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Bibliometric Analysis of Publication Hot Topics of Smartphones in the Field of Health and Medical Services

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Abstract: Smartphones have captured the attention of many health- and medical-services researchers. This study aimed to quantify research 'hotspots' in this field, analyse the relationship between research hotspots and the resulting knowledge groups, and provide visual representations of the findings. Using bibliometric analysis software tools for keyword frequency analysis, research hotspots were identified using keywords from PubMed entries from a 14-year period. The analyses of hotspots were performed using keyword co-occurrence analysis, social network analysis, principal component analysis, multidimensional scaling analysis, and network visualization technology. The results confirmed that the number of articles have been increasing each year. The topics of mobile applications, telemedicine, self-care, Diabetes Mellitus, treatment outcomes, health promotion, and patient satisfaction associated with smartphones were highlighted. The 35 high-frequency keywords that were extracted constituted five principal components of research related to information technology and telemedicine, diabetes, t-health promotion, and smartphones/handheld computers. Figures of knowledge network maps and perceptual maps show the relationship between the high-frequency keywords. Research hotspots for smartphone-related information technology, telemedicine, and health promotion have broad prospects for development. This study provides directions for research hotspots and future research in the field of smartphone applications for health and medical services.

Keywords: Smartphone, Health Services, Medical Services, Telemedicine, Information Technology, Bibliometric Analysis

1. Introduction

Mobile technologies have been adopted in the field of healthcare services to improve the accessibility and quality of healthcare services Smartphones, allow users to install software applications, connect to the Internet, and transmit data wirelessly [1-3]. These powerful functions have attracted much attention in the field of health and medical services [4-9]. Studies on smartphones are increasing, with some revealing growth in smartphone adoption by healthcare professionals and the public [1-16]. Smartphones play important roles in mobile clinical communication [1-7], patient education [8, 9], disease self-management [8-10], and remote monitoring of patients [6-9]. Some scholars have summarized the development and research in this field [11-15]. Mosa et al [12] summarized 83 healthcare applications for smartphones that had been described in 55 separate published articles. Others have examined research methods and characteristics. For example, Bindhim et al [13] reviewed quality assessment methods for smartphone health applications and Molina et al [14] analyzed their interdisciplinary characteristics. While these specific, detailed studies draw conclusions from descriptive analyses and systematic reviews, none have provided a quantitative, intuitive overview of the research status of smartphones in health or medical services; therefore, the relationship between the various studies or which research type is receiving the most attention is unknown.

Some bibliometric analyses focusing on mHealth are available: Shen et al [15] analyzed the publication outputs, collaboration characteristics, and topic bursts of mHealth research; Sweileh et al [16] presented geographical distribution and growth of publications using citation analysis of scientific literature regarding mHealth published from 2006–2016. However, these two studies involve many types of mobile devices, such as phones, patient monitoring devices, and personal digital assistants, and did not analyze smartphones separately; therefore, there was no specific literature regarding smartphone-related research. To fill this knowledge gap, this study aimed to quantify research "hotspots" in this field, analyze the relationship between research hotspots and the resulting knowledge groups, and provide visual representations of the findings.

2. Material and Methods

This study used bibliometric analysis to summarize and analyse scientific literature regarding smartphones in health and medical services. To examine the development and volume of research, keyword frequency was used to extract research hotspots; keyword co-occurrence analysis, social network analysis (SNA), principal component analysis (PCA), and multidimensional scaling analysis (MDS) were applied to clarify relationships between research hotspots and resulting knowledge groups. Additionally, the significance of the previous research hotspots was summarized and explored future research directions for scholars and developers.

2.1. Method of Analysis for Publication Hotspots

Keyword frequency analysis is a bibliometric analysis that can extract publication hot topics from various documents, identifying the publication mainstream of a particular field. Keywords are extracted from the core content of articles and are generally used to identify publication topics, indicate publication scope, and describe theories and methodologies used in research. If a keyword is repeated frequently in a given field, the topic can be regarded as having received much more attention and can be treated as a hot topic in this publication field [17, 18]. Therefore, analysing keywords according to their frequency semantics allows for a summary of publication hot topics in certain fields. The Medical Subject Headings (MeSH) terms are standardized keywords that are uniformly compiled by the US National Library of Medicine in the PubMed database. MeSH terms search is a unique search function in PubMed; it ensures better recall and precision. The content and form of MeSH terms are more consistent than author keywords for statistical analysis. Thus, MeSH term frequency analysis was employed in this study to determine publication hot topics of smartphones in health and medical services.

