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Evolution of Clinical Practice Guidelines: A Science Mapping Analysis

Klinik Uygulama Rehberlerinin Gelişimi: Bilim Haritalama Analizi

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ABSTRACT The aims of this study are to see the development of clinical practice guides (CPG) in the field of social sciences, to evaluate its development especially in terms of health management, to identify the prominent subjects in the future, and to discover the relationships among the important subjects of CPGs. Bibliometric mapping method has been used in this study. The studies analyzed by bibliometric mapping were downloaded from the Web of Science Core Collection database and analyzed by the SciMAT science mapping program. The analysis was conducted with the data arranged within the time frames of "1990-1999", "2000-2009" and "2010-2019". "Words" were used as the primary analysis parameter. The data gathered from published studies were assessed by strategic diagrams, overlap map, thematic evolution map as well as thematic network map. Performance analysis of the emerging themes was done with the information of h-index and the total citation number of the studies included in bibliometric mapping. This study showed that the most publications on CPG were released in 2017, the USA was the high-ranking country in these publications, the important motor themes were determined as "clinical guidelines" in the first period, "clinical practice guidelines" and "quality" in the second period, and "management" and "implementation" in the third period. It can be concluded that, in parallel with the increase of the publications on CPGs, the number of new relevant keywords will continue to increase. It is also evaluated that the studies on applying CPGs into practice, determining the experiences and attitudes of healthcare professionals towards CPGs, diminishing the obstacles on the way of implementing CPGs, evaluating CPGs from the managerial point of view and the effects of CPGs on the healthcare services in terms of quality, efficiency and outcomes will continue to increase soon.

Keywords: Practice guidelines; bibliometrics; guideline adherence; attitude of health personnel; quality of health care; quality of life

ÖZET Bu çalışmanın amacı, klinik uygulama rehberleri (KUR)nin sosyal bilimler alanındaki gelişimini görmek, özellikle sağlık yönetimi açısından bu gelişimi değerlendirmek, gelecekte öne çıkan konuları belirlemek ve KUR'ların önemli konuları arasındaki ilişkileri keşfetmektir. Araştırmada bibliyometrik haritalama yöntemi kullanılmıştır. Araştırmaya dâhil edilen makaleler Web of Science Core Collection veri tabanından indirilmiş ve SciMAT bilim haritalama programı aracılığıyla analiz edilmiştir. Analiz, veriler "1990-1999", "2000-2009" ve "2010-2019" periyotlarına ayrılarak gerçekleştirilmiş ve analiz birimi olarak "kelimeler" kullanılmıştır. Araştırma bulguları stratejik diyagramlar, örtüşme haritası, tematik gelişim haritasının yanı sıra tematik ağ ilişkileri haritası ile değerlendirilmiştir. Ortaya çıkan temaların performans değerlendirmeleri h-index ve toplam atıf sayısı ile yapılmıştır. KUR hakkında en fazla yayının 2017 yılında yapıldığı, en fazla yayın yapan ülkenin ABD olduğu, en önemli motor temaların 1. dönemde "clinical guidelines", ikinci dönemde "clinical practice guidelines" ve "quality", üçüncü dönemde ise "management" ve "implementation" temaları olduğu görülmüştür. KUR konusunda yapılan yayınların artışına paralel olarak kullanılan yeni anahtar kelimelerin sayısının da artmaya devam edeceği, KUR'ların uygulamaya aktarılmasına, sağlık çalışanlarının KUR'lara yönelik deneyim ve tutumlarının belirlenmesine, KUR'ların kullanılmasının önündeki engellerin azaltılmasına, KUR'ların yönetim perspektifinden değerlendirilmesine, KUR'ların sağlık hizmetleri kalitesine, etkinliğine, sonuçlarına ve etkilerine ilişkin çalışmaların yakın gelecekte de yapılmaya devam edeceği değerlendirilmektedir.

Anahtar Kelimeler: Uygulama rehberleri; bibliyometri; rehberlere uyum; sağlık personelinin tutumu; sağlık hizmetleri kalitesi; yaşam kalitesi

Although there are different definitions of clinical practice guidelines (CPGs) made by various institutions, the most common definition was given in 1990 and updated in 2011 by the Institute of Medicine, the updated version of which is "CPGs are statements that include recommendations intended to optimize patient care that is informed by a systematic review of evidence and an assessment

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of the benefits and harms of alternative care options".[1-4]

CPGs can be useful in numerous areas such as to know about new developments, to reach the solutions that would enable better health results, to enable to put research findings into practice, to decrease variations in implementation, to improve patient-physician relations, to reach a consensus among physicians, to enable to use the resources efficiently and to increase the productivity.[2,3,5-8]

CPGs can be developed nation-wide only by a designated institution as well as various institutions of different capabilities and objectives. There are both advantages and disadvantages.[9,10] The process of developing a CPG takes quite a lot of time and resources.[2,11-13] Although the process of developing a guideline can differ depending on the factors such as the institutional structure of developers, target audience for the guideline, objective, resources required to develop the guideline and the scope of the guideline. The basic phases of developing a guideline can be summarized as:

- Assigning the subject,
- Establishing guideline developer group,
- Scoping,
- Evaluation of scientific evidence,
- Forming suggestions,
- Preparing guideline,
- Publishing and dissemination of the guideline,
- Application and evaluation of the guidelines,
- Updating guidelines.

There are various studies on CPGs conducted from different perspectives and the number of studies is ever increasing. This study aimed to observe the progress in CPG field, to determine the prominent topics in the field and to discover the relations among important topics in the field. For this purpose, the bibliometric mapping methodology was used. The methodology of bibliometric mapping contributes significantly to scientific progress in many aspects by allowing evaluation of the progress in the field, by laying the academic foundation for the evaluation of new developments and by improving bibliometric indices to assess academic studies.[14] With this aspect, bibliometric analysis is commonly used as an important tool in many scientific areas such as medicine, math, economics, computer science, physics, sociology and psychology.[15] The general workflow of bibliometric analyses is composed of the following steps: retrieving data, arranging data (preprocessing), network extraction, normalization, mapping, analysis and visualization.[16,17]

Bibliometric analyses can be conducted by various science mapping programs such as Pajek, Gephi, UCINET, Cytospace, CoPalRed, Science of Science TOOL, VOSviewer, The Network Workbench, Bibexcel, CiteSpace II, IN-SPIRE and Vantage Point.[17-23] In this study, Science Mapping Analysis software Tool (SciMAT) was used as a science mapping program. SciMAT is open access and powerful science mapping program that covers many bibliometric analysis workflows with many other advantages, which are either offered with limited scope or not offered by other existing science mapping programs.[24] SciMAT enables preprocessing the data before analysis, time-slicing of data, data reduction and arranging of analysis techniques, algorithms and criteria during different analysis phases.[19]

METHODOLOGY

This study aimed to reveal the periodical progress of the studies published between 1990-2019 in the field of social sciences on CPGs. The studies analyzed for the study purposes were determined in two phases. The first phase comprised of downloading relevant data from the Web of Science (WoS) Core Collection database to determine the articles to be included in the study. The second phase is the analysis of data extracted from previously selected articles with SciMAT, which is one of the modern science mapping tools.

