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Original research

Worldwide productivity in the hand and wrist literature: A bibliometric analysis of four highly cited subspecialty journals

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HIGHLIGHTS

- There is a significant increase in the hand and wrist research during the past 10 years.
- The majority of articles is published by high-income countries, whereas no paper from low-income countries.
- The United States is the most productive country in hand and wrist research.
- Some European countries and Australia may have higher quality of articles.

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ABSTRACT

Objective: Hand and wrist research has recently shown obvious progress. The quantity and quality of publications from different nations, however, have not been analyzed. In our study, we aimed to assess the characteristics of worldwide productivity in hand and wrist literature using highly cited subspecialty journals.

Methods: Literature search using the Web of Science database was conducted to identify hand and wrist articles in four highly cited subspecialty journals from 2005 to 2014. The number of articles, impact factors and citations were analyzed to evaluate the contributions of different countries. Publication activity was adjusted for the countries by population size.

Results: A total of 4268 publications were identified. The number of articles showed a significant increase of 2.10-fold between 2005 and 2014 ($p = 0.0001$). North America, West Europe, and East Asia were the most prolific areas. The majority of publications (92.03%) were from high-income countries, 7.97% from middle-income countries, and no publications from lower-income countries. The United States published the most articles (53.89%), followed by United Kingdom (6.51%), Japan (6.14%), Canada (3.70%), and China (3.37%). Articles originating from the United States showed the greatest number of total 5-year impact factors (5y-IF) (4059.56) and total citations (17,998). When normalized to population size, United States ranked the first (7.16), followed by Sweden (6.53), and Netherlands (5.72). However, Netherlands (1.893) had the highest mean 5y-IF, followed by Germany (1.884) and Australia (1.883). Sweden had the highest average citations per article (11.38), followed by Germany (9.63), and Australia (9.08).

Conclusions: The number of publications of hand and wrist research shows a significant increase during the past 10 years. The United States is the most productive country in hand and wrist literature. However, some European countries and Australia may have higher quality of articles according to mean 5y-IF and mean citations per article.

1. Introduction

Recently, the field of hand and wrist research have grown obviously due to worldwide contributions. In fact, different countries should not provide equal contributions, because they have very different capabilities according to fund sources, scientific

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research programs, and healthcare systems [1,2].

The scientific papers promote the knowledge sharing and the advancement of hand and wrist research. The number of publications from a country can be used to evaluate its contributions to the creation of new knowledge, and also to determine trends in scholarly publications in a certain topic. In recent years, bibliometric analysis has been widely conducted to investigate the national contributions in many medical fields including surgical oncology [2], foot and ankle surgery [3], arthroscopy [4], rheumatology [5], plastic and reconstructive surgery [6], emergency medicine [7], anaesthesia [8], and critical care medicine [9].

Research productivity in hand and wrist field, however, has not been reported to date. In our study, we aimed to assess the quantity and quality of articles of different countries to reveal the characteristics of worldwide research productivity in hand and wrist research representing four highly cited subspecialty journals over a 10-year period.

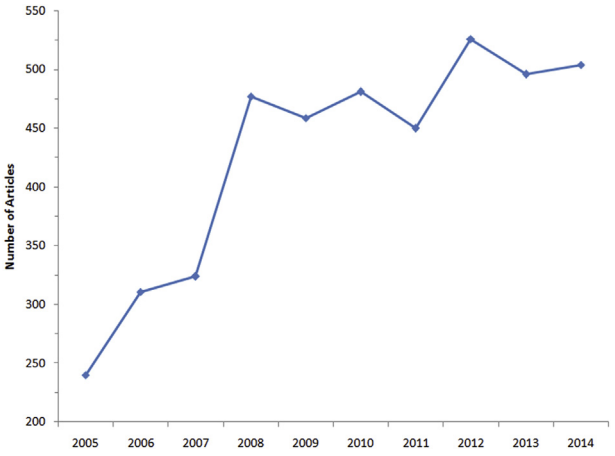

Fig. 1. Trend of publications from top 5 countries between 2005 and 2014.

