help researchers, funding agencies and policymakers allocate research resources effectively by analysing patterns in the literature, measuring citations, analysing co-authorship patterns, identifying potential collaborators and influential journals and benchmarking research productivity (10). Alan Pritchard formally introduced bibliometrics as a discipline in 1989 (11). Since then, it has received wider coverage, especially due to developments in information technology, the availability of computers, access to the internet and the availability of bibliometric software, such as Gephi, Leximancer, VOSviewer, CiteSpace, BibExcel, BiblioMaps, CitNetExplorer, SciMAT and the Sci2 Tool (12, 13). Significant advancements in the development of scientific databases which can work with bibliometric software packages have also been made (14). VOSviewer is the bibliometric software preferred for data analysis and visualisation (15). This tool can hypothesise knowledge domains by creating and envisaging co-occurrence network maps of co-authors and keywords and co-citation networks of cited authors based on the bibliographic archives collected from a specific database (16).

Although discussions on SA in medical education have gained universal attention for over three decades as a hotspot of multidisciplinary research, no published bibliometric studies related to this topic exist. To bridge this gap, this bibliometric study was conducted to document published work in the field of SA in medical education. Equally, the current study aimed to use bibliographic coupling (17) to identify clusters of published literature on how SA has been integrated into medical education over the years and use bibliometric analysis to identify the strength of collaborative networks between authors and research institutions globally to identify co-occurrence networks and author and co-author relationships across different regions to determine regions that have. Any paucity in the published literature on the integration of SA into medical education, analysis of the concepts and evaluation of the effectiveness of the integration strategies will guide future research.

METHODS

Study Design

Bibliometric analysis was used to identify the trends and core drivers of the published work on SA in medical education (15).

Information Sources

The bibliometric analysis was carried out on publications retrieved from PubMed and the Scopus databases (<https://pubmed.ncbi.nlm.nih.gov/advanced/>), (<https://www.scopus.com/>). These two databases were chosen for the following reasons: (a) PubMed publishes the highest volume of articles in the field of medicine and health sciences and (b) the Scopus database has wider coverage than all other existing databases with over 25,100 journals and access to approximately 1.7 billion citations (18, 19–21).

Search Strategy

The following search strategy was applied: (“Social accountability OR “socially accountable” OR “social responsibility” OR “socially responsible” OR “social responsiveness” OR “socially responsive”) AND (“medical education” OR “medical curriculum” OR “medical school”). VOSviewer software was used for the data analysis.

Data Selection Procedure

The data abstracted from the PubMed and Scopus databases, spanning January 1995 to March 2023, are depicted in Figure 1 in a flowchart that elucidates the study selection process for the VOSviewer analysis. The chart begins with the revelation of the number of citations identified: 1605 from Scopus, 1062 from PubMed and 24 through manual searches. After the elimination of duplicates, 2659 records

were screened. This sequential filtering, based on titles and abstracts, aimed to discard irrelevant records before the exhaustive full-text review. This precise and structured selection method culminated in the analysis of 1292 full-text articles in VOSviewer, effectively showcasing the thorough and methodical approach employed in determining the studies included up to the cut-off date of 1 March 2023.

