

The 100 most highly cited articles published in the telemedicine journals

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Article Info

Article type:
Research

Article History:

Received: 2022-07-26
Accepted: 2022-08-15
Published: 2022-08-22

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Keywords:

Highly Cited
Article
Citation
Telemedicine
Journal

ABSTRACT

Introduction: Identifying highly cited articles helps researchers find the most important areas, effective authors in the field, pioneer countries and frequently used journals. This study aimed to review the 100 most highly cited articles published in telemedicine journals.

Material and Methods: The list of the telemedicine journals was found by searching the “master journal list” of the Web of Science database. Then, the name of each journal was searched separately in the “Publication Name” section of the same database and the results were sorted based on the “times cited” order. The first 100 articles that received the most citations were selected. The journal name, study type and study field were extracted from the final articles.

Results: The top 100 highly cited articles were published in the Journal of Telemedicine and Telecare (n=54, 53.5%), Telemedicine and e-Health (n=45, 44.5%) and International Journal of Telemedicine and Applications (n=2, 2%). Most of the highly cited articles were review studies (n=55, 54%) and almost one-third of the reviewed articles were conducted on general telemedicine (n=28, 28%).

Conclusion: This study revealed that some characteristics such as review studies, studies on general telemedicine, and studies being published in the oldest telemedicine journals were more likely used and cited.

Cite this paper as:

Hajesmaeel-Gohari S, Bahaadinbeigy K. The 100 most highly cited articles published in the telemedicine journals. *Front Health Inform.* 2022; 11: 122. DOI: [10.30699/fhi.v11i1.391](https://doi.org/10.30699/fhi.v11i1.391)

INTRODUCTION

Telemedicine is defined as delivering health care services using information and communication technologies to individuals who live far from health care professionals. Telemedicine is used for different purposes, including prevention, diagnosis, treatment, research and education [1]. The use of telemedicine services has been increasing, particularly in the recent two years during the COVID-19 pandemic [2, 3]. This pandemic has caused social distancing; therefore, the delivery of healthcare services remotely using telecommunication technologies has been preferred.

With the increasing use of telemedicine, studies in this field have also increased. Therefore, scientific journals have been created to publish articles in this field. Different journals have published telemedicine articles, some of which are general and some others are specific in telemedicine. The Journals of Telemedicine and Telecare [4] and Telemedicine and e-Health [5] are the primary scientific journals in

telemedicine that were introduced in the 1990s. According to the review of the master journal list of Web of Science database with telemedicine and telehealth terms, there were six specific journals in September 2021 [6, 7].

One of the means to evaluating the quality of scientific articles is the number of citations that a published article has received [8]. The number of citations shows the impact of an article in the related field. Therefore, highly cited articles are the most valuable among other published articles [9]. Several studies have been published that evaluate highly cited articles in different fields such as dental medicine [10], nutrition [11], arthritis [12] and mental health [13]. A study was also published in 2014 that compared the most highly cited papers published in the two Journals of Telemedicine and Telecare as well as Telemedicine and e-Health in different characteristics such as the number of citations, origin countries and the number of authors [14]. This study showed that the mean number of citations for the Journal of Telemedicine and Telecare was higher than

for Telemedicine and e-Health. Since the number of specialist telemedicine journals has been increased in recent seven years, a new study needs to be conducted for evaluating the highly cited articles in telemedicine.

This study aimed to review some features of the 100 most highly cited articles published in six telemedicine journals, found by searching the Web of Science database. Highly cited articles are the indicators to show scientific excellence performance. Identifying these articles can be a step towards getting acquainted with prominent scientific articles in the field of telemedicine and provide useful information for researchers in this field. For those authors interested in publishing papers with a high number of citations in the future, knowing the characteristics of highly cited papers can be important and interesting. Results of this study could help researchers find the most important areas, effective authors in the field, pioneer countries and frequently used journals.

MATERIAL AND METHODS

The “master journal list” of the Web of Science database was searched to identify telemedicine journals. The number of eight journals was identified by searching the “master journal list” using telemedicine and telehealth terms in September 2021. Since two of the retrieved journals (Digital Health and The LANCET Digital Health) were not specific to the telemedicine field, they were removed from the list. Finally, six journals were selected for this study including Annual Review of Cyber Therapy and Telemedicine, International Journal of Telemedicine and Applications, Journal of Telemedicine and Telecare, Telemedicine and e-Health, International Journal of Telerehabilitation as well as Smart Homecare Technology and Telehealth.

After identifying the list of the relevant journals, the name of each journal was searched separately in the “Publication Name” section of this database and the results were sorted based on the “Times Cited” order. The results were refined by article and review document types.