2. Materials and methods

This study was conducted based on previous similar publications [2–9]. Literature search using Web of Science (WoS) was conducted to identify publications in hand and wrist field on August 5, 2015. The WoS is the world's leading database for citation and other academic impact information, which makes it widely used in studies on scientific productivity [6,7,9]. The journals included in this study should be highly cited subspecialty journals. It means that the source journals should be subspecialty journals in hand and wrist filed and included in Journal Citation Reports (JCR) (Thomson Reuters, New York, USA). So four highly cited subspecialty journals regarding hand and wrist research were chosen from the "Orthopedics" category in the 2014 JCR (Table 1) [10]. All publications in these four journals from 2005 to 2014 were identified. Only the original articles and reviews were included. Letter, editorial material and correction were excluded. Moreover, the aim of this study was to investigate the main characteristics in the hand and wrist research, and surgeons and therapists in hand and wrist field would get a general picture of the worldwide research productivity in their field. Therefore, we only included articles focus on hand and wrist. Two reviewers independently conducted the study selection and collected the data. Any disagreement was resolved by discussion.

The nation of the corresponding author was considered as the source nation [3,4]. The quantity of research productivity was determined by the number of published articles, and the quality of research productivity was assessed according to mean 5-year impact factors (5y-IF) and mean citations [4,6]. The primary outcome was the number of publications originating from different countries. Countries were ranked according to their research output represented by the number of publications. In addition, countries were classified into high-income, upper-middle-income, lower-middle-income, and low-income countries by Gross National Income per capita according to the categories of World Bank [11]. $12736 or more was considered as high income, $4126 to $12735 was considered as upper-middle income, $1046 to $4125 was considered as lower-middle income, and $1045 or less was considered as low income [11]. The proportion of articles published by countries in each category was calculated.

Countries publishing at least 1% of the total number of articles were determined as the main productive countries [3,4,6–9]. For these countries, the total numbers, the per capita numbers adjusted for population, total 5-year impact factors (5y-IF), mean 5y-IF, total citations, and mean citations were analyzed. The population for countries were collected from the Central Intelligence Agency [12]. In addition, publications in the four journals in the top five countries was calculated, and the top five countries in the four journals were collected.

Regression analysis was used to determine significant changes in time trend between 2005 and 2014. SPSS version 19.0 (SPSS Inc., Chicago, IL, USA) was used to conduct all statistical analysis, and $p < 0.05$ was considered as significant.

Table 1
Journals included in search.

Journal	Abbreviation	IF	5y-IF
Journal of Hand Surgery, European Volume	JHSE	2.037	1.900
Journal of Hand Therapy	JHT	2.000	2.061
Journal of Hand Surgery, American Volume	JHSA	1.667	1.855
Hand Clinics	HC	1.259	1.249

IF, impact factors.

3. Results

In the years 2005–2014, 4268 articles were identified form the four journals in the database of WoS. There was a significant increase in the worldwide number of annually published articles from 2005 to 2014 ($p = 0.001$) (Fig. 1). A total of 240 articles were published in 2005, and 504 articles were published in 2014. It suggested a 2.10-fold increase in publications. The United States published the largest number of papers (2300; 53.89%) in hand and wrist literature, followed by the United Kingdom (278; 6.51%), Japan (262; 6.14%), Canada (158; 3.70%), and China (144; 3.37%).

A total of 52 countries contributed to the scientific output in the field of hand and wrist research from 2005 to 2014. The world map in Fig. 2 shows the worldwide research productivity. It suggested that North America, West Europe, and East Asia were the most prolific areas. A total of 3928 articles (92.03%) published by authors in high-income countries, 340 articles (7.97%) were published by authors in upper-middle income countries and lower-middle income countries. However, no article was published by authors in low-income countries (0.00%) (Fig. 3).

