

Global Scientific Outputs of Palliative Care Publications: A Holistic Approach with Bibliometric Analysis

Arzu Akdağlı Ekici¹, [MD]
ORCID: 0000-0001-7219-3145

Özgür Yağan¹, [MD]
ORCID: 0000-0003-1596-1421

¹Hitit University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Çorum, Turkey.

Corresponding Author: Arzu Akdağlı Ekici
Hitit University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Çorum, Turkey.
E-mail: akekici@gmail.com

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ABSTRACT

Objective: This study aims to summarize the scientific outputs of the palliative care studies conducted between 1975 and 2019 through bibliometric analyses, identify the top effective journals, top-cited studies, the collaboration between countries, and trend topics.

Materials and Methods: We performed a bibliometric analysis on palliative care. "Palliative care", "terminal care", "end-of-life care" and "hospice care" terms were used as the keywords in the title section of articles in Web of Science database. Spearman correlation coefficient was performed for the correlation analysis between the number of publications produced by the countries and economic indicators.

Results: There were 22361 publications about palliative care. Of these publications, 10309 were articles. The top three countries that produced more than 100 articles were the USA, the United Kingdom, and Canada. The top three journals that had the highest number of publications were Journal of Palliative Medicine, Journal of Pain and Symptom Management, and Palliative Medicine. There was a positive, highly significant relationship between the number of publications and Gross domestic product ($r = 0.709$, $p < 0.001$).

Conclusion: This study is believed to be a beneficial guide about the global outputs of palliative care for the clinicians and scientists and present new research ideas to the researchers.

Keywords: Palliative care, end-of-life care, hospice care, terminal care, bibliometric analysis.

INTRODUCTION

Palliative care is defined as the supportive care provided to patients and their families who are facing a fatal condition in which the therapeutic approaches are insufficient [1-4]. The purpose of palliative care is to provide the patient with relief until the end-stage using pharmacological and nonpharmacological methods for preventing pain, dyspnea, and fatigue symptoms caused by the disease. The purpose of palliative care that starts with the diagnosis time and supportive care provided to the family in the mourning process is to relieve the pain of patients and families by making a comprehensive assessment of the physical,

psychological and moral symptoms [1-4]. Just like pain affects the quality of life; anorexia, dysphagia, dyspnea, xerostomia, and weight loss are the most important symptoms that affect the course of the disease and have top priority in the treatment [5]. The main diseases that require palliative care include motor neuron diseases and progressive neurologic diseases (Alzheimer, ALS), advanced organ failure (heart, lung, kidney, liver, brain), cancers nonresponsive to the treatment, HIV/AIDS, and genetic/congenital, progressive diseases in children [5-6].

Bibliometrics is the statistical analysis of scientific publications, primarily articles [7-9]. Citation analysis as part of the bibliometric analysis is a method used for the relative effect of an article, author, or journal. Literature review becomes more and more difficult for researchers with the increasing number of publications [10-12]. Thanks to bibliometric analyses, researchers have access to a lot of summary information in a short time by obtaining the top-cited effective studies, related journals to be followed, the effectiveness of the countries, collaboration between the countries, and active authors and institutions [13-14].

The need for palliative care centers as well as the importance of these centers has been increasing due to factors such as an increase in cancers and longer length of life and an increase in chronic diseases [4]. However, the literature includes no bibliometric studies that provide a summary of the studies on palliative care. This study aims to summarize the scientific outputs of the studies conducted between 1975 and 2019 through bibliometric analyses, identify the top effective journals, top-cited studies, the collaboration between countries, and trend topics.