The list of all the articles obtained from the selected journals was entered into Excel software (version 2016) and the articles were sorted based on the most citations. The first 100 articles that received the maximum number of citations were selected. Finally, information including author name, journal name, year of publication, number of citations, country, study type and study field was extracted from the final articles. Country was determined based on the affiliation of the first author. If the article had been conducted on general telemedicine or on several subspecialties of telemedicine, it was considered as “General”. Some articles were not in the field of

telemedicine that were considered as “Not specific for telemedicine” like some articles that had been performed on electronic health or mobile health. Data were analyzed using descriptive statistics (frequency and frequency percentage).

RESULTS

Totally, 5901 articles were retrieved and entered into Excel software. The number of citations for the top 100 cited articles ranged from 565 to 83. Since the number of citations from the 100th to 101th articles was equal, 101 articles were reviewed in this study ([Appendix 1](#)).

Included articles were published in only three journals including Journal of Telemedicine and Telecare (n=54, 53.5%), Telemedicine and e-Health (n=45, 44.5%) and International Journal of Telemedicine and Applications (n=2, 2%) (Fig 1).

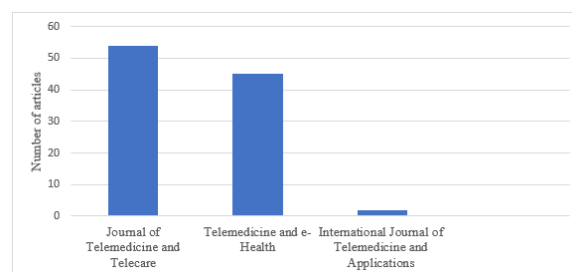


Fig 1: Journals in which the 100 most highly cited articles were published

Most of the articles were from the USA (n=41, 41%), UK (n=15, 15%), Canada (n=11, 11%) and Australia (n=5, 5%) (Table 1).

Table 1: Countries of included articles

Country	Number (%)
USA	41 (41)
UK	15 (15)
Canada	11 (11)
Australia	5 (5)
Spain	4 (4)
China	3 (3)
Norway	3 (3)
Belgium	2 (2)
The Netherland	2 (2)
Italy	2 (2)
Korea	2 (2)
Austria	1 (1)
Finland	1 (1)
Japan	1 (1)
Switzerland	1 (1)
France	1 (1)
Taiwan	1 (1)
Thailand	1 (1)
Croatia	1 (1)
Mauritius	1 (1)
Argentina	1 (1)
South Africa	1 (1)
Total	101 (100)

The publication years of the articles ranged from 1998 to 2020. Approximately half of the articles were published in 2012 (n=11, 11%), 2011 (n=10, 10%), 2007 (n=9, 9%), 2015 (n=8, 8%) and 2004 (n=7, 7%) (Fig 2). The maximum mean number of citations was in 2020, 2018 and 2013 with the means of 342, 257.5 and 201, respectively (Fig 3).

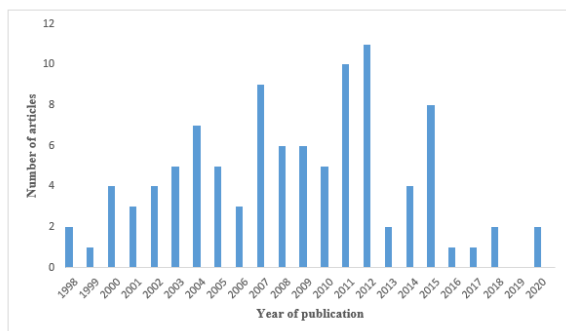


Fig 2: Number of 100 most highly cited articles by year of publication

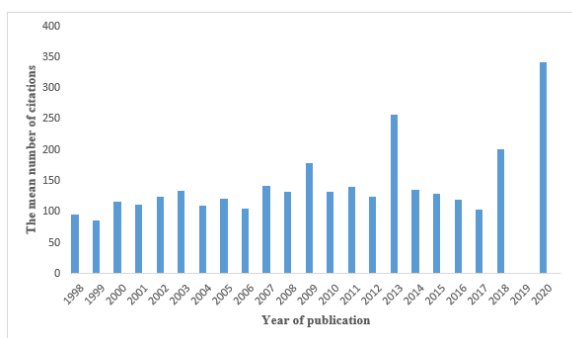


Fig 3: Mean number of citations by year of publication

More than half of the articles were review studies (n=55, 54%). Among the original studies, 34% were cross-sectional and randomized controlled trial (Table 2).

Table 2: Study type of the most highly cited articles

	Study type	Number (%)
Review studies	Systematic review	29 (28.5)
	Review	26 (25.5)
Original studies	Cross-sectional	18 (18)
	Randomized controlled trial	16 (16)
	Prospective	7 (7)
	Randomized clinical trial	4 (4)
	Case report	1 (1)

The most study fields of the articles were general (n=28, 28%), telemonitoring (n=17, 17%), not specific for telemedicine (n=12, 12%), telemental health (n=12, 12%) and home telehealth (n=9, 9%) (Fig 4).