A total of 16 countries was determined as main productive countries (Table 2). These countries published the majority (91.38%; 3900/4268) of the total number of articles. The majority (14) of these 16 countries were high-income countries, and China and Turkey, ranking the 5th and 14th respectively, were middle-income countries. The United States was the country with the largest

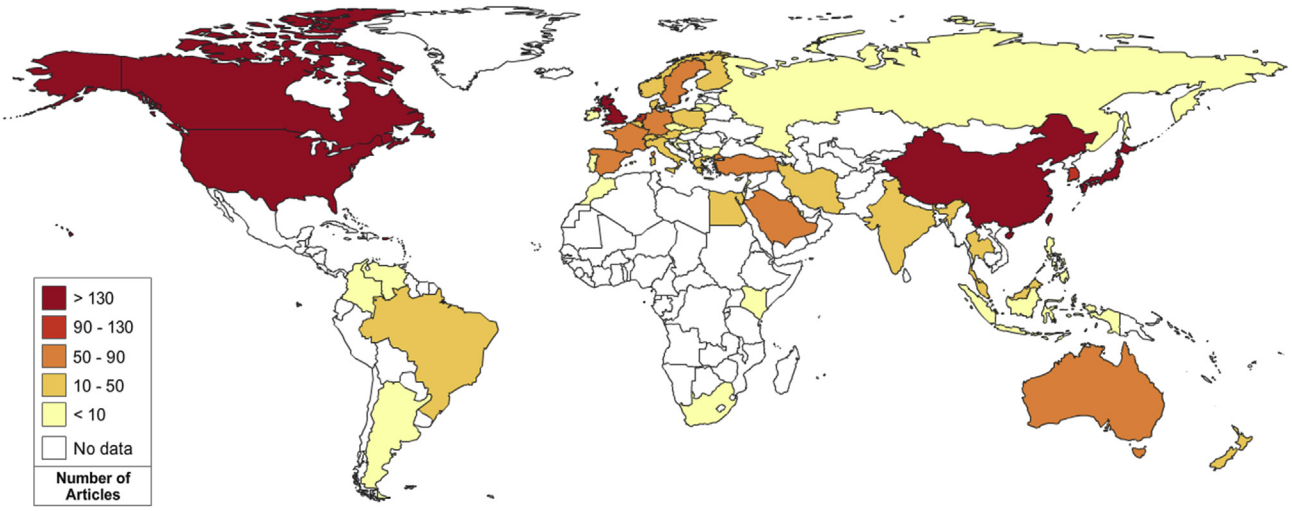

Fig. 2. The world map of the worldwide research productivity in 2005–2014.