SELECTING RELEVANT STUDIES AND DATA COLLECTION

The data of the related studies published in journals indexed by Social Sciences Citation Index (SSCI) from 1945 to 2019 were obtained from the WoS database on 23 November 2019, and they were mapped. WoS was selected as main database since it contains numerous scientific publications and especially focuses on social science.[25] In the search of re-

lated studies, the keywords of *"CPGs"* and *"clinical guideline/s"* were used. The *"OR"* Boolean operator was used to ensure that the data collected in the search process would be relevant for the study purpose and to identify articles that contain at least one keywords. In this way, the study findings could be expanded.[26] Through detailed scanning, 5.021 articles were selected and relevant data from those studies were downloaded in plaintext format and uploaded to SciMAT program.

PRE-PROCESSING AND ANALYSIS OF DATA

Of the 5.021 studies downloaded from WoS database and uploaded to SciMAT program, 8 studies belonging to the period of 1969-1989 were excluded because they did not contain any useful data for the bibliometric analysis, thus 5.013 studies remained.

The data of selected studies were divided into three periods, which were first "1990-1999", second "2000-2009" and third period "2010-2019" to evaluate the scientific development of CPGs in the process periodically. Then, data of respective periods were uploaded accordingly. Words were used as an analysis parameter during the analysis. Interpretation and data reduction procedures were carried out to obtain more relevant research findings. Data reduction means excluding keywords from analysis depending on their occurrence frequency in the research. Increase in the reduction index results in fewer themes.[27] The data reduction index that should be applied for each period in SciMAT program was decided through examining findings that were reached after a few iterations.

Within this context; for the period "1990-1999" 4 data reduction indices, for "2000-2009" 12 data reduction indices and finally for "2010-2019" period 35 data reduction indices were determined. Keywords with an occurrence frequency below these levels were excluded from the analysis. Singular and plural forms of the keywords in the analysis were collected under the same group, statements and abbreviations with the same meaning were collected under a single group and statements with spelling errors were added to the relevant group.

During the network extraction phase carried out after data preprocessing, a co-word analysis was conducted based on the co-occurrence frequency of the publication keywords examined in the study.[14] High co-occurrence frequency of two keywords demonstrates the affiliation of those keywords.[27] "Co-occurrence" methodology was used in the selection of matrix type to group keywords according to their affiliation and, to eliminate keywords with weak networks in the analysis of the research.

The next step was normalization process aiming to normalize the network discovered in the previous phase, which means to adjust the data for different occurrence frequency from the discovered network. As one of the similarity measures for normalization in bibliometrics, "equivalence index" was used and thus the comparison of the frequency of use and co-occurrence ratio for the keywords in the articles could be possible.[14,27]

During the next phase, which is the selection of cluster algorithm, "simple centers algorithm" methodology was chosen and maximum and minimum network magnitudes were determined as 6 and 1, respectively. By these constraints, the number of words that might be related with emerged themes was limited. During document mapping phase, by selecting "core mapper" method, findings could be assessed by strategic diagrams, thematic networks, overlap maps, and thematic evolution maps. H-index and total citation numbers were chosen as the performance evaluation criteria for the themes emerging in the analysis findings.

In the last phase before the analysis was carried out, "inclusion index" was chosen as a similarity measure for both thematic evolution maps and overlap maps. Through this measure, a longitudinal analysis was made possible by taking into account the inclusiveness of the periods of one another and the conceptual relationship between themes could be determined.[27]

In this study, the findings estimated by the SciMAT program were evaluated with strategic diagrams, overlap map and thematic evolution map created by the program, while the internal and external thematic networks were evaluated with the thematic network map developed by the authors. In strategic diagram, themes can be classified into four

groups considering the centrality on the x-axis and density on the y-axis.[28-32] Centrality shows the degree of interaction of a theme with other themes and it expresses the external harmony and the degree of centrality increases as it approaches the right in the diagram. Density expresses the inner harmony by showing the strength of the inner links among all keywords related to a theme and can be evaluated as a measure of theme development. The density increases, as the diagram approaches upwards.[33,34] The themes in the upper right quadrant of the strategic diagram show "motor themes" with high centrality and intensity, which are interpreted as well-developed and important for the research area. The themes in the upper left quadrant of the diagram show "well-developed and isolated themes" with strong internal but unimportant external ties. The themes in the lower left quadrant show the weakly developed and marginal themes with low centrality and intensity that can be labeled as "emerging or disappearing themes". Themes in the lower right quadrant show "basic and transversal themes" which are important for the research area but not developed. In the strategic diagram, the size of the circles changes in proportion to the number of publications of the relevant theme.

The internal and external relations of the prominent themes in the strategic diagram, which are important for the field of clinical practice guidelines in the relevant period were presented with thematic network maps. The five themes that establish the highest level of internal and external relationships with the related theme are located on the map. The size of the themes in the colored areas that represent thematic clusters varies according to the number of publications, the thickness of the lines shows the relationships between themes differentiates according to the weight of the relationship. Furthermore, the weights of relationships between themes are also indicated by numbers.

On the overlap map, horizontal arrows represent the number of words and stability index for both periods, and upper entry arrows indicate the number of new words in the relevant period, upper exit arrows indicate the number of words that exist in the relevant period but do not exist in the next period.[35]

On the thematic evolution map, straight lines signify a strong link among the themes in different ways. For example; relevant themes share the same name, that both themes use the same keywords, or that one of the themes uses the keyword of the other themes. Dashed lines mean that related themes share other words rather than theme names.[33,35] The thickness of the lines in the thematic evolution map is proportional to the degree of the relationship, the size of the circle is proportional to the number of publications of the theme.

RESULTS

According to the results obtained from the WoS database, the number of articles published annually is presented in Figure 1, and the number of articles published in the periods used in the research analysis is presented in Figure 2. According to these findings, although there is a decrease in the number of published articles for the years 1993, 2002, 2004, 2012 and 2018 compared to the previous year, it is observed that the number of published articles increased significantly over the years and periods.

The top 10 countries with the most articles published in the period of 1990-2019 are presented in Figure 3. According to these findings, the country with the most publications is the USA, while Canada, England and Australia, with more than 500 publications, follow the USA.

Findings related to the 20 most frequently used word groups in the articles studied throughout the research are presented in Table 1. According to these findings, the words "CPGs" are used most in the articles, followed by the words "management" and "care".

The strategic diagram of the themes for the period of the "1990-1999" period is shown in Figure 4. Twelve themes emerged from 241 articles analyzed in the "1990-1999" period. It was observed that out of 12 themes, 4 are motor themes (clinical guidelines, physicians, recommendations, disease), 2 are basic and transversal themes (outcomes, dissemination), 2 are well-developed and isolated themes (efficacy, risk), and 4 are emerging or disappearing themes (disorders, women, therapy, quality).