MATERIALS and METHODS

We performed a bibliometric analysis of the published literature between 1975 and 2019 on palliative care publications using Web of Science (WoS; Thomson Reuters, New York, NY, USA) database. "Palliative care", "terminal care", "end-of-life care" and "hospice care" terms were used as the keywords in the title section of articles (*title: ("palliative care") or title: ("terminal care") or title: ("end-of-life care") or title: ("hospice care") refined by: document types: (article) timespan: 1975-2019. Indexes: SCI-Expanded, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI.*) The articles were downloaded from the WoS database (access date: 03.01.2020) and were analyzed bibliometrically. A web site (<http://lert.co.nz/map/>) was utilized for drawing the world map. Bibliometric network visualization was performed using the VOSviewer (Version 1.6.13) package programming [15]. Statistical analysis was performed using SPSS (Version 22.0, SPSS Inc., Chicago, IL, ABD) package programming. The normality of the data distribution was assessed using the Shapiro-Wilk

test. Spearman correlation coefficient analysis was performed for the correlation analysis between the number of publications produced by the countries and economic indicators of GDP (gross domestic product) and GDP PPP (purchasing power parity). Estimations about the number of publications in the following years were done using the linear regression analysis. Statistical significance was taken $p < 0.05$.

RESULTS

A review of the related literature showed that there were 22361 publications about palliative care published between 1975 and 2019 (Article, proceedings paper, meeting abstract, review, letter, book review, editorial material, book, book chapter, bibliography, news item, etc.). Of these publications, 10309 were articles. Bibliometric analyses were performed with a total number of 10309 articles. 9580 (92,9%) of the 10309 articles were written in English, and the remaining low number of articles were written in French (236), German (213), Spanish (161), Portuguese (42), Polish (19), Italian (15), Korean (10), Croatian (9), Turkish (5), Hungarian (4) Czech (3), Dutch (2), Greek (2), Japanese (2), Russian (2) Danish (1), Malay (1), Norwegian (1), and Slovenian (1) languages.

Development of Publications

The distribution of the publications according to years is demonstrated in Figure 1, which also demonstrates the regression analysis results about the estimations about the number of publications between 2020 and 2024. Regression analysis results showed that there would be 998 articles to be published in 2020 (CI%: 865-1131) and 1087 articles in 2024 (CI%: 898-1275) (Figure 1). There was a statistically significant increase trend in the publications ($p < 0.05$).

Active Countries

The distributions of the world countries that produced the highest number of publications are demonstrated in Figure 2. The top five countries that produced more than 100 articles were the USA (3953), the United Kingdom (1423), Canada (946), Australia (850), Germany (543), Netherlands (357), France (330), Japan (308), Spain (306), Italy (257), Sweden (232), Belgium (217), Switzerland (180),