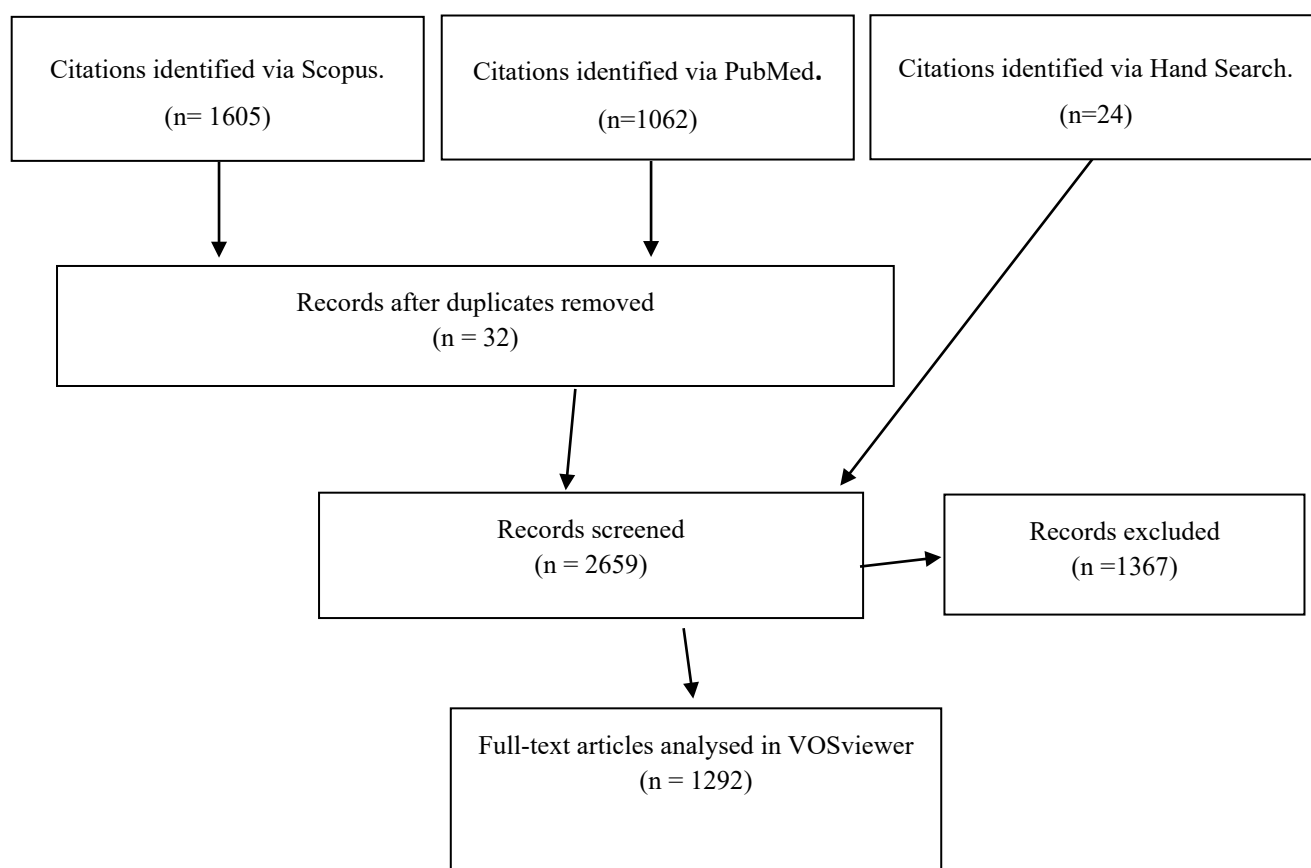


Figure 1: Flow chart of the identified studies from Scopus, PubMed, and hand search. The flow chart shows the step-by-step screening process and the included number of articles for VOSviewer analysis is indicated.

Data Analysis

We used VOSviewer for the data analysis and visualisation (22, 23). Quantitative methods were used to describe the characteristics of the publications and to determine the following:

- a. The distribution and trend of publications in SA in medical education over time;
- b. The distribution of publications from various countries;
- c. The organisations involved in the area of SA in medical education that have published at least three articles;
- d. The associations between different authors and co-authors;
- e. The authors in the domain who have published at least five articles and their areas of focus in regards to SA in medical education;
- f. The source and citation relationships;
- g. The top journals (i.e. those that have published at least 10 articles);
- h. The top publications (i.e. those with at least 200 citations); and
- i. Whether there are any collaboration networks for authors from developed and developing regions.

Bibliographic coupling was used to identify clusters of published literature on how SA has been integrated into medical education over the years.

Ethical Review

Ethical approval was not required, since no primary data were collected.

RESULTS

Distribution and Growth Trend of Publications by Year

The study retrieved 1292 articles about SA in medical education published from 1995 to 1 March 2023. The number of publications and cumulative publications on a year-by-year basis were plotted to explore the publication trends for the years under review. The increase in the number of publications on a specific subject is a reasonable indication of the research trend in that field (Figure 2).