Keyword co-occurrence analysis refers to the frequency of two keywords appearing in an article at the same time, representing their correlation. Highly relevant keywords represent the core issues and hot topics of the subject. The co-word matrix constructed by keyword co-occurrence analysis can be used for SNA, PCA, and MDS to further demonstrate the relationship between publication hotspots.

SNA examines the relationship structure and attributes of social networks, revealing network characteristics and implicit relationships among members through specific indicators. 'Centrality' is one of the focuses of SNA, reflecting the importance of nodes in the network; 'degree centrality' reflects the closeness of connections between a node and other nodes in the network. 'Between centrality' reflects the degree to which a node controls the entire network's resources and the size of its role as an intermediary bridge in the network. Visualization techniques were used in this study to construct a knowledge network map illustrating the importance of the keywords and their co-occurrence relationship, providing an intuitive understanding of the publication hot topics.

PCA is a multivariate statistical method of examining correlations between multiple variables. It derives a few principal components from the original variables, keeping as much information about the original variables as possible. MDS data analysis displays the structure of distance-like data in a perceptual map. The distance between every pair of points in perceptual maps is strongly related to the similarity between that pair of objects. In this study, each point in a perceptual map represents a MeSH term; highly similar MeSH terms are clustered to form knowledge groups. PCA and MDS were used in this study to integrate publication hot topics and analyse the knowledge structure of published literature on smartphones in health and medical services.

2.2. Literature Retrieval and Screening Method

NoteExpress software (Beijing Aegean Software Center, China) was used on August 7, 2019, to search the PubMed database and downloaded bibliographic records with the Boolean expressions 'smartphone and medical information', 'smartphone and health information', 'smartphone and health services', and 'smartphone and medical services'. Search range was set to 'all fields', without limiting articles' publication dates or language. A total of 2717 articles were retrieved. After examining document types and the bibliographic items, 108 articles were excluded: 6 news, 1 editorial erratum, 2 interviews, and 99 with missing keywords; thus, 2609 articles were included.

2.3. Data Analysis

NoteExpress and Bibexcel extracted MeSH terms and constructed co-word matrices. The specific research process of MeSH term frequency analysis in this study involved two steps. First, different keyword forms [15] were unified in four ways: (1) keywords with the same meaning e.g., *cellular phone* and *cell phone* were unified as *cellular phone;* (2) the singular and plural of non-MeSH term keywords were used in the most prevalent form, e.g. *smartphone* and *smartphones* were unified as *smartphone*; (3) full names and abbreviations, e.g., *app, application*, and *applications,* were unified as *applications*; (4) subtypes of diseases were unified by name of the primary disease, e.g. *type 2 diabetes*, and *type 1 diabetes* were unified into *diabetes*. Second, keywords were sorted in descending order of frequency to extract the top 35 keywords and research methods as research 'hotspots' and a co-word matrix was constructed to conduct SNA, PCA, and MDS.

SNA was used to identify relationships between research hotspots; the knowledge network map was constructed with Netdraw software [19]. In the map (Figure 2), the size of the node shown in the knowledge network map depends on the degree in SNA and the number of lines connecting each node. The more lines the node connects, the bigger the node appears. The lines represent the strength of the relationships between pairs of keywords. Thicker lines indicate higher co-occurrence frequency and closer relationship [20].

SPSS 18.0 software was used for PCA and MDS; the mainstream knowledge group was determined according to the contribution rate of each principal component and the eigenvector in the component matrix and keyword meanings. MDS was used to construct the perceptual map and show the distance and similarity between the keywords; keywords with high similarity converge to form a knowledge group.