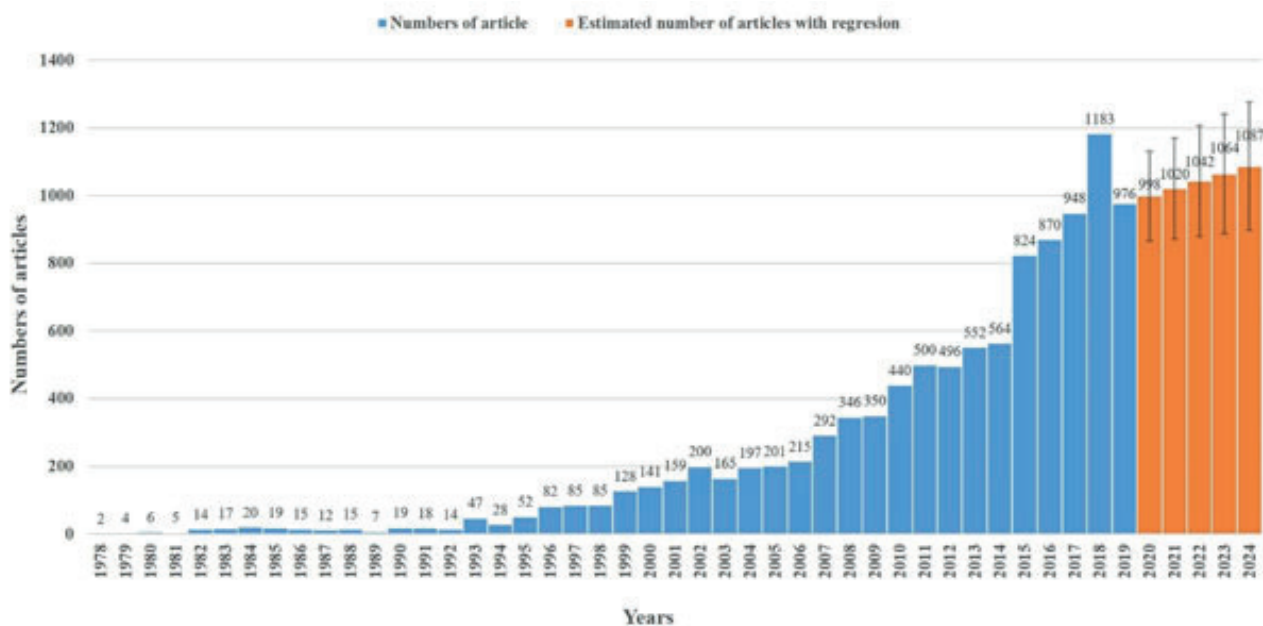


Figure 1. Distribution of articles by year on palliative care

Scotland (177), Taiwan (143), Ireland (140), Brazil (136), India (136), China (134), South Korea (134), Norway (116), and New Zealand (110) respectively. Figure 3 demonstrates the international collaboration network map of the 66 countries that produced at least 5 articles among 133 countries that had articles about palliative care. Cluster analysis results indicated 7 different collaborations in 7 different colors.

palliative care and the total number of citations of these journals.

The top five journals that had the highest number of publications were Journal of Palliative Medicine (873), Journal of Pain and Symptom Management (793), Palliative Medicine (754), American Journal of Hospice Palliative Medicine (479), and Journal of Palliative Care (319) respectively.

Active Journals

Table 1 demonstrates the top 50 journals that produced the highest number of articles about

Active Organizations

The top 10 active universities that had publications about this issue were King's College London (241),



Figure 2. World map for the distribution of articles by country on palliative care.

Footnote: In the indicator given at the bottom left of the figure, productivity increases from green to red

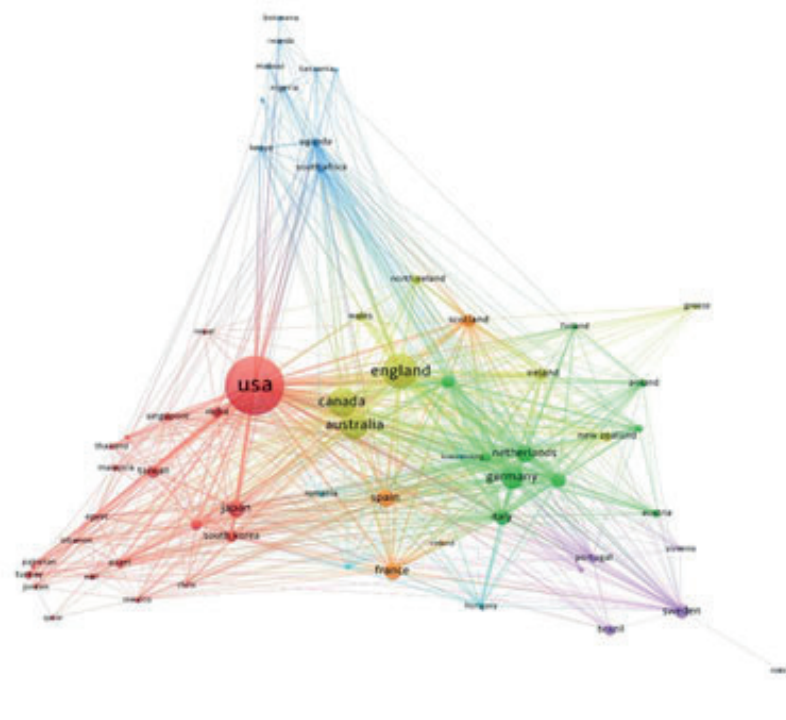


Figure 3. Network visualization map for international collaboration of worldwide countries on palliative care.