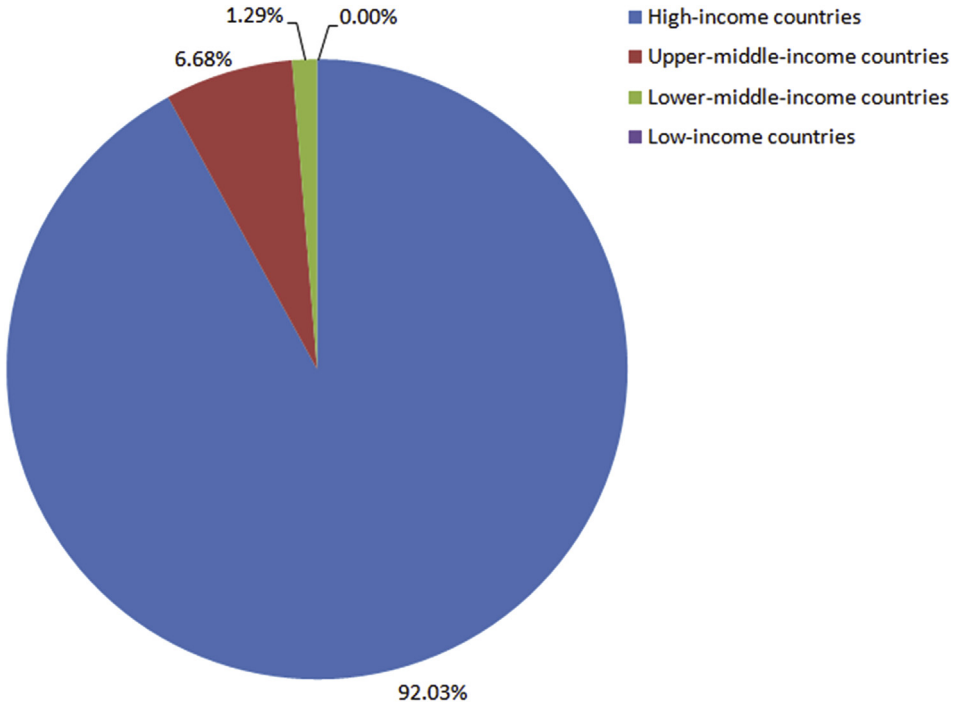

Fig. 3. Publications grouped by gross national income in 2005–2014.

number of total citations (17998). However, regarding the average citations, Sweden ranked the highest (11.38), followed by Germany (9.63), and Australia (9.08). Regarding the mean 5y-IF, Netherlands (1.893) ranked the first, followed by Germany (1.884) and Australia (1.883). Regarding the production per capita, United States ranked the highest (7.16), followed by Sweden (6.53), and Netherlands (5.72).

Table 3 shows the publication from the top 5 countries. *Journal of Hand Surgery, American Volume* (JHSA) was the most popular journal in 4 of the top 5 countries, including United States, Japan, Canada and China, while *Journal of Hand Surgery, European Volume* (JHSE) was the most popular journal in United Kingdom.

JHSA published the largest number of articles in hand and wrist research (2673; 62.63%), followed by JHSE (796; 18.65%), *Hand Clinics* (HC) (502; 11.76%), and *Journal of Hand Therapy* (JHT) (297; 6.96%). Table 4 lists the five most prolific countries in the four journals. The United States was the most prolific country in 3 journals including JHSA, HC and JHT, while the United Kingdom was the most prolific country in JHSE. In addition, the United States and the United Kingdom were shown in the top five countries in all the four journals.

4. Discussion

Hand and wrist research has shown a considerable progress in recent years, which should be attributed to researchers and surgeons worldwide. Scientific publication not only provides new knowledge in a field, but also indicates research productivity of

Table 2
Publications in the most productive countries between 2005 and 2014.

Country	Number of articles	% Of articles	Number per million population	Total 5y-IF	Mean 5y-IF	Total citation	Mean citation
United States	2300	53.89	7.16	4059.56	1.765	17998	7.83
United Kingdom	278	6.51	4.34	521.53	1.876	1817	6.54
Japan	262	6.14	2.06	488.82	1.866	1555	5.94
Canada	158	3.70	4.50	277.38	1.756	1222	7.73
China	144	3.37	0.11	262.47	1.823	1146	7.96
Netherlands	97	2.27	5.72	183.60	1.893	744	7.67
South Korea	91	2.13	1.85	170.30	1.871	273	3.00
Australia	83	1.94	3.65	156.28	1.883	754	9.08
Spain	83	1.94	1.72	152.20	1.834	557	6.71
Germany	80	1.87	0.99	150.72	1.884	770	9.63
Sweden	64	1.50	6.53	119.22	1.863	728	11.38
France	58	1.36	0.87	104.52	1.802	410	7.07
Saudi Arabia	58	1.36	2.09	109.57	1.881	258	4.45
Turkey	56	1.31	0.71	105.26	1.880	235	4.20
Italy	45	1.05	0.73	84.48	1.877	246	5.47
Switzerland	43	1.01	5.29	78.52	1.826	351	8.16

IF, impact factors.