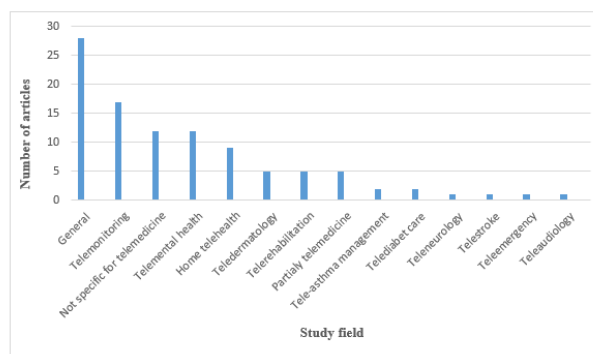


Fig 4: Number of articles by study field

The number of authors in articles ranged from 1 to 23 with the mean=5.5 and mode= 4 authors. In terms of being first and corresponding author of the articles, the name of authors who had two or more articles is presented in Table 3.

Table 3: Name of authors with two or more articles as the first or corresponding author

Author	Number of articles
Rashid L. Bashshur	4
Loane MA	2
John J Craig	2
Julie Polisen	2
Rod Elford	2
David Hailey	2

DISCUSSION

The present study was performed to review some features of the 100 most highly cited articles published in six telemedicine journals. The results revealed that the reviewed articles were published in only three of the six telemedicine journals. The Journal of Telemedicine and Telecare with the impact factor of 6.1 [4] and Telemedicine and e-Health with the impact factor of 3.5 [5] were the first scientific journals in telemedicine that were introduced in the 1990s. Due to the long history and specialization of these journals, the possibility of publishing quality articles and increasing their citation increases. Articles that were published in these journals had more reader and, therefore, were more likely to have more citations. Although International Journal of Telemedicine and Applications began to get published in 2008, only two highly cited articles have been published in it. This journal has no impact factor and is just indexed as Emerging Sources Citation Index.

The mean number of citations based on the year of publication showed that the year 2020 was at the first rank. With the spread of Coronavirus disease 2019 (COVID-19) in the last two years and social distancing, the use of telemedicine services has become more widespread. For this reason, many

studies have been done in the field of telemedicine that are widely used and cited.

The USA, UK and Canada have had the largest number of highly cited articles. The USA has more articles than any other country. The other study also showed that the USA ranked first in the telemedicine publications, followed by the UK [15]. The USA is a pioneer in using telemedicine services. This country has even established regulations to using remote medical services [16].

More than half of the highly cited articles were review studies. The other study that was performed on the analysis of telemedicine publications showed that almost 70 percent of the telemedicine studies were original articles [17]. These results revealed that despite having a large number of original studies in the field of telemedicine, review articles are more used by researchers in this field because they are summaries of original studies and are therefore cited more highly.

“General” was the most common group as the study type of the reviewed articles. This result showed that researchers are more willing to use articles focused on telemedicine or several subspecialties of telemedicine. In comparison, the results of another study are similar to the present one [14]. However, unlike the present study that showed telemonitoring is second-ranked after “General,” in the previous study, telemonitoring is at the sixth level. The prevalence of chronic diseases has been increasing. The patients with these types of diseases should be monitored continuously. The use of remote monitoring technologies can help better manage these diseases in situations where access to health care providers is not easily available and there is a need for providing timely treatment. In recent years, the remote patient monitoring market has also increased [18]. Therefore, the mentioned issues can be the cause for performing more studies about telemonitoring and more use of these studies in the recent years.

We only searched specialist journals in telemedicine; therefore, we might miss some telemedicine articles

with the high number of citations that have been published in other journals. The other limitation of this study is that our search was limited to the review and original research articles. Moreover, the list of the 100 top highly cited articles may be changed over time especially during the outbreak of COVID-19 because of the high use of telemedicine services in this pandemic.

CONCLUSION

This study provided the characteristics that might cause an article in telemedicine to receive more citation. In conclusion, review studies, studies on general telemedicine, studies conducted by the authors from pioneer countries such as the USA and studies published in the oldest telemedicine journals were more widely used and cited.

ACKNOWLEDGMENTS

We would like to express our gratitude to Institute for Future Studies in Health, Kerman University of Medical Sciences, for providing the research environment for this project.

This research was approved by Ethics Committee of Kerman University of Medical Sciences with Ethical ID IR.KMU.REC.1400.425.

AUTHOR'S CONTRIBUTION

SH and KB contributed to designing the study. The selection and evaluation of the papers and data extraction were done by SH. SH and KB participated in drafting the manuscript and approved the final version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest regarding the publication of this study.

FINANCIAL DISCLOSURE

This study was funded by Kerman University of Medical Sciences with the research ID 40000635.

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