Footnote: The size of the circle shows the large number of articles, the colors indicate the clusters, and the thickness of the lines indicates the strength of relationship.

University Toronto (200), University Washington (189), Duke University (187), University of California, San Francisco (170), Flinders University South Australia (152), University Texas MD Anderson Cancer Center (147), University Pennsylvania (134), University Alberta (130), and Dana-Farber Cancer Institute (122) respectively.

Active Authors

The most active authors in this subject are; Bruera E (165), Higginson IJ (131), Morita T (97), Deliens L (95), Currow DC (94), Curtis JR (77), Radbruch L (75), Miyashita M (72), Payne S (68), and Harding R (64).

Citation Analysis

Table 2 demonstrates the bibliometric analysis of the top 15 articles that received most citations according to the total number of citations in the articles published between 1975 and 2019. The last column of Table 2 demonstrates the average number of citations per year.

The total number of citations per article was calculated by dividing the total number of citations received by the journals, and the network visualization map is demonstrated in Figure 4.

Co-citation Analysis

There were a total of 153676 publications cited in the references sections of all the articles that were analyzed. The top 5 articles that received the highest number of co-citations in the references section were the studies conducted by Temel et al. (2010), Connors et al. (1995), Bakitas et al. (2009), Bruera et al. (1991), and Teno et al. (2004) respectively [16-20].

Trend Topics

There were 9619 different keywords used in the 10309 articles. These words included 88 keywords that were used in at least 40 different articles. The cluster analysis between these keywords is given in Figure 5.a. Trend visualization network map is given in Figure 5.b. The most frequently used keywords about this issue are given in Table 3."

Correlation Analysis

There was a positive, highly significant relationship between the number of publications and GDP ($r = 0.709$, $p < 0.001$ respectively). A positive, moderate level relationship was found between the number of publications and GDP PPP ($r = 0.642$, $p < 0.001$).

Table 1. Active journals on palliative care.

Journals	RC	%	C	Journals	RC	%	C
Journal of Palliative Medicine	873	8.4	13432	Clinics in Geriatric Medicine	45	0.4	567
Journal of Pain and Symptom Management	793	7.6	16140	Critical Care Medicine	44	0.4	2792
Palliative Medicine	754	7.3	19061	Social Science Medicine	38	0.3	1072
American Journal of Hospice Palliative Medicine	479	4.6	2672	JAMA Journal of the American Medical Association	37	0.3	5756
Journal of Palliative Care	319	3.0	4065	Pediatrics	36	0.3	2730
BMC Palliative Care	301	2.9	2043	Cancer Nursing	35	0.3	480
Supportive Care in Cancer	260	2.5	4025	Nursing Ethics	35	0.3	222
Journal of Hospice Palliative Nursing	211	2.0	823	British Medical Journal	33	0.3	1454
Palliative Supportive Care	159	1.5	1083	BMJ Open	32	0.	292
BMJ Supportive Palliative Care	105	1.0	522	Journal of Oncology Practice	30	0.2	317
Medecine Palliative	101	0.9	51	Patient Education and Counseling	30	0.2	366
International Journal of Palliative Nursing	97	0.9	200	Journal of the American Medical Directors Association	29	0.2	452
Indian Journal of Palliative Care	91	0.8	160	Canadian Family Physician	28	0.2	216
Journal of the American Geriatrics Society	86	0.8	3806	Clinical Journal of Oncology Nursing	28	0.2	170
Medicina Paliativa	74	0.7	87	Schmerz	28	0.2	190
Journal of Advanced Nursing	64	0.6	1808	Health Social Care in the Community	27	0.2	471
Journal of Clinical Nursing	57	0.5	632	Journal of Medical Ethics	27	0.2	421
Plos One	57	0.5	482	Journal of Social Work in End of Life Palliative Care	27	0.2	71
Journal of Clinical Oncology	55	0.5	5347	Oncologist	27	0.2	560
Cancer	53	0.5	2444	Zeitschrift Fur Palliativmedizin	27	0.2	19
Annals of Palliative Medicine	51	0.4	207	BMC Health Services Research	26	0.2	461
Progress in Palliative Care	50	0.4	66	British Journal of General Practice	26	0.2	801
Omega Journal of Death And Dying	47	0.4	284	European Journal of Cancer	26	0.2	1123
European Journal of Cancer Care	46	0.4	702	Nurse Education Today	26	0.2	267
Psycho Oncology	46	0.4	787	Archives De Pediatrie	25	0.2	108