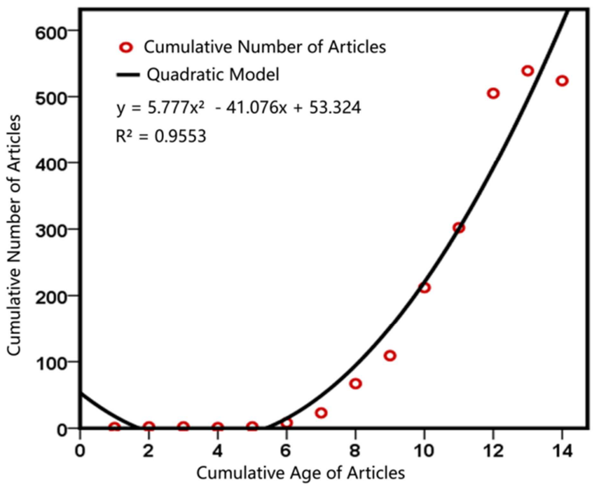

Figure 1. *Cumulative number of articles by year.*

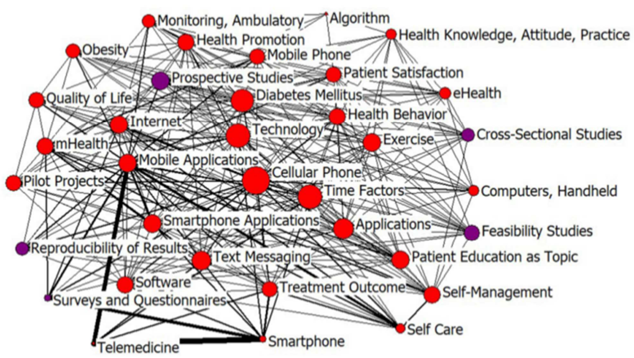

Figure 2. *Knowledge network map for 35 keywords (The red node is the keyword representing the research content, and the purple node is the keyword representing the research method).*

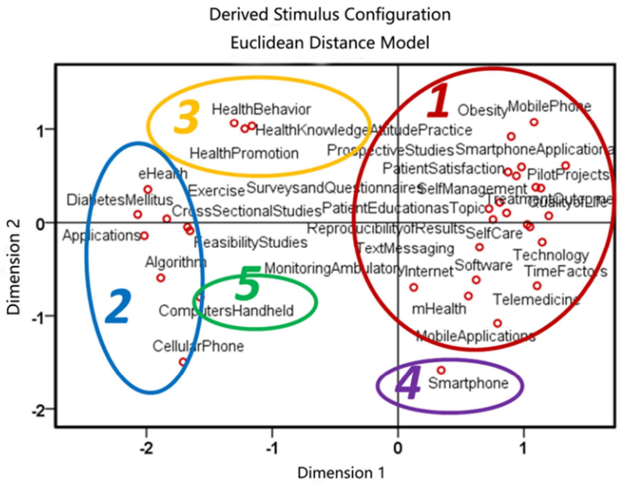

Figure 3. *Perceptual map derived from MDS (Stress = 0.179, RSQ = 0.923).*

3. Results

3.1. Annual Distribution of Literature

The number of articles increased yearly, and the number of articles in 2014 increased significantly (Table 1). Since the 2019 articles did not represent an entire year, this study used the curve of the growth trends of the literature from documents from 2005–2018. A significant correlation was found between the year and the cumulative number of documents ($r = 0.977$, $p < 0.001$) (Figure 1).

3.2. Analysis of Research Hotspots

The top 35 keywords representing the research content and methods were selected as research hotspots (Table 2). From the order and meaning of keywords, we found that many studies focused on information technology, especially mobile applications. Fifteen top keywords were related to information technology, with 5330 (66%) total occurrences. There were many studies related to telemedicine, self-care, treatment outcomes, and health promotion. The predominant study methods are surveys and questionnaires.