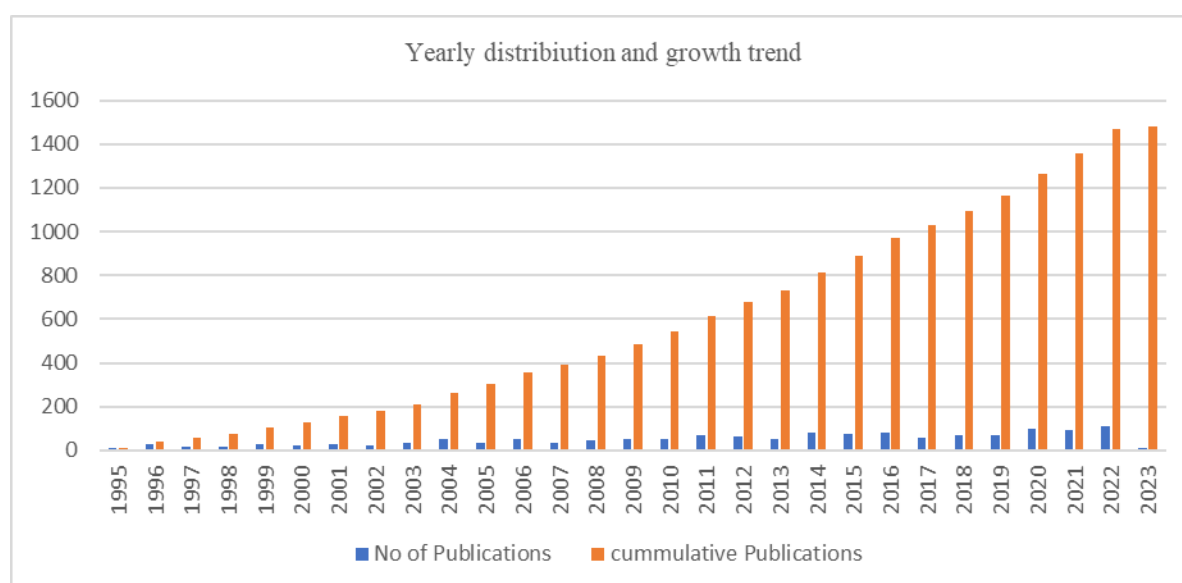


Figure 2: A graph of the number of publications and cumulative publications on a year-to-year basis to demonstrate the publication trends in social accountability and medical education from 1995-2023.

Distribution of Publications by Country

The retrieved articles were from 90 countries, with the United States of America (USA) having the highest number of articles ($n = 512$), followed by Canada ($n = 206$), the United Kingdom (UK) ($n = 132$) and Australia ($n = 87$). South Africa, France, Germany, the Netherlands, Brazil and Spain had at least 20 articles each. In total, 28 countries published at least 10 articles in the field of SA in medical

education during the period reviewed. Regarding the number of citations, the USA received the highest number of citations (n = 8642), followed by Canada (n = 4163), the UK (n = 2388) and Australia (n = 1559). In terms of the average citations per article, Canada had 20.21 citations per article, followed by France (18.44 citations per article) and the UK (18.09 citations per article), as shown in Table 1.

Table 1: Countries with highest number of publications on social accountability in medical education, number of citations per document, average citations per document, and Total Link Strength from 1995-2023

S/No	Country	Documents	Percentage of Documents	Citations	Average Citations	Nominal GDP Rank	Total Link Strength
1	United States	512	33.33	8642	16.88	1	724
2	Canada	206	13.41	4163	20.21	8	1160
3	United Kingdom	132	8.59	2388	18.09	6	469
4	Australia	87	5.66	1559	17.92	14	585
5	South Africa	38	2.47	506	13.32	39	225
6	France	27	1.76	498	18.44	7	393
7	Germany	24	1.56	139	5.79	4	2
8	Netherlands	23	1.50	409	17.78	29	180
9	Brazil	21	1.37	163	7.76	12	40
10	Spain	21	1.37	93	4.43	16	65
11	Belgium	18	1.17	282	15.67	26	279
12	India	18	1.17	102	5.67	5	10
13	Italy	18	1.17	193	10.72	10	0
14	Japan	18	1.17	127	7.06	3	40
15	China	17	1.11	173	10.18	2	9

Total Link Strength and Country Collaboration Network

The value of the total link strength (TLS) demonstrates the collaboration of one subject with another. From the findings, Canada presented a TLS of 1160, followed by the USA with 724, Australia with 585 and the UK with 469. In the current study, Canada emerged as the most outstanding country in

terms of collaborative research with other countries. Based on the TLS score, most countries have a research connection with Canada, the USA and the UK (Table 1).

Distribution of Publications by Organisations/Institutions

The University of British Columbia led with 39 publications, 697 citations and an average citation per article of 17.87. The Northern Ontario School of Medicine, James Cook University, McGill University, the University of Ottawa and McMaster University had at least 200 citations each. From this analysis, it can be deduced that the University of British Columbia plays a significant role in the field of SA in medical education research, based on the quality of the research work being published (Table 2).