RC: Record Count C: Number of Citation

DISCUSSION

The findings showed that there was a significant increase trend in the articles about palliative care. The number of articles low at the beginning started to increase after the year 2006 with more than 200 articles published, and there have been more than 800 articles published every year since 2015. Regression analysis results also indicated that the increase trend would continue. An analysis of the publication distributions of the world countries showed that the developed countries were effective in publication productivity. Several studies in literature reported that the economic growth of the countries was related to their article productivity [9-11]. In their bibliometric study on Palliative Care, Liu et al. (2018) also reported that

there was a highly significant relationship between the economic power of the countries and their publication productivity [21]. An analysis of the authorship collaboration of the countries showed that geographical regional neighborhood was the most important factor in collaborations. The top-productive countries such as the United Kingdom, Canada, and Australia were in the same cluster, which shows that collaborations and co-research are important factors for scientific outputs.

An assessment of the articles analyzed according to the number of citations showed that the study that received the highest number of citations in total and per year was the study entitled "Early palliative care for patients with metastatic non-small-cell lung cancer" written by Temel, JS. et al. and published in the New England Journal of

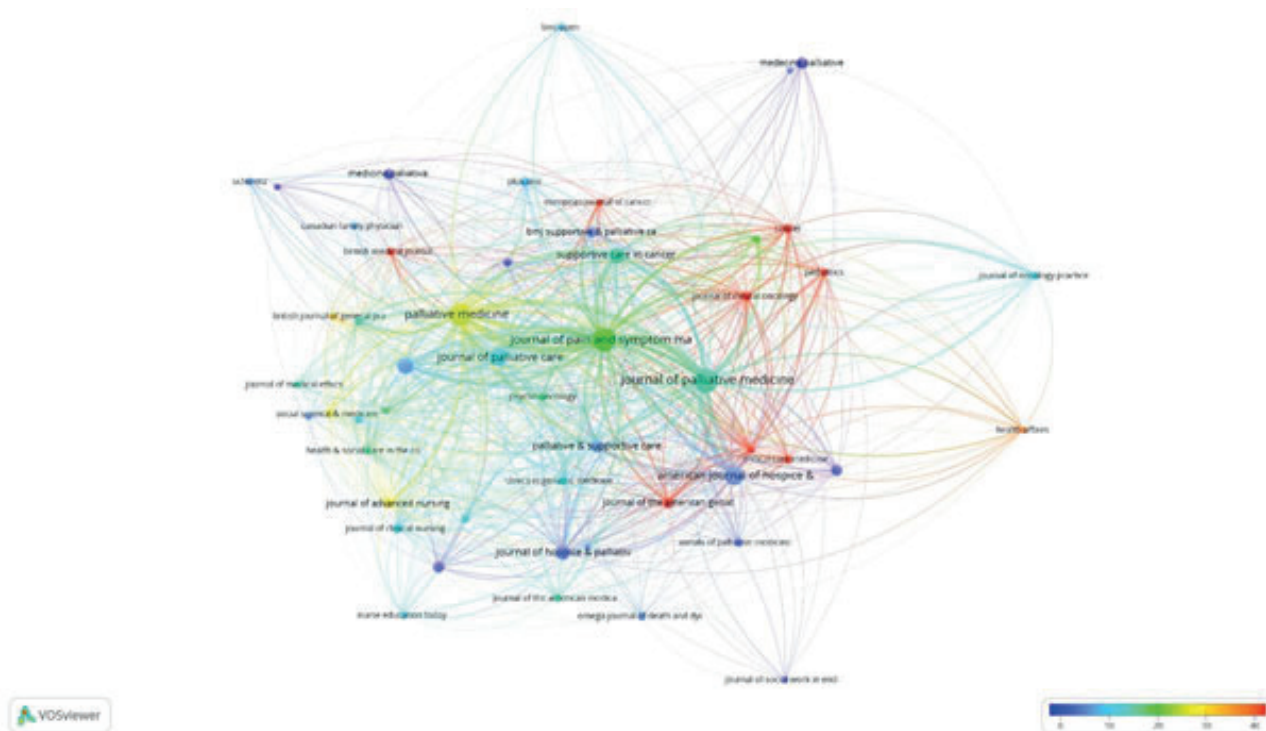


Figure 4. Network visualization map of journals based on citations analysis on palliative care

Footnote: The number of citations from blue to red (blue-green-yellow-red) increases

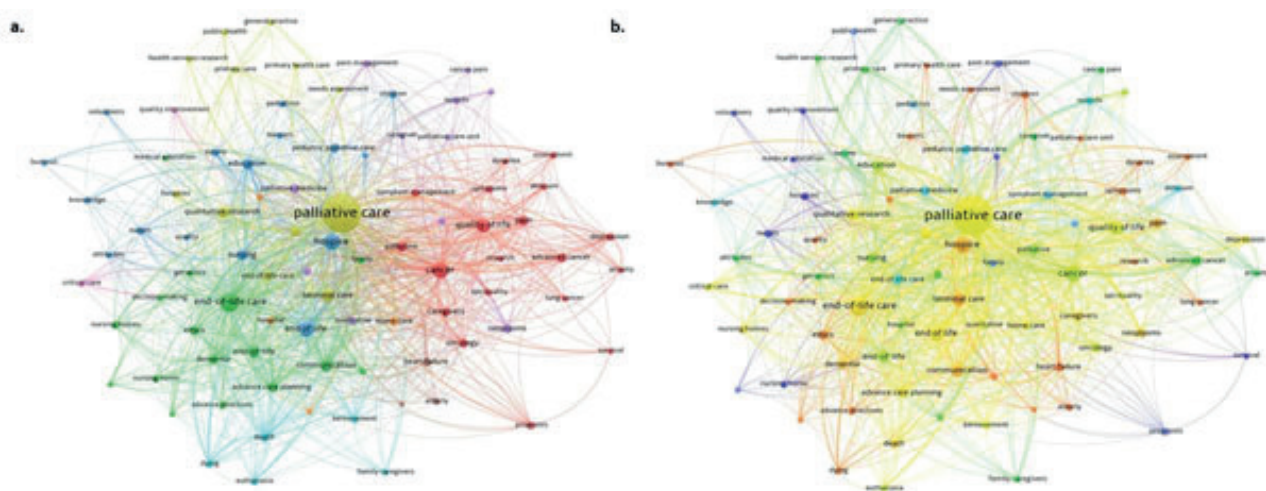


Figure 5. a. Network visualization map for cluster analysis based on keyword analysis on palliative care Footnote: Indicator shows current publications from blue to red **b.** Network visualization map for trends based on keyword analysis on palliative care

Footnote: Indicator shows current publications from blue to red

Medicine in 2010 [16]. The top effective study according to the total number of citations was the study conducted by Detering, KM. et al., which was entitled “The impact of advance care planning on end of life care in elderly patients: randomized controlled trial” published in BMJ-British Medical Journal in 2010 [22]. The third top-cited study was conducted by Teno et al. [20].

An assessment done according to the number of average citations per year showed that the top effective article, which was not among the top 10, was written by Ferrell et al. (2017) and published in the Journal of Clinical Oncology with the title of “Integration of palliative care into standard oncology care: American Society of Clinical Oncology clinical practice guideline update” [23].