3.3. Knowledge Network Map Between Research Hotspots

We constructed a knowledge network map with the 35 extracted keywords as shown in Figure 2. The red node is the keyword representing the research content, and the purple node is the keyword representing the research method. SNA results are shown in Table 3. Figure 2 demonstrates 'Cellular Phone' is the largest node at the centre of the knowledge network and is connected to 28 keywords. 'Technology' and 'Time Factors' each connected to 24 keywords. Table 3 shows the Degree of each keyword in SNA. Among them, the keywords Mobile Applications, Prospective Studies, Treatment Outcome, Patient Satisfaction, Monitoring, Ambulatory are worthy of attention. Their rankings of the Betweenness Centrality are higher than the Degree Centrality, which means they play important intermediary roles in the 35 keywords. The keyword-related research content can be utilized in subsequent studies.

3.4. Mainstream Knowledge Group Analysis

PCA of the extracted 35 keywords showed they constitute five principal components; their accumulated contribution rate is 87.037%, as shown in Tables 4 and 5. Through the eigenvector in Table 4, the information reflected by each principal component may be summarized as follows: the first principal component related primarily to information technology and telemedicine; the second mainly reflects research information related to diabetes; the third comprehensively reflects research information related to health promotion; and the fourth and fifth principal components include other research related to smartphones and handheld computers. Figure 3 shows the perceptual map constructed by MDS, marking the distance between each keyword and the five principal components.

Table 1. *Number of articles per year regarding smartphone use and applications for healthcare.*

Publication year	Number of articles	Composition ratio (%)
2005	1	0.04%
2006	2	0.08%
2007	2	0.08%
2008	1	0.04%
2009	2	0.08%
2010	8	0.31%
2011	23	0.88%
2012	67	2.57%
2013	109	4.18%
2014	212	8.13%
2015	302	11.58%
2016	505	19.36%
2017	539	20.66%
2018	524	20.08%
2019	312	11.96%
Total	2609	100.00%

Table 2. *Frequency and order of the top 35 keywords of research articles on healthcare applications and uses for smartphones.*

Number	Keywords	Frequency	Number	Keywords	Frequency
1	Smartphone	1660	19	Feasibility Studies	115
2	Mobile Applications	949	20	Cross-Sectional Studies	110
3	Telemedicine	593	21	Text Messaging	105
4	mHealth	429	22	Software	105
5	Cellular Phone	418	23	Computers, Handheld	103
6	Internet	320	24	Obesity	102
7	Surveys and Questionnaires	302	25	Self-Management	99
8	Self Care	250	26	eHealth	98
9	Diabetes Mellitus	182	27	Technology	98
10	Health Promotion	165	28	Time Factors	97
11	Applications	154	29	Quality of Life	90
12	Reproducibility of Results	145	30	Algorithm	90
13	Pilot Projects	143	31	Patient Satisfaction	88
14	Health Behaviour	136	32	Health Knowledge, Attitude, Practice	88
15	Exercise	130	33	Mobile Phone	88
16	Patient Education as Topic	123	34	Prospective Studies	87
17	Smartphone Applications	120	35	Monitoring, Ambulatory	85
18	Treatment Outcome	116	Total		8069

Table 3. *Centrality analysis of the 35 keywords of research articles about smartphone usage in healthcare application and education.*

Keywords	Degree Centrality	Between Centrality	Closeness Centrality
Cellular Phone	28	30.074	75
Time Factors	24	26.812	80
Technology	24	21.311	80
Diabetes Mellitus	23	14.596	80
Applications	21	15.258	82
Text Messaging	20	17.310	84
Mobile Applications	19	22.567	84
Internet	19	12.829	84
Exercise	19	9.346	84
Patient Education as Topic	19	4.728	84
Smartphone Applications	19	6.576	85
Prospective Studies	19	15.922	85
mHealth	18	12.829	85
Health Promotion	18	8.184	85
Health Behavior	18	8.887	85
Software	18	7.581	86
Self-Management	18	7.027	86
Treatment Outcome	17	12.348	87
Patient Satisfaction	17	12.607	87
Pilot Projects	16	3.217	87
Feasibility Studies	16	5.878	87
Quality of Life	16	5.947	89

