Worldwide Research Productivity in the Field of Arthroscopy: A Bibliometric Analysis

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Purpose: This study aimed to evaluate the quantity and quality of articles from different countries involving arthroscopy to investigate the characteristics of worldwide research productivity. **Methods:** Web of Science was searched for arthroscopy articles published between 1999 and 2013. The numbers of articles and citations were analyzed to assess the contributions of different countries. Publication activity was adjusted by country population and gross domestic product (GDP). **Results:** A total of 12,553 articles were published worldwide. The time trend for the number of articles showed an increase of 2.27-fold between 1999 and 2013. North America, Western Europe, and Eastern Asia were the most productive areas. High-income countries published 90.86% of the articles; middle-income countries, 9.11%; and lower-income countries, only 0.02%. The United States published the most articles (35.40%), followed by Germany (9.53%), the United Kingdom (6.80%), the Republic of Korea (5.45%), and Japan (4.76%), and had the highest total citations (78,161). However, Sweden had the highest mean citations (35.56), followed by Switzerland (23.39) and the Netherlands (18.90). There were positive correlations between the number of publications and population/GDP ($P < .01$). When normalized to population, Switzerland ranked the highest, followed by Finland and Sweden. When adjusted by GDP, the Republic of Korea ranked first, followed by Finland and Turkey. **Conclusions:** The number of publications on arthroscopy increased significantly from 1999 to 2013, with a more than 2-fold increase in volume. The United States was the most productive country as measured by total publications, but when adjusted for population, Switzerland published the highest number of articles, followed by Finland and Sweden. When publications were adjusted for GDP, the Republic of Korea ranked first, with Finland second and Turkey third. **Clinical Relevance:** Bibliometric analysis allows us to understand contributions of different world regions in scientific research in the field of arthroscopy and gives insight into the quantity and quality of articles related to arthroscopy.

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Significant growth has been observed in the field of arthroscopy in recent years. Increased worldwide contributions are responsible for this dramatic progress. However, scientific contributions to the field of arthroscopy may not be equal for each country because different countries have different health care systems, financial research sources, and scientific research programs.[1,2]

Publication, as an integral part of the scientific research process, is important for the advancement of the field of arthroscopy. The number of articles published by a country is an indicator of its contributions to the creation of new knowledge, and bibliometric analysis is often used to investigate trends in scholarly publications and the relative importance of articles on a specific topic. In recent years, bibliometric analysis for assessing national research productivity has been increasingly performed in various medical fields, such as surgical oncology,[2] emergency medicine,[3] anesthesia,[4] critical care medicine,[5] rheumatology,[6] and plastic and reconstructive surgery.[7] However, to our knowledge, bibliometric studies concerning the quantity and quality of articles published in the field of arthroscopy have not been previously reported.

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This study aimed to evaluate the quantity and quality of articles from different countries involving arthroscopy to investigate the characteristics of worldwide research productivity. We hypothesized that the United States was the most productive country in the field of arthroscopy whereas some smaller countries were more productive when normalized to population or gross domestic product (GDP).

Methods

On October 10, 2014, a computerized literature search of the Web of Science (WoS) database was conducted. This platform was chosen because it is the world's leading collection of citation and other academic impact information and has been widely used in similar studies.[3,5,7] The topic searched for was "Arthroscop*," with the publication time span limited to the years between 1999 and 2013, with no restriction on language. Only original articles and reviews were included; letters, editorial materials, and article corrections were excluded. When there was more than 1 institutional affiliation listed, the country of the corresponding author was taken as the source nation.

The number of published articles was considered an index of the quantity of research productivity, whereas the number of citations was considered a quality indicator. The primary outcome was the number of original articles attributed to each country. To determine the contribution of different countries, the countries were ranked according to their productivity. On the basis of the World Bank categorization of gross national income, we also calculated the proportion of articles that were attributed to high-income, upper-middle—income, lower-middle—income, and low-income countries.[8] This categorization in terms of gross national income per capita was as follows: high income, $12,746 or more; upper-middle income, $4,126 to $12,745; lower-middle income, $1,046 to $4,125; and low income, $1,045 or less.[8] In addition, the research productivity of different countries was evaluated in relation to population size and GDP. These data for each country were gathered from the most recent reports of the Central Intelligence Agency and World Bank.[8,9]

We further analyzed those countries publishing at least 1% of the total publications (main productive countries). We examined the total number of publications, per-capita publication numbers after adjustment for population and GDP, total citations, and mean citations. The publications in the top 5 journals from the top 5 countries were generated, and the top 5 countries in the top 5 journals were listed.

Regression analysis was used to determine significant changes in publication number over time between 1999 and 2013. The statistical significance of the correlation was determined with the Spearman test. All statistical tests were performed using SPSS software (version 19.0; SPSS, Chicago, IL), and $P < .05$ was considered statistically significant.

Results

A total of 12,553 articles on arthroscopy were identified in the WoS database. There was a significant increase in the worldwide number of annually published articles from 1999 to 2013 ($P < .001$). A total of 516 articles were published in 1999 and 1,172 articles were published in 2013, suggesting a 2.27-fold increase in publications between 1999 and 2013.

A total of 76 countries contributed to publications in the field of arthroscopy. The United States published the highest number of articles (4,444 of 12,553, 35.40%), followed by Germany (1,196 of 12,553, 9.53%), the United Kingdom (853 of 12,553, 6.80%), the Republic of Korea (684 of 12,553, 5.45%), and Japan (598 of 12,553, 4.76%). Figure 1 depicts articles published from the top 5 countries during the period from 1999 to 2013. Europe was the most productive continent (39.72%), followed by North America (38.09%), Asia (18.01%), Oceania (2.38%), South America (1.18%), and Africa (0.53%). The world map of worldwide research productivity is shown in Figure 2, indicating that North America, Western Europe, and Eastern Asia were the most productive regions from 1999 to 2013. Moreover, high-income countries published 11,406 articles (90.86%), and middle-income countries (sum of upper-middle—income and lower-middle—income countries) published 1,144 articles (9.11%). However, low-income countries published only 3 articles (0.02%) (Fig 3). The numbers of publications showed strongly significant correlations ($P < .01$) with population size and GDP ($r = 0.417$ and $r = 0.776$, respectively) (Fig 4).

There were 18 main productive countries (producing at least 1% of total articles) (Table 1). The majority of

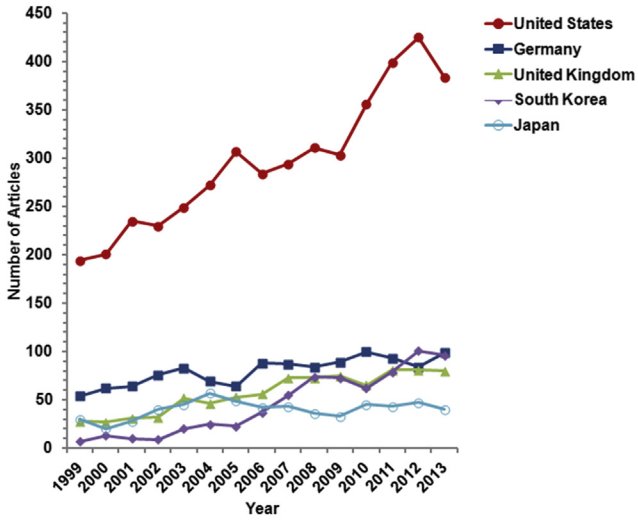

Fig 1. Time trend for number of articles from top 5 countries between 1999 and 2013.