Table 2. Top 15 most cited articles according to total citations on palliative care.

No	Article	Author	Journal	PY	TC	AC
1	Early palliative care for patients with metastatic non-small-cell lung cancer	Temel, JS. et al.	New England Journal of Medicine	2010	3237	323.7
2	The impact of advance care planning on end of life care in elderly patients: randomised controlled trial	Detering, KM. et al.	BMJ-British Medical Journal	2010	919	91.9
3	Family perspectives on end-of-life care at the last place of care	Teno, JM. et al.	Jama-Journal of the American Medical Association	2004	909	56.81
4	Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: a meta-analysis of 94 interview-based studies	Mitchell, AJ. et al.	Lancet Oncology	2011	778	86.44
5	Effects of a palliative care intervention on clinical outcomes in patients with advanced cancer the project enable ii randomized controlled trial	Bakitas, M. et al.	Jama-Journal of the American Medical Association	2009	770	70
6	Quality end-of-life care - patients' perspectives	Singer, PA. et al.	Jama-Journal of the American Medical Association	1999	734	34.95
7	American society of clinical oncology provisional clinical opinion: the integration of palliative care into standard oncology care	Smith, TJ. et al.	Journal of Clinical Oncology	2012	715	89.38
8	Early palliative care for patients with advanced cancer: a cluster-randomised controlled trial	Zimmermann, C. et al.	Lancet	2014	587	97.83
9	Change in end-of-life care for medicare beneficiaries site of death, place of care, and health care transitions in 2000, 2005, and 2009	Teno, JM. et al.	Jama-Journal of the American Medical Association	2013	552	78.86
10	Palliative care: the world health organization's global perspective	Sepulveda, C. et al.	Journal of Pain and Symptom Management	2002	512	28.44
11	Improving the quality of spiritual care as a dimension of palliative care: the report of the consensus conference	Puchalski, C. et al.	Journal of Palliative Medicine	2009	506	46
12	Palliative care for children	Nelson, RM. et al.	Pediatrics	2000	505	25.25
13	Cost savings associated with us hospital palliative care consultation programs	Morrison, RS. et al.	Archives of Internal Medicine	2008	453	37.75
14	Increased satisfaction with care and lower costs: results of a randomized trial of in-home palliative care	Brumley, R. et al.	Journal of the American Geriatrics Society	2007	440	33.85
15	A national survey of end-of-life care for critically ill patients	Prendergast, TJ. et al.	American Journal of Respiratory and Critical Care Medicine	1998	430	19.55

PY: Publication year, TC: Total citation, AC: Average citations per year

The second top effective study following this one was conducted by Zimmermann et al. (2014) and published in Lancet Journal with the title of "Early palliative care for patients with advanced cancer: a cluster-randomized controlled trial" [24]. The third most effective study according to the average number of citations per year was written by Smith et al. (2012) with the title of "American Society of Clinical Oncology provisional clinical opinion: the integration of palliative care into standard oncology care" [25]. This study was followed by the meta-analysis study conducted by Mitchell et al. (2011)

on depression, anxiety, and adjustment disorder prevalence in cancer patients. The study was also ranked fourth according to the total number of citations [26].

As to the number of co-citations in all the articles that were analyzed, the studies conducted by Temel et al. (2010), Connors et al. (1995), Bakitas et al. (2009), Bruera et al. (1991) and Teno et al. (2004) were the top-cited studies [16-20]. Researchers interested in this topic could be recommended to read the above-mentioned publications first.

Table 3. The most used frequently keywords on palliative care.