Keywords	Degree Centrality	Between Centrality	Closeness Centrality
Mobile Phone	16	10.873	88
Obesity	15	3.904	88
Reproducibility of Results	14	1.733	90
Cross-Sectional Studies	14	5.233	89
Monitoring, Ambulatory	14	9.518	90
eHealth	13	3.053	90
Computers, Handheld	12	3.395	91
Health Knowledge, Attitude, Practice	12	4.712	93
Self Care	11	0.908	93
Surveys and Questionnaires	9	1.417	95
Smartphone	8	1.683	103
Telemedicine	5	0.327	100
Algorithm	5	0.411	112

Table 4. *Component matrix obtained from the PCA.*

Keywords	Component 1	Component 2	Component 3	Component 4	Component 5
Smartphone	0.510	-0.107	-0.235	0.768	0.055
Mobile Applications	0.674	-0.211	0.110	0.649	-0.092
Telemedicine	0.850	-0.033	-0.028	0.240	0.121
mHealth	0.701	0.089	0.211	0.587	-0.173
Cellular Phone	0.009	0.634	-0.069	0.097	-0.280
Internet	0.637	0.212	0.289	0.609	0.126
Surveys and Questionnaires	0.938	0.104	0.147	0.092	0.104
Self Care	0.940	0.101	0.113	0.149	-0.016
Diabetes Mellitus	0.073	0.850	0.146	0.021	0.145
Health Promotion	0.270	0.422	0.818	0.052	0.135
Applications	0.032	0.837	0.099	0.001	-0.134
Reproducibility of Results	0.921	0.110	0.168	0.226	-0.016
Pilot Projects	0.923	0.124	0.252	0.137	-0.077
Health Behavior	0.258	0.473	0.790	0.038	0.130
Exercise	0.074	0.858	0.234	0.020	0.131
Patient Education as Topic	0.921	0.126	0.173	0.196	-0.042
Smartphone Applications	0.944	0.102	0.018	-0.027	0.083
Treatment Outcome	0.938	0.051	0.032	0.120	0.105
Feasibility Studies	0.122	.918	0.175	-0.018	0.136
Cross-Sectional Studies	0.129	.898	0.174	-0.051	0.131
Text Messaging	0.900	0.083	0.076	0.176	0.233
Software	0.831	0.047	0.003	0.326	0.366
Computers, Handheld	0.063	0.510	0.280	-0.007	0.687
Obesity	0.861	0.152	0.149	0.075	-0.086
Self-Management	0.921	0.082	0.053	0.052	-0.130
eHealth	0.065	0.798	0.242	-0.049	0.156
Technology	0.918	0.040	-0.062	0.053	0.215
Time Factors	0.943	0.049	0.030	0.144	0.157
Quality of Life	0.932	0.106	0.140	0.134	-0.107
Algorithm	0.073	0.810	0.016	-0.032	-0.026
Patient Satisfaction	0.930	0.133	0.221	0.096	-0.094
Health Knowledge, Attitude, Practice	0.312	0.451	0.745	-0.037	-0.021
Mobile Phone	0.898	0.091	0.163	-0.043	-0.031
Prospective Studies	0.918	0.112	0.247	0.115	-0.119
Monitoring, Ambulatory	0.892	0.024	0.123	0.315	-0.003

Table 5. *Composition of the five principal components and variance contribution rate.*

Principal component	Eigenvalue	Component variance contribution rate	Keywords
1	12.852	50.606%	Mobile Applications; Telemedicine; mHealth; Internet; Surveys and Questionnaires; Self Care; Reproducibility of Results; Pilot Projects; Patient Education as Topic; Smartphone Applications; Treatment Outcome; Text Messaging; Software; Obesity; Self-Management; Technology; Time Factors; Quality of Life; Patient Satisfaction; Mobile Phone; Prospective Studies; Monitoring, Ambulatory
2	3.747	69.609%	Cellular Phone; Diabetes Mellitus; Applications; Exercise; Feasibility Studies; Cross-Sectional Studies; eHealth; Algorithm
3	2.954	77.320%	Health Promotion; Health Behaviour; Health Knowledge, Attitude, Practice
4	2.704	83.807%	Smartphone
5	1.894	87.037%	Computers, Handheld

4. Discussion

This study found that studies of smartphones in medicine and healthcare started around the year 2000, with an overall growth trend in the past 14 years. Many articles cover mobile applications, information technology, telemedicine, health promotion, etc., as reported by Shen et al [15] and Sweileh et al [16]. Our knowledge network map shows the relationship between 35 important keywords. The results of PCA and MDS are consistent, and these research hotspots are integrated into five knowledge groups.