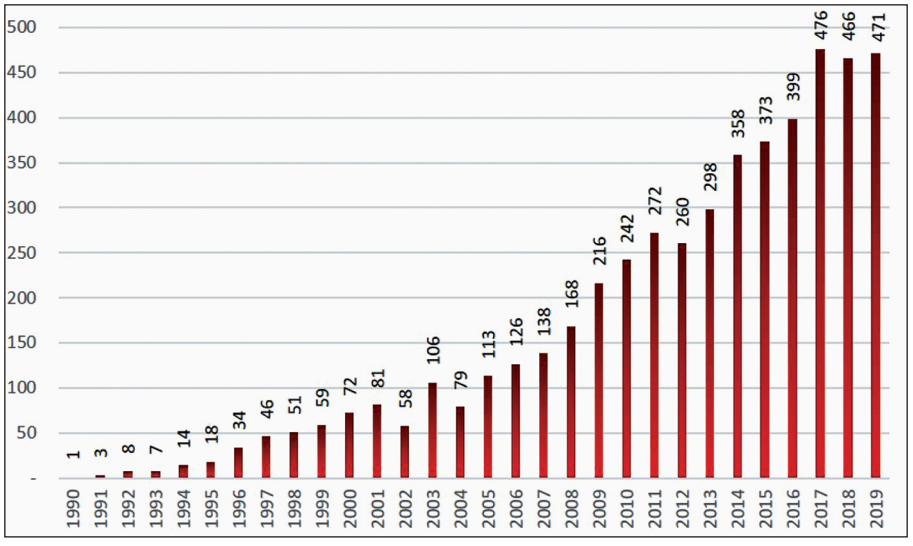

FIGURE 1: Distribution of articles by years.

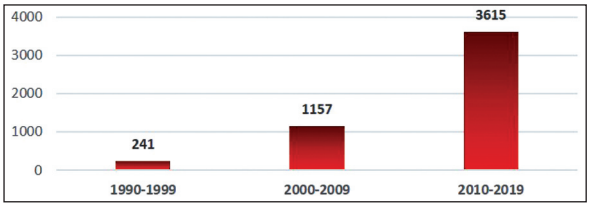

FIGURE 2: Distribution of articles by periods.

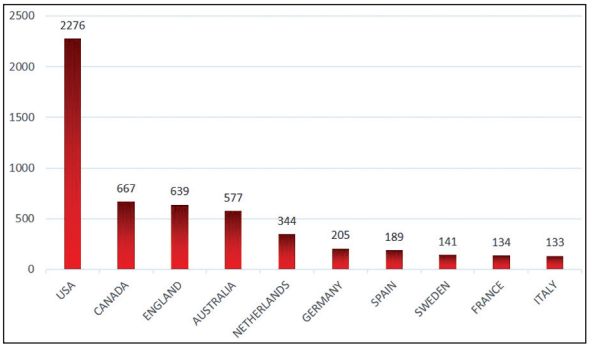

FIGURE 3: Distribution of articles by countries.

Performance analysis findings regarding the themes in the strategic diagram of the "1990-1999" period are provided in Table 2. It is observed that "clinical guidelines" theme, which stands out in the strategic diagram, has the highest number of publications, the highest h-index value and the highest number of citations. When the thematic network presented in Figure 5 is examined, it is observed that the theme of "clinical guidelines" have internal relationships with the themes of "attitudes" (w=0.05), "medicine" (w=0.06), "primary care" (w=0.05), "management" (w=0.05) and "reliability" (w=0.11), all of which exist in the same cluster. Furthermore, it is seen that the theme of "clinical guidelines" have external relationships with the themes of "physicians"

TABLE 1: Most frequently used words (top 20).

Word Groups	n
Clinical practice guidelines	1431
Management	659
Care	607
Guidelines	562
Clinical guidelines	548
Implementation	420
Quality	407
Primary care	364
Interventions	358
Health care	322
Randomized controlled trial	314
Prevalence	307
Depression	296
Physicians	278
Health	267
United States	253
Quality of life	253
Risk	242
Outcomes	241
Children	240

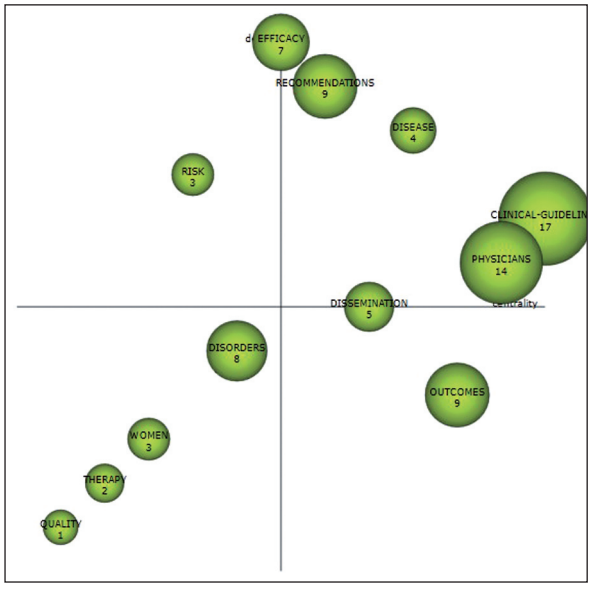

FIGURE 4: Strategic diagram for the period of 1990-1999.

(w=0.03) and "trial" (w=0.02) which are located in the cluster of physicians, the theme of "recommendations" (w=0.02) from the cluster of recommendations, the theme of "practice guidelines" (w=0.03) from the cluster of outcomes and the theme of "general practice" (w=0.02) from the cluster of women.

Based on the findings given in Table 2, the theme with the most publications and the highest h-index value after the theme of "clinical guidelines" is the theme of "physicians" which is concerned with the use of clinical practice guidelines, decision support systems, maintenance services and experimental studies. The theme of "dissemination" is observed as a striking theme. Although 5 articles have been published on this theme, the number of citations of these articles is quite high. These findings demonstrate that this theme is important for the field of clinical practice guidelines. Although there are 9 publications on the theme of "outcomes", which is one of the main themes of the period, h-index is 7 for this theme and it is related to feedback, system and services, practice guidelines and practice policies.

The strategic diagram of the themes for the "2000-2009" period is given in Figure 6. Twenty one themes emerged from 1,157 articles analyzed in the "2000-2009" period. It is observed that out of these themes; 7 themes are motor themes (CPGs, quality, depression, smoking cessation, women, knowledge, preventive care), 4 are basic and transversal themes (outcomes, adherence, controlled trial, trial), 4 of them are well-developed and isolated themes (children, practice guidelines, efficacy, major depression) and 6 of them are emerging or disappearing themes (prevalence, mortality, general practitioners, dissemination, perspectives, disease).

Performance analysis findings concerning the themes in the strategic diagram of "2000-2009" period are given in Table 3. It is observed that the theme of "CPGs" has the highest number of publications, the highest h-index value and, the highest number of

TABLE 2: Findings related to the themes of 1990-1999 period.