Table 2: Leading Organisations/institutions with over three Publications in the field of social accountability in medical education from 1995-2023

S/No	Organization/Institution	Country	Documents	Citations	Average Citation/ Document	Total Link Strength
1	University of British Columbia	Canada	39	697	17.87	11
2	Flinders University, Alice Springs	Australia	30	532	17.73	9
3	University of Northern Ontario	Canada	30	477	15.90	7
4	James Cook University	Australia	25	343	14.90	6
5	McGill's university	Canada	20	351	13.72	5
6	University of Ottawa	Canada	17	260	17.55	3
7	McMaster University	Canada	13	224	17.23	1
8	Massachusetts General Hospital	The United States	12	198	16.50	1
9	Yale School of Medicine	The United States	11	137	12.45	1
10	Ateneo de Zamboanga University	Philippines	11	168	15.27	2
11	Universiteit Maastricht	Netherlands	11	182	16.55	2
12	Kings College London	The United Kingdom	11	98	8.91	1
13	University of Limerick	Ireland	9	117	13.00	3
14	University of KwaZulu-Natal	South Africa	8	97	12.13	3
15	University of Sharjah	UAE	8	98	12.25	1
16	University of Gezira	Sudan	8	82	10.25	2

Author and Co-Author Relationships and Areas of Expertise

The total number of articles published and the citation metrics achieved by the authors were used to classify the most involved researchers in the field of SA in medical education. The following authors had the highest number of published articles: Boelen, C. (n = 24), Woollard, R. B. (n = 17), Neusy, A. J. (n = 15), Cruess, R. L. (n = 15), Ross, A. (n = 14) and Strasser, R. (n = 14). Regarding the number of citations, Boelen, C. had the highest number (n = 651), followed by Woollard, R. B. (n = 634), Cristobal, F. (n = 613) and Cruess, R. L. (n = 587) (Table 3). The average number of citations per article offers evidence regarding the most influential scholars in the field of study. A high-ranking and quality manuscript will have more citations, which are determined by calculating the mean number of citations each article receives. In the current study, Cristobal, F. (11 articles and 613 citations) and Cohen, J. J. (8 articles and 339 citations) had the highest average citations per article and therefore the greatest impact on the research field.

Table 3: Top authors and co-authors who published most documents in the field of social accountability in medical education from 1995-2023.

S/No	Authors & Co-authorship	Documents	Citations	Average Citations per Document	Total Link Strength
1	Boelen C.	24	912	38.0	261
2	Woollard B.	17	634	37.3	174
3	Neusy A.-J.	15	297	19.8	298
4	Ross A.	14	125	8.9	31
5	Strasser R.	14	386	27.6	106
6	Cruess R.L.	15	587	39.1	7
7	Cristobal F.	11	613	55.7	133
8	Dharamsi S.	11	342	31.1	58
9	Hogenbirk J.C.	10	191	19.1	173
10	Larkins S.	11	220	20.0	221
11	Rourke J.	10	219	21.9	90
12	Abdalla M.E.	10	292	29.2	122
13	Reeve C.	10	328	32.8	116
14	Woolley T.	9	137	15.2	207
15	Taha M.H.	7	113	16.1	72
17	Cohen J.J.	8	339	42.4	5
18	Elsanousi S.	6	117	19.5	188
19	Gibbs T.	6	145	24.2	87
20	Preston R.	6	102	17.0	167

While the analysis identified the authors, schools, journals and countries that have frequently written about the concept, it did not provide information about the authors' expertise in the area of SA (e.g. concept analysis, integration into education, evaluation of effectiveness, etc.). Drilling down to this level would have increased the bibliometric analysis's usefulness.

As the result of a hand search, the authors found that C. Boelen, who is the leading author, contributed mostly on topics related to the rural health workforce, social work, evidence-based practice and the development and delivery of effective healthcare (24, 25). R. B. Woollard's areas of expertise included medically underserved populations, emerging community concepts of caring, the impact of medical schools on health and SA and accreditation (26, 27).