Table 3
Publications from the top 5 countries.

Rank	United States	United Kingdom	Japan	Canada	China
1	JHSA (1644)	JHSE (187)	JHSA (203)	JHSA (79)	JHSA (88)
2	HC (407)	JHSA (68)	JHSE(53)	HC (38)	JHSE (40)
3	JHT (177)	JHT (14)	JHT (5)	JHT (34)	HC (12)
4	JHSE (72)	HC (9)	HC (1)	JHSE (7)	JHT (4)

JHSA, Journal of Hand Surgery, American Volume; JHSE, Journal of Hand Surgery, European Volume; JHT, Journal of Hand Therapy; HC, Hand Clinics.

countries. This study demonstrated that there was a significant increase in the number of hand and wrist publications from 2005 to 2014. The authors in United States published the largest number of papers than any other country. The United States has been the leader in many medical fields [2–9], which is also proved in hand and wrist research in the present study. Our findings suggest that the United States plays an important role in the field of hand and wrist research.

In addition to producing the largest number of publications, the United States was the country with the largest number of total citation, and had high mean citation. These indicate that the United States is very productive but also produces high-quality articles. In addition, the United States had the highest per capita numbers of articles. These findings suggest that United States is the most prolific country in the world in hand and wrist research.

A "10/90" divide has been used to describe the ratio of non-high versus high income countries in scientific research productivity [13], which had been proved in many medical fields [3,4,6–8]. A similar result with a slightly higher ratio for high income countries was found in our study. There are only two non-high income countries in the main productive countries, including China and Turkey. The increasing impact of these middle-income countries, especially China, in several biomedical fields was proved by many publications [3,4]. The high research productivity may reflect the rapid development of economy in these middle-income countries. These countries should further improve their hand and wrist research output and could become important contributors to hand and wrist research. In addition, for low-income countries not producing any articles, government policy, medical infrastructures, research fund and researchers may be the main reasons for their poor research productivity [3,4,8,13].

Besides the United States, some small European countries, including Sweden and Netherlands, were more productive when the total number of articles was normalized by population size. It should make more informative to normalize by the number of researchers in hand and wrist research in different countries rather than population size, but it is very difficult to get these data. Nonetheless, this result indicates the high scientific research output in these smaller countries. In addition, although there is no consensus on the measurements of the quality of the articles, mean impact factors and mean citations have been widely used in this topic [2–9]. This study found that Netherlands (1.893) had the highest mean 5y-IF, followed by Germany (1.884) and Australia (1.883). Sweden had the highest average citations per article (11.38), followed by Germany (9.63), and Australia (9.08). These findings may suggest that some European countries and Australia may have higher quality of articles according to mean 5y-IF and mean citations per article.

In the 3 journals, including JHSA, HC and JHT, the United States was the most prolific country, and these three journals were the top 3 popular journals in the United States in hand and wrist research. It should be recognized that all these journals were published in the United States. More submissions may be from United States than from other countries. Similarly, the United Kingdom is the most productive countries in JHSE, and JHSE published in the United Kingdom was the most popular journal in United Kingdom.

This study has some limitations. First, the database of WoS was used to identify hand and wrist publications. Articles published in

Table 4
Top ranked countries by journal.

Rank	JHSA	JHSE	HC	JHT
1	United States (1644)	United Kingdom (187)	United States (407)	United States (177)
2	Japan (203)	United States (72)	Canada (38)	Canada (34)
3	China (88)	Japan (53)	China (12)	Australia (18)
4	Canada (79)	Saudi Arabia (44)	United Kingdom (9)	United Kingdom (14)
5	United Kingdom (68)	China (40)	France (7)	Netherlands (11)

JHSA, Journal of Hand Surgery, American Volume; JHSE, Journal of Hand Surgery, European Volume; JHT, Journal of Hand Therapy; HC, Hand Clinics.

non-WoS-cited journals were not included, despite some hand and wrist researches may published in this journals. Second, the journals were chosen under the orthopedics category in the JCR, but some general orthopedic and basic research journals, which also produced some publications of hand and wrist research, were not considered. Nonetheless, the four highly cited journals could represent the main contributions to the field of hand and wrist research.