Name	No. of documents	No. of citations	h-Index	Centrality	Density
Clinical guidelines	17	973	14	34.45	8.82
Physicians	14	860	10	32.94	7.84
Recommendations	9	410	6	26.36	21.16
Outcomes	9	469	7	31.53	7.17
Disorders	8	303	7	23.65	7.17
Efficacy	7	230	6	24.01	23.57
Dissemination	5	946	5	27.83	7.54
Disease	4	318	4	29.75	9.38
Risk	3	369	3	20.48	9.05
Women	3	49	3	17.82	3.57
Therapy	2	7	1	10.69	1.87
Quality	1	19	1	10.37	0.93

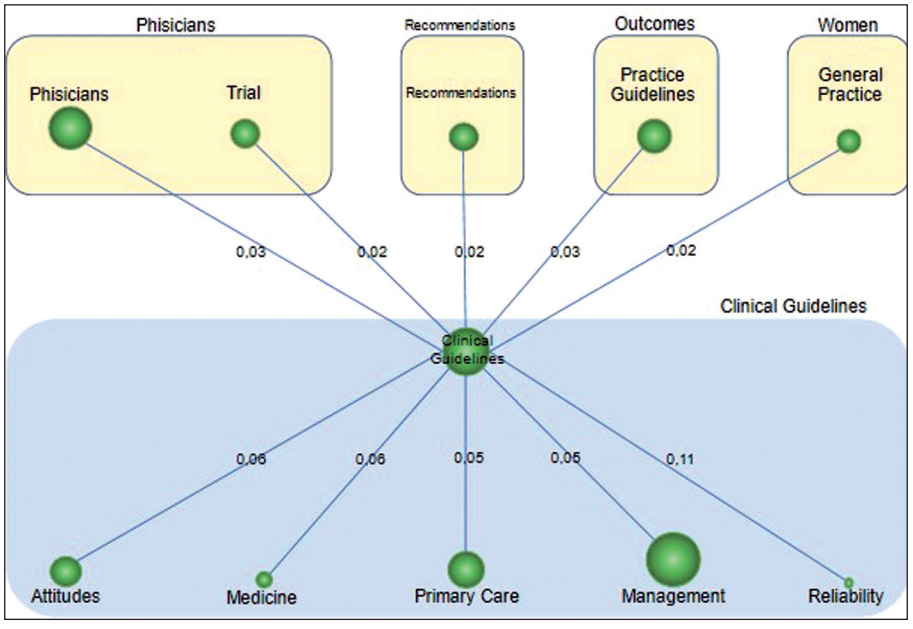

FIGURE 5: Thematic network map (clinical guidelines).

citations. When the thematic network presented in Figure 7a is examined, it is observed that the theme of "CPGs" has internal relationships with the themes of "physicians" (w=0.05), "management" (w=0.05), "care" (w=0.05), "healthcare" (w=0.06) and "implementation" (w=0.05) all of which are located in the same cluster. Moreover, it is also seen that the theme of "CPGs" has external relations with the themes of "quality" (w=0.04) and "evidence-based medicine" (w=0.05) from the cluster of quality, "attitudes" (w=0.04) from the cluster of a controlled trial, "evidence-based practice" (w=0.04) from the cluster of practice guidelines, "attention deficit hyperactivity disorder (ADHD)" (w=0.04) from the cluster of children. After the theme of "CPGs", "quality" is the theme with the highest number of publications, with the highest h-index value and with the highest number of citations. When the thematic network presented in Figure 7b is examined, it is observed that the "quality" theme has internal relations with the themes of "clinical guidelines" (w=0.04), "guidelines" (w=0.04), "improvement" (w=0.03), recommendations" (w=0.04) and "evidence-based medicine" (w=0.04) all of which are located in the same cluster. Besides, it is also seen that the "quality" theme has external relations with "CPGs" (w=0.04), "management" (w=0.05) and "care"

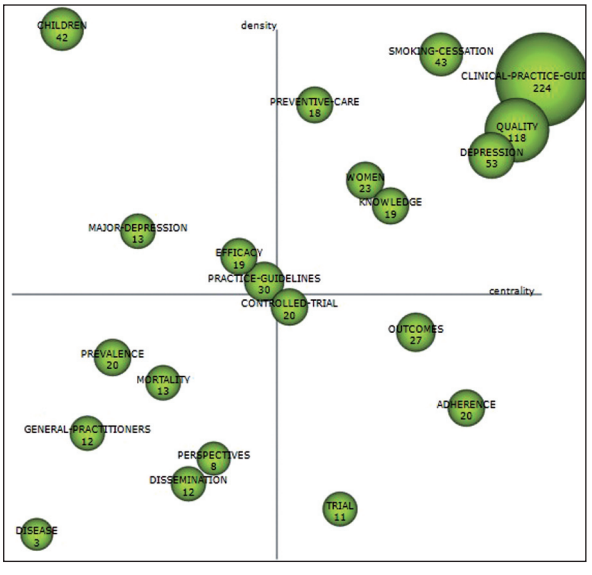

FIGURE 6: Strategic diagram of 2000-2009 period.

(w=0.04) from the cluster of CPGs (w=0.03) from the cluster of practice guidelines and "outcomes" (w=0.02) from the cluster of outcomes.

The theme of "children" which is a developed and specific theme is important for the field of CPGs. It has the h-index value of 21 and 3,200 articles have been published on it. Studies on this theme were conducted on diagnosis, adolescence, asthma, attention deficit and hyperactivity.

TABLE 3: Findings related to themes of 2000-2009 period.

Name	No. of documents	No. of citations	h-Index	Centrality	Density
Clinical practice guidelines	224	7,825	44	43.4	7.71
Quality	118	3,605	31	27.8	4.81
Depression	53	1,455	22	24.39	3.89
Smoking cessation	43	1,945	21	17.06	12.5
Children	42	3,200	21	10.05	22.4
Practice guidelines	30	1,009	16	14.16	1.87
Outcomes	27	1,007	15	16.87	1.68
Women	23	1,085	14	15.3	2.53
Prevalence	20	1,195	12	10.52	1.56
Adherence	20	772	13	18.12	1.36
Controlled trial	20	654	13	14.55	1.86
Knowledge	19	467	14	15.36	2.45
Efficacy	19	469	11	13.3	2.02
Preventive care	18	692	13	14.85	5.56
Major depression	13	617	9	10.64	2.09
Mortality	13	324	9	11.38	1.38
Dissemination	12	506	7	11.87	1.21
General practitioners	12	609	9	10.39	1.34
Trial	11	300	8	15.04	0.46
Perspectives	8	98	6	12.32	1.27
Disease	3	123	2	8.04	0.23

The strategic diagram of the themes for "2010-2019" is given in Figure 8. Twenty six themes emerged from 3,615 articles analyzed in the "2010-2019" period. It is observed that out of these themes; 7 themes are motor themes (implementation, management, prevalence, quality, depression, attitudes, efficacy), 6 are basic and transversal themes (interventions, quality of life, outcomes, professionals, nutrition, controlled trial), 6 of them are well-developed and isolated themes (children, risk factors, decision making, major depressive disorder, intensive care unit) and 7 of them are emerging or disappearing themes (people, experiences, general practice, services, survival, questionnaire, framework).

Performance analysis findings regarding the themes in the strategic diagram of "2010-2019" period are given in Table 4. It is observed that the theme of "management" has the highest number of publications while the theme of "implementation" has the highest number of citations even these themes have the same h-index value. When the thematic network presented in Figure 9a is examined, it is observed that the "management" theme has internal relations with the themes of "clinical guidelines" (w=0.02), "guidelines" (w=0.03), recommendations" (w=0.03), "primary care" (w=0.02) and "diagnosis" (w=0.04) all of which are located in the same cluster. Additionally, it is also noted that the "management" theme has external relations with "clinical practice guidelines" (w=0.05), "implementation" (w=0.02) and "care" (w=0.02) from the cluster of implementation, "prevention" (w=0.02) from the cluster of interventions and "prevalence" (w=0.02) from the cluster of prevalence.