Keyword	O	Keyword	O	Keyword	O	Keyword	O
palliative care	4553	pediatric palliative care	119	pain management	70	needs assessment	48
end-of-life care	809	palliative medicine	118	children	69	research	48
cancer	513	death	112	nursing home	69	death and dying	47
hospice	501	heart failure	110	hospices	68	geriatrics	47
end of life	415	caregivers	102	opioids	68	long-term care	47
quality of life	355	home care	98	qualitative	67	primary care	47
terminal care	276	quality of care	96	quality improvement	66	quality	47
communication	262	depression	95	spirituality	66	attitudes	46
end-of-life	233	nursing homes	89	symptom control	65	cancer pain	46
qualitative research	233	nurses	88	delirium	60	general practice	46
education	187	symptom management	86	evaluation	59	palliative care unit	46
pain	182	survey	83	knowledge	59	place of death	46
nursing	175	family	81	assessment	56	decision-making	45
hospice care	170	supportive care	80	elderly	56	medical education	45
advance care planning	164	bereavement	79	hospital	55	volunteers	45
palliative	164	euthanasia	76	pediatrics	54	anxiety	44
advanced cancer	142	decision making	75	barriers	53	caregiver	44
dementia	134	dying	73	lung cancer	52	family caregivers	43
neoplasms	134	symptoms	73	pediatric	52	survival	43
ethics	132	advance directives	72	burnout	50	health services	42
end of life care	130	prognosis	72	public health	50	dyspnea	41
oncology	126	critical care	71	health services research	48	primary health care	40

O: Number of occurrences

The top active journals that produced more than 200 publications were Journal of Palliative Medicine, Journal of Pain, and Symptom Management Palliative Medicine, American Journal of Hospice Palliative Medicine, Journal of Palliative Care, BMC Palliative Care, Supportive Care in Cancer, and Journal of Hospice Palliative Nursing respectively. Authors who would like to produce publications in this issue could consider these journals. An assessment of the journals that produced 25 and more articles according to the number of citations per article showed that the JAMA Journal of the American Medical Association and Journal of Clinical Oncology, Pediatrics, Critical Care Medicine, Cancer, Journal of the American Geriatrics Society, British Medical Journal, European Journal of Cancer, British Journal of General Practice, Journal of Advanced Nursing, Social Science Medicine, Palliative Medicine, Oncologist, and Journal of Pain and Symptom Management were listed at the top respectively. Researchers who would like to have more impact on their articles could consider these

journals.

According to the keyword trend analysis results, the keywords studied in recent years were quality, primary health care, decision-making, barriers, children, needs assessment, dyspnea, symptoms, lung cancer, heart failure, ethics, advance directives, burnout, death, and dying.

A literature review indicated only 3 bibliometric studies on palliative care. Cheong et al. (2019) published a bibliometric study on palliative care studies in the Asian Pacific Region [27]. de Andrade et al. (2016) also conducted a bibliometric study on Palliative Care and Spirituality [28]. Liu et al. (2018) conducted a bibliometric study with 6273 articles on palliative care studies between 2001 and 2016 [21]. The present study is more comprehensive than these studies mentioned. Firstly, it encompasses a wider interval in terms of the years when the articles were published. This study is the most comprehensive one in the literature that analyzed

more than 10 thousand articles published between the years 1975 and 2019. In addition, unlike other studies, this study is the first study that includes keyword analysis as well as citation analysis for journals and articles.

A limitation of this study is that it did not utilize databases such as PubMed, Google Scholar, and Scopus because the WoS database indexes articles published in the journals with higher impact in comparison to other databases. In addition, since the WoS index enables no access to the publications before 1975, we could not analyze the publications before 1975.

As a result, there was a statistically significant increase trend in the number of publications about palliative care. The most productive countries

were the USA, United Kingdom, Canada, and Australia. Publication productivity was affected by the economic growth of the countries. This article provides a comprehensive bibliometric summary of the 10309 articles on palliative care published between 1975 and 2019. This study revealed the effective journals that produced publications about this issue, effective articles that received more citations, and trend topics. This article is believed to be a beneficial guide about the global outputs of palliative care for the clinicians and scientists and present new research ideas to the researchers.

CONFLICT of INTEREST

Authors declares that they have no conflict of interest.

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