5. Conclusion

There is a rapid increase in the number of articles in hand and wrist research from 2005 to 2014. The majority of articles in the field of hand and wrist research are published by high-income countries, whereas few paper by low-income countries. The United States is the most prolific country when considering the total and per capital number of publications. However, some European countries and Australia may have higher quality of articles according to mean 5y-IF and mean citations per article.

Ethical approval

No needed.

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Author contribution

Study conception and design: Chunyou Wan, Zhiwei Jia.
Acquisition of data: Xiaolong Mei, Xuwei Zhu, Tao Zhang.
Analysis and interpretation of data: Xiaolong Mei, Tao Zhang, Zhiwei Jia.
Drafting the manuscript: Xiaolong Mei, Xuwei Zhu, Tao Zhang.
Critical revision of manuscript: Chunyou Wan, Zhiwei Jia.

Conflicts of interest

None.

Guarantor

Chunyou Wan and Zhiwei Jia.

References

[1] A. Langer, C. Diaz-Olavarrieta, K. Berdichevsky, et al., Why is research from developing countries underrepresented in international health literature, and what can be done about it? Bull. World Health Organ. 82 (10) (2004) 802–803.
[2] I.S. Bakker, K.P. Wevers, H.J. Hoekstra, Geographical distribution of publications in the scientific field of surgical oncology, J. Surg. Oncol. 108 (8) (2013) 505–507.
[3] X. Luo, Z. Liang, F. Gong, et al., Worldwide productivity in the field of foot and ankle research from 2009–2013: a bibliometric analysis of highly cited journals, J. Foot Ankle Res. 8 (2015) 12.
[4] Z. Liang, X. Luo, F. Gong, et al., Worldwide research productivity in the field of arthroscopy: a bibliometric analysis, Arthroscopy 31 (8) (2015) 1452–1457.
[5] T. Cheng, G. Zhang, Worldwide research productivity in the field of rheumatology from 1996 to 2010: a bibliometric analysis, Rheumatol. Oxf. 52 (9) (2013) 1630–1634.
[6] W.J. Zhang, W. Ding, H. Jiang, et al., National representation in the plastic and reconstructive surgery literature: a bibliometric analysis of highly cited journals, Ann. Plast. Surg. 70 (2) (2013) 231–234.
[7] Q. Li, Y. Jiang, M. Zhang, National representation in the emergency medicine literature: a bibliometric analysis of highly cited journals, Am. J. Emerg. Med. 30 (8) (2012) 1530–1534.
[8] M.D. Bould, S. Boet, N. Riem, et al., National representation in the anaesthesia literature: a bibliometric analysis of highly cited anaesthesia journals, Anaesthesia 65 (8) (2010) 799–804.
[9] Z. Li, L.X. Qiu, F.X. Wu, et al., Assessing the national productivity in subspecialty critical care medicine journals: a bibliometric analysis, J. Crit. Care 27 (6) (2012), 747.e741–e745.
[10] Institute for Scientific Information, Journal Citation Reports, 2014. Available at: www.webofknowledge.com.
[11] World Bank List of Economies. World Bank Data Development Group. Available at: http://data.worldbank.org/about/country-andlending-groups.
[12] The World Factbook. Central Intelligence Agency. Available at: https://www.cia.gov/library/publications/the-world-factbook.
[13] S. Saxena, G. Paraje, P. Sharan, et al., The 10/90 divide in mental health research: trends over a 10-year period, Br. J. Psychiatry 188 (2006) 81–82.