When the thematic network presented in Figure 9b is examined, it is noticed that the "implementation" theme has internal relations with the themes of "barriers" (w=0.04), "CPGs" (w=0.05), "care" (w=0.04), "knowledge translation" (w=0.04) and "dissemination" (w=0.04) all of which are located in the same cluster. Additionally, it is also observed that the "implementation" theme has external relations with "attitudes" (w=0.03) from the cluster of attitudes, "clinical guidelines" (w=0.03) from the cluster of management, "interventions" (w=0.03) from the

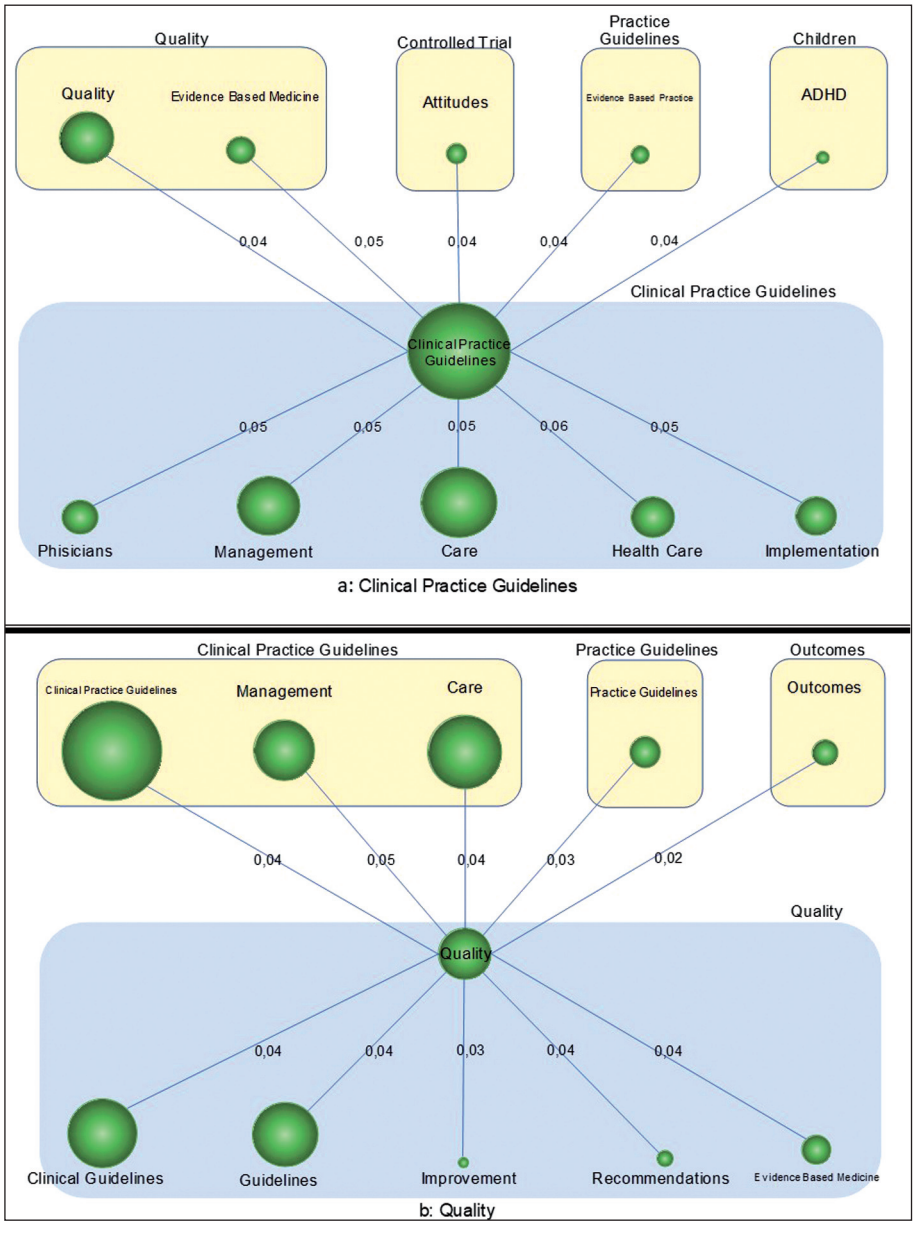

FIGURE 7: Thematic network map (clinical guidelines; quality.)

cluster of interventions, "strategies" (w=0.03) from the cluster of professionals and finally "healthcare" (w=0.03) from the cluster of quality.

In Table 4, it is observed that "quality" existing in all periods with 2,227 citations, "children" existing in the last two periods with 2,329 citations, and "quality of life" existing in the last period with 2,911 citations are the themes that have been always gotten interest or emerging by having more than 2,000 citations. Furthermore, these themes are perceived to have an important holding in the field of clinical practice guidelines since they have the h-index values of 21 and above (22, 21, and 26, respectively). It was found out that the studies on the theme of "quality of life", which have gained importance in the last period, are conducted on cancer patients (especially breast cancer) and the elderly. And it should be also noted that those studies on the theme of "quality of life" are mainly randomized controlled studies and they have strong validity.

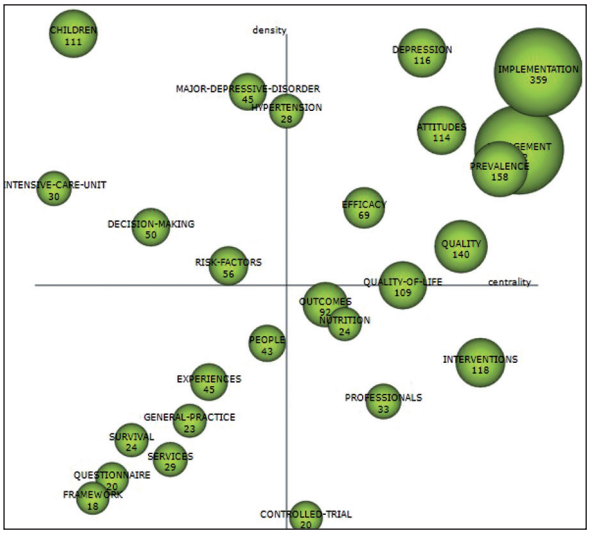

FIGURE 8: Strategic diagram of 2010-2019 period.

The overlap map showing the evolution of keywords for the periods in this study is given in Figure 10. The number of keywords increased in parallel with the number of published articles. The number of keywords increased from 832 to 11,362 by 1,365% from 1990-1999 to 2010-2019 periods. 488 keywords (stability index=0.59) out of 832 keywords existed in the period of 1990-1999 reappeared together with additional 3,480 new keywords in the period of 2000-2009. 2,166 keywords (stability index=0.55) out of 3,968 keywords existed in the period of 2000-2009 continued to be used with an addition of 9,196 new keywords (total 11,362 keywords) in the period of 2010-2019. Based on these findings, it is understood that more than half of the keywords used in the previous periods were used in the next period as well, and the number of new keywords added in each period increased continuously.