4.1. Smartphone-Related Information Technology Is the Focus in This Field

Among the 35 high-frequency keywords identified, 15 keywords (43%) with the total frequency of 5330 (66%) relate to information technology. These keywords are closely related to others in the knowledge network map, indicating that information technology development has attracted much attention from researchers in this field. The frequency of 'Mobile Applications' ranked second and is linked with 19 other keywords. In the SNA, the 'Degree Centrality of Mobile Applications' ranked sixth, and 'Between Centrality' ranked third, indicating that the development and research of mobile applications has not only received much attention from researchers but also that it is at the frontier of research content in healthcare. We found that as information technology develops, the utility of smartphone applications must be constantly updated. Müller et al [17] mentioned that dealing with rapidly developing information technology in the field of healthcare is a problem that many researchers and developers must think about. The Institute for Healthcare Informatics (IMS) reported more than 50% of mobile applications have been downloaded less than 500 times, mainly because of poor quality and lack of specific application guidance and support from health professionals [14]. Martínez-Pérez et al [13] found that the current service population of most mobile applications was the general population, not clinicians; also, researchers and developers should work on visualized graphics and videos in the design of various applications. Therefore, we believe that the function, style, and scope, as well as the applicable population and professional performance of smartphone applications, should be the focus of future research in the development of smartphone information technology for healthcare. Researchers can go deeper in these directions.

4.2. Research on Smartphone-Related Telemedicine Deserves More Attention

Keyword frequency analysis showed 'telemedicine' ranked third in total frequency. The results of PCA and MDS found 'telemedicine' formed a large knowledge group with many other keywords (first principal component in Table 5; first knowledge group in Figure 3), suggesting previous smartphone-related telemedicine studies are numerous and extensive, including not only information technology but also various evaluations, such as treatment outcomes, quality of life, and patient satisfaction. In the knowledge network map, the lines which represent co-occurrence frequency between the keyword 'telemedicine' and 'smartphone' and 'mobile applications' were much thicker than other lines, indicating that a large number of telemedicine studies have focused on smartphone and mobile applications.

Furthermore, the keywords 'Prospective Studies', 'Treatment Outcome', 'Patient Satisfaction', 'Monitoring', and 'Ambulatory' in the first principal component are worthy of attention as the rankings of Between Centrality of these keywords are significantly higher than those of Degree Centrality, which implies that the research related to these keywords will continue to be valued for years to come. At present, smartphones provide convenient and fast information transmission and communication and have a considerable number of users.

Many developers and researchers believe that smartphones are ideal terminals for telemedicine. In reviewing the related literature, we found that although smartphones can enhance communication between patients and doctors, improving satisfaction and quality of care, they are underutilized in actual medical care [5]. Segura-Sampedro et al [6] proposed that follow-up telemedicine based on smartphones is feasible and safe for early postoperative complications, and with the development of specific mobile applications, this follow-up may become standard practice. Deng et al [18] suggested that in developing countries and those with developing economies, the research and application of mobile phones in health care should be strengthened. Based on the above analysis, we believe smartphones still have great research value and in-depth research space in the field of telemedicine, and research evaluating applications of various technologies will especially receive more attention.