Distribution of Journals

Table 4 presents the names of the major journals, which published a minimum of 10 research articles on SA in medical education. The journal with the largest share of publications on SA in medical education was *Academic Medicine*, which published 97 articles, resulting in 2639 citations. *Medical Education* had the highest average total citations per article (52 articles; 33.54 average citations per article:), followed by *Annals of Internal Medicine* (12 articles; 28.25 average citations per article) and *Academic Medicine* (97 articles; 27.21 average citations per article). Regarding the TLS, *Medical Teacher* led (n = 356), followed by *Academic Medicine* (n = 274) and *Medical Education* (n = 261). *Academic Medicine*, *Medical Teacher*, *BMC Medical Education* and *Education for Health* had the greatest interlinkages with other journals.

Table 4: Top journals that have published most articles on social accountability in medical education from 1995-2023

S/No	Source	Documents	Citations	Average Citation per Document	Total Link Strength
1	Academic Medicine	97	2639	27.21	274
2	Medical Teacher	87	1801	20.70	356
3	Medical Education	52	1744	33.54	261
4	BMC Medical Education	31	332	10.71	88
5	Education for Health: Change in Learning & Practice	27	339	12.56	108
6	Family Medicine	20	330	16.50	20
7	The Lancet	15	186	12.40	56
8	Rural and Remote Health	14	182	13.00	33
9	Journal of Medical Education	13	220	16.92	2
10	Journal of General Internal Medicine	13	246	18.92	5
11	Journal of Interprofessional Care	13	172	13.23	35
12	Advances in Health Sciences Education	12	255	21.25	43
13	Annals of Internal Medicine	12	339	28.25	0
14	Academy Psychiatry	10	132	13.20	4
15	Canadian Family Physician	10	95	9.50	18

Article and Citation Relationships

In bibliometrics, a higher citation count is a characteristic of the excellent quality of the published article, resulting in a higher number of citations by other researchers in the same field. In this study, publications cited more than 50 times were selected. As shown in Table 5, publications which had at least 100 citations were authored by the following: Boelen, C., 2011 (n = 264) and Strasser, R. P., 2009 (n = 186) and 2013 (n = 130).

Table 5: Top cited articles on social accountability and medical education from 1995-2023, including the author, number of citations and the total link strength

S/No	Article Title	First Author	Citations	Total Links Strength
1	Social accountability: The extra leap to excellence for educational institutions(3)	Boelen C. (2011)	264	2
2	Canada's new medical school: The northern Ontario school of medicine: Social accountability through distributed community engaged learning(33)	Strasser R.P. (2009)	186	1
3	Transforming health professional education through social accountability: Canada's Northern Ontario School of Medicine(34)	Strasser R. (2013)	130	2
4	Caring for a common future: medical schools' social accountability(5)	Woollard R.F. (2006)	97	1

5	The Social Accountability of Medical Schools and its Indicators(35)	Boelen C. (2012)	94	3
6	Social accountability and accreditation: a new frontier for educational institutions(36)	Boelen C. (2009)	93	4
7	Teaching medicine as a profession in the service of healing: Academic Medicine(37)	Cruess R.L. (1997)	81	1
8	Linking the teaching of professionalism to the social contract: A call for cultural humility(38)	Cruess S.R. (2010)	66	1
9	The physician as health advocate: Translating the quest for social responsibility into medical education and practice(39)	Dharamsi S. (2011)	62	2
10	The impact of socially accountable health professional education: A systematic review of the literature (40)	Reeve C. (2017)	58	1

Analysis and Co-Occurrence Networks of Keywords and Country Collaborations

To better understand the most relevant terms in the databases used for this analysis, we evaluated 3739 keywords. Most of the identified keywords mirrored the words used in the search strategies, such as social accountability, medical students, medical education, social responsibility, the medical profession, social behaviour and curriculum development. From the analysis, the collaboration networks indicated that the greatest collaborators were from Canada, the USA, the UK and Australia. The Netherlands, the Philippines, Iran and South Africa also had some collaborations, albeit on a small scale, as demonstrated in.