The thematic evolution map for the research periods is given in Figure 11. Considering the number of publications, the themes of "clinical guidelines" and "physicians" in the period of 1990-1999, the themes of "CPGs" and "quality" in the period of

TABLE 4: Findings related to the themes of 2010-2019 period.

Name	No. of documents	No. of citations	h-Index	Centrality	Density
Management	362	3,337	27	29.2	3.68
Implementation	359	4,316	27	31.68	6.1
Prevalence	158	1,417	20	17.49	3.22
Quality	140	2,227	22	16.41	2
Interventions	118	1,281	18	17.45	1.48
Depression	116	1,576	19	14.8	6.19
Attitudes	114	1,381	18	15.61	4.28
Children	111	2,329	21	7.2	14.13
Quality of life	109	2,911	26	14.7	1.78
Outcomes	92	1,219	16	12.13	1.72
Efficacy	69	1,273	16	13.11	2.66
Risk factors	56	685	14	9.37	1.88
Decision making	50	811	11	8.83	2.33
Major depressive disorder	45	845	12	9.79	5.23
Experiences	45	413	11	9.2	1.01
People	43	334	11	9.96	1.65
Professionals	33	371	11	13.63	0.81
Intensive care unit	30	376	11	6.34	2.71
Services	29	178	8	8.9	0.5
Hypertension	28	1,096	14	10.07	4.81
Nutrition	24	265	9	12.15	1.66
Survival	24	209	8	8.81	0.64
General practice	23	282	11	8.94	0.76
Questionnaire	20	269	10	8.72	0.39
Controlled trial	20	229	7	11.53	0.23
Framework	18	330	8	7.81	0.3

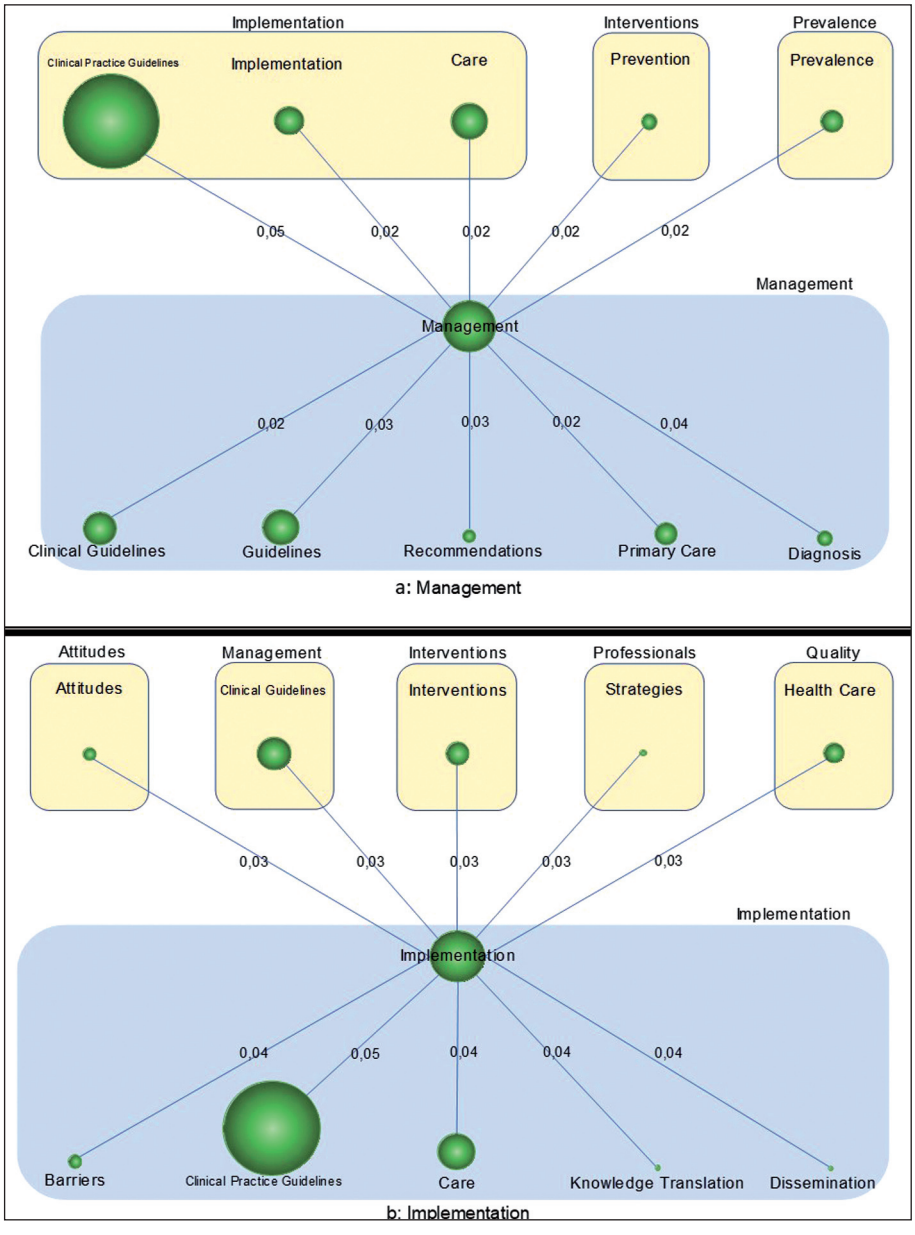

FIGURE 9: Thematic Network Map (management; implementation)

2000-2009, the themes of "management", "implementation", "prevalence" and "quality" in the period of 2010-2019 are noted as the prominent themes with the highest number of publications.

The theme of "CPGs" in the period of 2000-2009 is in relation with the themes of "physicians" and "recommendations" from the previous period, and the themes of "implementation", "management", "attitudes" and "quality" from the last period. This finding demonstrates that the studies related to CPGs focused on the physicians and the recommendations of CPGs before 2000, but in the post-2010 period, these studies have been mostly carried out within the framework of GPGs implementation, analyzed from

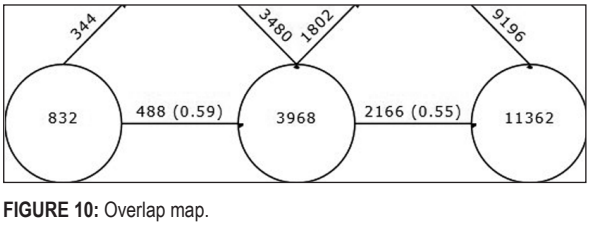

FIGURE 10: Overlap map.