4.3. Smartphones Related to Chronic Disease Prevention and Health Management Have Broad Prospects for Development

The keyword frequency analysis of this study shows that the keywords of 'Diabetes Mellitus', 'Health Promotion', and 'Health Behaviours' not only have high frequency but also form two knowledge groups with other keywords. This indicates that many researchers are examining the advantages of smartphones in chronic disease prevention, health promotion, and health education. The report published by IMS in 2014 shows 70% of healthcare applications are available to the general population as tools for achieving health and wellness and improving physical activity. Some common health applications have high development potential for some chronic diseases, such as diabetes and cardiovascular disease. El-Gayar et al [9] analysed the status and potential of mobile applications for diabetes self-management, referring to an overwhelming number of applications and studies of applications relating to diabetes, similar to the results of this study. Considering that many countries have invested substantial resources into research and improvement of chronic disease prevention and health promotion, the development and optimization of healthy smartphone applications will have a large market space; researchers can expand the study of this area.

4.4. Research Methods in This Field Need to Be Improved

Among the 53 primary keywords identified, those representing research methods are ‘Surveys and Questionnaires’, ‘Reproducibility of Results’, ‘Feasibility Studies’, ‘Cross-Sectional Studies’, and ‘Prospective Studies’. The high frequency of ‘Feasibility Studies’ shows that the development of smartphone applications is in the early stages. The node for ‘Prospective Studies’ connects with 19 keywords, indicating that many studies have adopted this method. Additionally, the keyword ‘Reproducibility of Results’ ranked 12th in the keyword frequency analysis, which implies that the reproducibility of many research results in this field has attracted attention. Molina Recio et al [14] pointed out that some studies in this field currently lack sufficient accuracy and evidence and are incapable of being replicated. This situation leads to unclear goals and poor applicability of suggestions for application. BinDhim et al [13] suggested that researchers should be more rigorous in their experimental design and publication of results and conduct more empirical evaluation studies. Hence, we hope researchers will use more rigorous scientific research methods to provide more scientific basis and support for the development of smartphones in health and medicine.

4.5. Limitations

Firstly, the results in this study may be affected by the accuracy of the keywords. Four main methods of ‘cleaning’ keywords in this study were used, but some were still synonymous, which affects the results to some extent. Secondly, this study used ‘all fields’ as the search range, using ‘smartphone and medical information’, ‘smartphone and health information’, ‘smartphone and health services’, and ‘smartphone and medical services’ as Boolean searches. This was based on the following considerations: First, the research history of smartphones is relatively short and the initial content of emerging disciplines is mostly scattered, so expanding the search scope was beneficial for consulting relevant literature; Second, to ensure the accuracy of the research topic, the smartphone topics were limited to information technology and health and medical services. This keyword restriction led to the exclusion of some related studies, thereby affecting the research results. Therefore, the summary in this study may not be representative of the complete body of literature. Thirdly, this study was based on literature in PubMed, emphasizing the academic research of smartphones in the field of healthcare. The results are different from many studies based on many smartphone-based medical applications available from online stores. However, most such studies have not been discussed in the medical literature (PubMed articles). Finally, it is worth mentioning that the figures and the tables produced by this study contain a large amount of information. It is not possible to discuss the research content related to each keyword specifically in this article, but researchers can refer to the figures and the tables according to their research interests. The specific analysis methods can be found in the literature [21, 22].

5. Conclusions

The study applied keyword co-occurrence analysis, SNA, PCA, MDS, and network visualization technology providing intuitive results to help researchers and developers understand the previous research in the field. We found that the number of articles have been increasing each year. The topics of mobile applications, telemedicine, self-care, Diabetes Mellitus, treatment outcomes, health promotion, and patient satisfaction associated with smartphones were highlighted. The 35 high-frequency keywords that were extracted constituted five principal components of research related to information technology and telemedicine, diabetes, t-health promotion, and smartphones/handheld computers. Knowledge network map and perceptual map show the relationship between the high-frequency keywords. Research hotspots for smartphone-related information technology, telemedicine, and health management for chronic disease prevention have broad prospects for development. This study provides directions for research hotspots and future research in the field of smartphone applications for health and medical services. Scholars who are concerned about other mobile devices also can refer to this study for a comparison.

Declarations of Interest

All the authors do not have any possible conflicts of interest.

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Author’s Contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by ZT, YW, JL. The first draft of the manuscript was written by ZT and YW; YW provided the theoretical framework and edited most of the manuscript; SL helped improve the manuscript. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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