Bibliographic Coupling Analysis

Bibliographic coupling represents the association between two articles found to have in common a high proportion of keywords, descriptors, citations or other simple indications of what they are concerned with (17). We selected 71 articles from the original data according to the coupling strength in VOSviewer (the selected articles had at least 50 citations each). Five clusters were identified, and they are presented in different node colours (Figure 3). The article aligned to Cluster 1 (orange nodes) focuses on SA indicators and the accreditation of medical schools to be socially accountable. The article aligned to Cluster 2 (pink nodes) focuses on the experiences and attitudes of residents and medical students in relation to SA in medical education and their attitudes towards serving

underserved populations. Cluster 3 (blue nodes) focuses on the role of physicians as health advocates in translating the quest for SA into medical education and practice. The articles in Cluster 4 (green nodes) focus on the impact of medical education, including the formation of professional identity in medical students and alliance formation between society and medicine (i.e. the public's stake in medical professionalism). Finally, the articles in Cluster 5 (dark blue nodes) focus on preparing medical students for the continual improvement of healthcare with more emphasis on a fair and just culture, leadership and engagement for achieving SA in medical education, as shown in Figure 3.

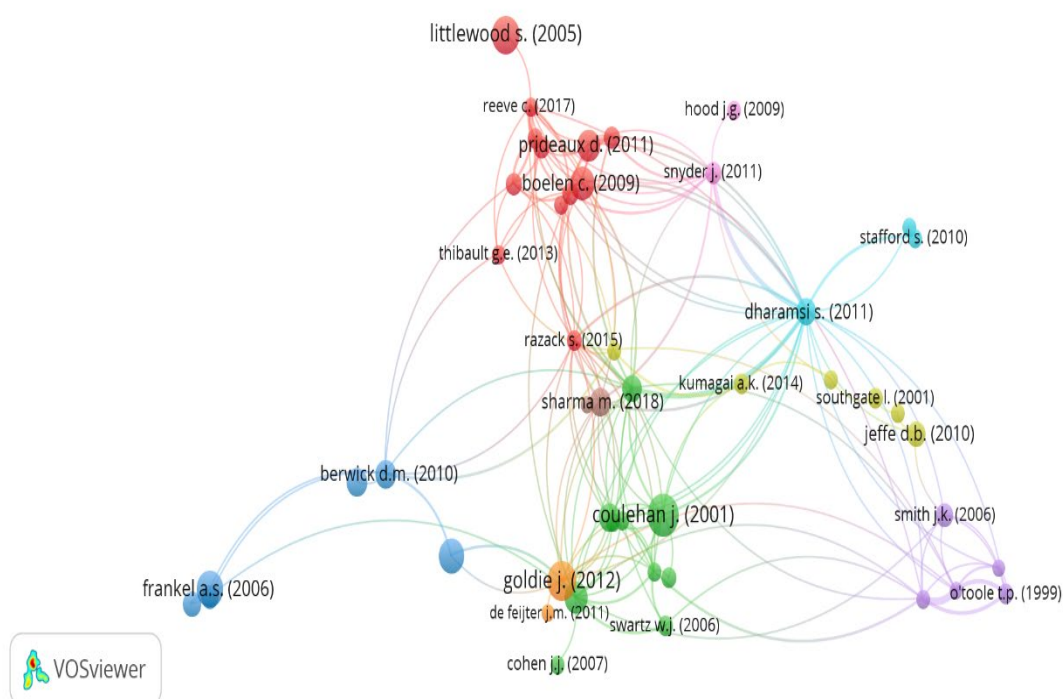


Figure 3: Bibliographic coupling diagram shows the cluster of authors who publish common or closely related studies. In the current study, five clusters of information related to the integration of social accountability into medical education were identified as indicated by different colours of the nodes.

DISCUSSION

In the current study, we presented a bibliometric analysis of SA in medical education. VOSviewer software was used to undertake a bibliometric analysis of published articles related to the research topic. The choice of the Scopus database as the preferred database in this study was permissible given the advantage it has over other databases (14). The current study's findings show that the number of publications increased exponentially over the entire study period (1995–2022). The highest numbers of published articles were from the USA, Canada and the UK. The findings validate the efforts of developed countries in prioritising SA in medical education curricula and investing in making their medical education curricula more concentrated (3).

Regarding collaborations between different countries, the leading countries in the publication of manuscripts were the USA, Canada, the UK, Australia, South Africa, India and France. Studies have demonstrated that the future of medical education lies in a move away from such internationally interconnected styles, which stress the mobility of apprentices, educators and curricula across country borders, to a multinational approach in which internationalisation is integrated and entrenched within curricula (28).