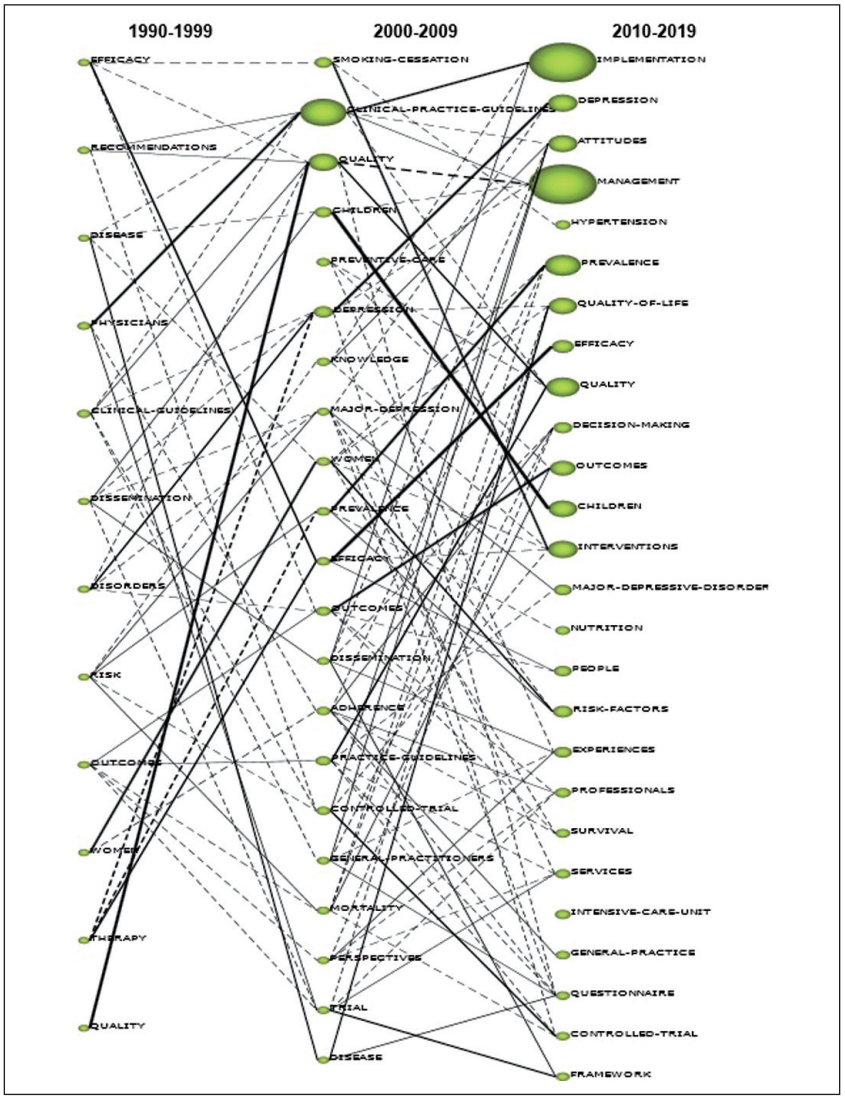

FIGURE 11: Thematic evolution map (1990-2019).

the managerial, attitudes of CPG users and quality perspectives.

The theme of "quality", which was included with the same name in all periods, presented a strong relationship in all periods and the number of publications on this theme has increased continuously. The "quality" theme related to the "recommendations" and "clinical guidelines" themes in the first period has started to be related to the studies especially conducted on the topic of "management" in the last period and also to be associated with the theme of "questionnaire".

The theme of "children", which is associated with the theme of "dissemination" and "disease" in the period of 1990-1999, has taken the same name by performing a strong relationship in both second and third periods and has shared common keywords with studies on "management" in the last period.

The theme of "depression" is observed to have the same name in the second and third periods and showed a strong relationship between these periods. While the "depression" theme in the second period was related to the themes of "disorders" and "therapy" from the first period, but it was related to the studies on the themes of "management", "quality of life" and "controlled trials" from the last period.

The "women" theme, which took place under the same name in the 1990-1999 and 2000-2009 periods

and showed a strong relationship between these periods, is noted to be highly associated with the "risk factors" theme from the last period.

While the theme of "prevalence", which has the same name in the last two periods, has been associated with the themes of "risk" and "therapy" from the first period has been associated with studies on "risk factors" in the last period.

The theme of "dissemination", which takes place in the first two periods, is related to the themes of "management" and "decision making" as well as "implementation", "experiences" and "framework" themes from the last period.

While the "practice guidelines" theme, which is related to the theme of "outcomes" for the period of 1990-1999, shows a strong relationship with the theme of "quality" from the period of 2010-2019, it also shares common keywords with the themes of "major depressive disorder", "services", "questionnaire" and "controlled trials".

The "controlled trial" theme showing a strong relationship in the periods of 2000-2009 and 2010-2019 and existing with the same name in those periods has been noted to be co-occurred with the themes of "attitudes" and "interventions" in the last period.

The theme of "general practitioners", which is related to the studies on "clinical guidelines" from the first period, is observed to be related to the themes of "attitudes", "decision making", "experiences" and "questionnaire" from the last period.

The themes of "efficacy" and "outcomes", which took place under the same name in all periods, showed a strong relationship among the periods and the number of publications on these themes increased continuously.

CONCLUSION

Research findings demonstrate that publications on CPG have been increasing gradually and the country with the highest number of publications is the USA. Moreover, parallel to the number of publications, new keywords used in publications has been increasing and research topics have been expanding accordingly.

It was noticed that the "clinical guidelines" theme, which was included in the strategic diagram of the 1990-1999 period as the most prominent motor theme, was again the most prominent motor theme under the name of "CPGs" in the period 2000-2009, and quite a lot of publications were published on it. However, in the third period, instead of previous themes, the "implementation" theme, which included the implementation of CPGs, emerged as the main motor theme and showed a strong relationship with the theme of "CPGs" from the previous period. The "dissemination" theme, which included the dissemination of CPGs in the first period, has lost its importance and has become one of the disappearing themes in the second period. Whereas, in the second period, the theme of "adherence" including studies evaluating compliance level with CPGs progressed. In the third period, it was observed that in parallel with the studies on the implementation of CPGs, the studies on the attitudes of the users towards CPGs were also intensely conducted and the theme of "attitudes" was observed to be among motor themes in this period. Moreover, in the third period, it was also noted that the researches about the experiences of the users were initiated and the theme of "experiences" become one of the emerging themes. As the use of it, CPGs increased, the studies on management were also addressed to a great extent. Additionally, the theme of "management" emerged as a motor theme with the highest publications, having relationships with the themes of "CPGs" and "quality" from the previous periods.

Concerning the "quality" theme, which had been among the emerging themes in the period of 1990-1999, studies were conducted immensely in the field of CPGs since 2000. In the same vein, this topic found its place among the motor themes of the second period and in the last period and, continued to be studied without losing its importance in terms of CPGs and kept its position among the motor themes. And it was also found out that the theme of "quality of life" also emerged as one of the essential themes of the field in the last period.

The theme of "efficacy", which had the highest density in the 1990-1999 period, proceeded to be worked on despite the relative density decreased in the second period and thus it found itself a place among the isolated themes. However, in the last pe-

riod, its relationship with other themes increased and the theme of "efficacy" became one of the motor themes of the last period.

The theme of "physicians", which was among the motor themes and covered all physicians in general in the period of 1990-1999, lost its importance and in the second period, more specific studies on "general practitioners" were initiated. In the third term, while the theme of "general practice" was among the emerging themes, the theme of "professionals", including other healthcare professionals and especially nurses was among the main themes of the last period.

The theme of "outcomes" found its place in the main and transversal themes section in all periods and continued to be studied on by the increasing number of publications over time.

In the second period, it was observed that during the development of CPGs, "controlled trial" and "trial" themes gained much importance and were located among the major themes in relation to the scientific studies taken into consideration during the development of guide suggestions by the guide development groups. In the last period, it was noted that the theme of "controlled trial" kept its position among the main themes.

The "women" theme, which found its place among the emerging themes in the 1990-1999 period, were studied more in relation to CPGs over the years and showed up among the motor themes in the period 2000-2010. In this vein, the "children" theme was noted to be among the most discussed topics and the most developed isolated themes of this period. Moreover, preserving this feature in the last period as well, the "children" theme was the most advanced isolated theme of this period.

The theme of "disease", which was among the motor themes in the period of 1990-1999, lost its importance and became one of the disappearing themes in the second period, and more specifically, "depression" and "major depression" themes were studied on to a higher extent. While the "depression" theme, which was among the motor themes in the second period, also kept its position among the motor themes in the last period, the "major depression" theme, which was among the advanced and isolated themes in the second period, made progress and became more isolated and was among the developed and isolated themes under the name of "major depressive disorder" theme in the last period. And last but not least, it was also noted that in the last period the theme of "hypertension" emerged among the developing isolated topics.

Having generally evaluated, the studies in the first period were carried out on developing recommendations of CPGs, dissemination, and effectiveness of the guidelines, evaluation of patient results. Additionally, especially physicians were prioritized, diseases were handled in general and studies were conducted on women. In the second period, the studies focused mainly on dissemination and effectiveness of guidelines, evaluation of patient results along with knowledge level of CPG users, compliance level with CPG recommendations, perspectives on guidelines. Moreover, general practitioners rather than specialized physicians were addressed, studies on specific areas such as preventive care, smoking cessation, depression were conducted. Children, as well as women, were prioritized and quality had increased its importance in this period. In the last period, studies on effectiveness of guideline, evaluation of patient results continued, studies on the implementation of CPGs were prioritized, the attitudes and experiences of CPG users were researched as well. All healthcare professionals rather than physicians were addressed. Additionally, while studies on depression continued, studies on specific areas such as hypertension, nutrition, intensive care units were carried out. CPG studies on children continued, and studies on management and decision making were conducted while the importance of quality increased.

Based on research findings of this study, it is assessed that in the near future, the studies will continue to be conducted on the issues of; putting the CPGs into practice, determining the experiences and attitudes of healthcare professionals towards CPGs, reducing the barriers on the way of using CPGs, evaluation of CPGs from a managerial perspective, effects of CPGs on the healthcare system in terms of quality, effectiveness and outcomes.

It is believed that research findings that were reached through this study could provide the researchers, who plan to research in the field of CPG, with insight while determining the topics they will address, could encourage new bibliometric analysis about general and more specific issues in the field of CPG and could provide an opportunity for comparison of the findings. Moreover, by taking the themes emerging through this study as a foundation, content analysis can be made based on texts in relevant fields.

All of these conclusions suggest that the journey of CPGs continues not only in some old streams but in different streams as well. Based on the findings of this study it can be concluded that:

a. Studies on CPGs have aimed to provide evidence on more specific diseases rather than more general advises on the importance of CPGs,

b. An increasing number of CPG studies related to attitudes or quality of life indicate that users of CPGs that are mainly physicians may have some hesitations to implement CPGs. This suggests that physicians are not only the users of CPGs, but patients, other healthcare providers such as managers or the whole healthcare community should be accepted as the users of CPGs.

c. Quality continues to be the main interest of CPGs to assure that patients are received appropriate treatment, physicians provide evidence-based procedures, and managers feel comfortable on good quality health services based on evidence on the effectiveness of treatment methods.

d. Even if efficacy was found to be a theme as isolated, it is clear that it is very common to rename some older terms. Outcome or outcome measurement studies are mostly related to efficacy studies and their numbers have increased in the last decades. This means that studies on CPGs continue to be among the studies aiming to increase the efficacy of and effectiveness of treatment methods and procedures.

e. It is seen that CPG studies related to children have increased in the last 20 years, but these studies have been conducted in an isolated area, most of which have been mostly related to ADHD disease. It is considered that having contributed to the implementation of CPG into practice, evaluation of CPG users' knowledge, attitudes and experiences, and evaluated CPGs in terms of management, and associated them with quality, effectiveness and patient outcomes, these studies can carry this theme to a more important location in the field.

f. It was observed that during the first periods of use, CPGs were used effectively to obtain better health results, to apply the evidence into practice and to reduce variations in practice. During these periods, the evidence in the literature, especially from randomized controlled trials, were used in the CPG development processes to provide medical recommendations, especially for physicians. In the last periods, management and decision-makers become more interested in CPGs as they were responsible for using their scarce resources more efficiently and allocate their funds on more effective alternatives. CPGs were started to be also used by healthcare managers and decision-makers as evidence for their purposes. Conducting cost-effectiveness analyzes in CPG development processes and involving managers and decision-makers along with all stakeholders in external evaluation of draft guidelines led to increasing the use of CPGs by managers and decision-makers. It is considered that healthcare managers also actively used CPGs recently in managerial activities such as improving health services, providing cost-effective provision of the services, increasing quality and efficiency, and achieving better health outcomes. Similarly, decision-makers are thought to use CPGs at the micro and macro level in the decision-making phase and consider it in the resource allocation. Health managers and decision-makers are also expected to use CPG more in the future.

g. It is considered that CPGs can be associated with individual and institutional performance evaluations in the upcoming period. Additionally, it is possible to use CPG as proof in the performance evaluation and performance-based payment, which is coherent with the definition and purpose of the CPGs.

h. CPGs have been involved in medical practices since the day they started to be developed and used. Over time, the importance of CPGs has increased more. It has also begun to become a tool that all stakeholders in health services have started to use for their purposes. Additionally, it is considered that

CPGs will continue to be used more prominently in the health system in the future.

As a limitation of this research, only the articles included in the SSCI index of the WoS database are evaluated. It is assessed that the next studies can be conducted in other databases and indexes or can be planned to cover all databases and indexes. Furthermore, the data of this study or other planned studies can be carried out in different science mapping programs as well. This research was carried out by taking into account the 10-year periods. In the upcoming studies, it is possible to discuss the progress in the field in more detail by periods of 5 years or less.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: ***Design:*** *Yusuf Çelik, Selahattin Akyüz;* ***Control/Supervision:*** *Yusuf Çelik, Selahattin Akyüz, Uğur Uğrak;* ***Data Collection and/or Processing:*** *Selahattin Akyüz, Uğur Uğrak;* ***Analysis and/or Interpretation:*** *Yusuf Çelik, Selahattin Akyüz, Uğur Uğrak;* ***Literature Review:*** *Selahattin Akyüz;* ***Writing the Article:*** *Yusuf Çelik, Selahattin Akyüz, Uğur Uğrak;* ***Critical Review:*** *Yusuf Çelik;* ***References and Fundings:*** *Yusuf Çelik, Selahattin Akyüz, Uğur Uğrak.*

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