The wealth of published work shows a paradigm shift from the traditional medical school curriculum to a more socially accountable medical curriculum. It is worth noting the tremendous work of Charles Boelen, who has passionately authored works about this field of study. In one of his works, he asserts that in many countries, health systems suffer from fragmentation as different health activities conducted by different stakeholders are poorly coordinated, resulting in the need for mitigation to improve the quality, equity, relevance and cost-effectiveness of healthcare. Boelen suggests that the

impact on health would be enhanced if all stakeholders shared a common vision of how to best meet people's priority health needs through SA (29).

This study also provided a comprehensive list of journals in which most of the research work on SA in medical education has been published. This is significant, particularly to upcoming researchers, as it can guide them with a strong background knowledge of the study topics that have been covered in the field of SA in medical education and feasible research gaps. The study also reveals the possibility of networking with appropriate research collaborators who have considerable expertise in the field of SA in medical education. To sustain the gains made in the integration of SA in medical education, there is a need for progressive research on concepts and frameworks that have been applied and worked in the integration of SA into medical education so that they can be replicated in countries and regions that are lagging in incorporating the concept of SA in medical education.

The study has provided a comprehensive analysis of research organisations and institutions that are actively involved in publishing articles on SA in medical education. This analysis is very critical, especially for creating partnerships and collaborations with institutions that are already grounded in this field. Bindu (2007) has argued that the growing participation of organisations and institutions in collaborative relations has led researchers to explore how different factors may contribute to organisational development advantages. He affirms that creating collaborative and social networks may influence the possibility of identifying research gaps and areas of mutual collaboration in knowledge advancement and sharing (30). Through bibliographic coupling, the current study identified five clusters to which most of the researchers were aligned. These clusters include SA indicators and accreditation, medical students' attitudes towards SA, the role of physicians as SA advocates, the impact of medical education and preparing medical students for continued improvement of the health of the population, particularly the underserved. These findings are in line

with the key SA frameworks that are widely published in the existing literature demonstrating the shared values of SA, community partnerships, learning exposure and medical professionalism (31). It is worth noting that although there has been tremendous research on SA and medical education, the reviewed articles, through bibliographic coupling, did not include any studies that assessed why there has been a lag in the integration of SA into medical education. Integration of SA into medical education would expand and diversify community service learning, optimise partnerships and collaborations, enhance in-class learning through experiential pedagogy and optimise multidisciplinary partnerships to deliver interprofessional education (32).

The major limitation of the study was its reliance on the Scopus database, which is subject to continuous change and updates in the number of indexed journals. Like all other scientific databases, there is a possibility of variation in the results after a short period, as more researchers are delving into the research topic. Another limitation was the number of false positives and false negatives in the current study. However, we believe that the false positives and false negatives were very minimal and would almost not affect the accuracy of the results of the study, since a comprehensive search strategy was undertaken.

We also identified some limitations of the bibliometric analysis software in analysing data from the PubMed database. The VOSviewer tool allow only two analyses in the PubMed database – namely, co-authorship and co-occurrence – while the essential types of analysis, such as citation analysis, bibliographic coupling and co-citations, could only be performed in the Scopus database. Although this bibliometric analysis examined the authors, institutions, journals and countries that have frequently published on SA in medical education, it did not assess the expertise of individual authors in specific areas such as concept analysis, integration into education and effectiveness evaluation. To overcome this limitation, the authors performed a manual analysis using the authors' ORCIDs and

Google Scholar citations. Moreover, we recommend that the developers of bibliometric software, such as VOSviewer, improve their functionality to incorporate such features, as is the case with the Scopus dataset.

CONCLUSION

To the best of our knowledge, this is the first bibliometric analysis of SA in medical education. The study findings showed steady progress in the number of articles published over the years, with a clear indication that the trend will continue in the coming years. The results indicated that most publications were from the USA and Canada, and the most productive organisation was the University of British Columbia. The leading author in terms of the number of publications and total link strength was Boelen, C., and the journal with the highest number of publications and citations was *Academic Medicine*. The collaboration networks between authors and research institutions were very strong among the developed countries, and as such, the research networks with existing and emerging institutions from developing countries for holistic research on SA in medical education need to be strengthened. In the bibliometric coupling, the study failed to provide information regarding the factors that are contributing to the slow integration of SA in medical education. Further research on these factors is needed to expedite the pace of the integration of SA into medical education. Research on the contributing factors that are weakening research networks within developing countries and between developed and developing countries is also needed. If these networks are improved, there is a possibility of improving the integration of SA into medical education, thereby fulfilling the obligation of medical schools to become socially accountable.

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