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Original article

## Orthopedics research output from China, USA, UK, Japan, Germany and France: A 10-year survey of the literature

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### ABSTRACT

**Background:** In the past decade, researchers have made great progress in the field of Orthopedics. However, the research status of different countries is unclear. To summarize the number of published articles, we assessed the cumulative impact factors in top orthopedic journals. The aims of the study were to measure: 1) the quality and quantity of publications in orthopedics-related journals from China and other five countries, 2) the trend of the number of publications in orthopedics-related journals.

**Methods:** The related journals were selected based on the 2014 scientific citation index (SCI) and articles were searched based on the PubMed database. To assess the quantity and quality of research output, the number of publications including clinical trials, randomized controlled trials, meta-analyses, case reports, reviews, citations, impact factors, number of articles in the top 10 journals and most popular journals were recorded.

**Results:** A total of 143,138 orthopedics articles were published from 2005 to 2014. The USA accounts for 24.9% (35,763/143,138) of the publications, followed by UK (7878/143,138 (5.5%)), Japan (7133/143,138 (5.0%)), Germany (5942/143,138 (4.2%)), China (4143/143,138 (2.9%)) and France (2748/143,138 (1.9%)). The ranking for accumulated impact factors as follows: USA, UK, Japan, Germany, France and China. The mean impact factor's order is USA, China, Germany, Japan, France, UK, and interestingly the mean impact factors in Japan is similar to the Germany in 2005–2014. The USA had the highest percentage of articles in the top 10 journals, while China owns the least. The USA had the highest number of average citations, while Japan had lowest number of average citations.

**Conclusions:** According to this study, we can conclude that the USA has had been leading the orthopedics research in the past 10 years. Although China still falls behind, it has made considerable progress in the orthopedics research, not only in quantity but also quality.

**Level of evidence:** IV.

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## 1. Introduction

Orthopedics diseases affect the health of people worldwide, including rachitic, fracture, rheumatism, protrusion of intervertebral disc, Avascular Necrosis of the Femoral Head/Osteonecrosis of the Femoral Head (ANFH/ONFH). In the past decades, the health status of the Chinese population has been significantly improved. Generally, the number of published scientific papers represents a

country's scientific strength [1]. Study of orthopedics has become a hot area nowadays and shows a promising future [2–4].

Orthopedics study in China has seen rapid development in recent years [5]. The number of articles in the specific field represents the level of concern in the field. Many articles analyzing the status in certain disciplines have been published [6,7]. But the scientific publications in orthopedics by Chinese authors have not been reported. We therefore intended to reveal the contribution of Chinese authors in the field of orthopedics compared with top five countries—the United States (USA), the United Kingdom (UK), Germany, France and Japan—to the research in the field of orthopedics. The aims of the study were to measure:

- the quality and quantity of publications in orthopedics-related journals from China and other five countries;
- the trend of the number of publications in orthopedics-related journals.

**Abbreviations:** USA, the United States; UK, the United Kingdom; JCR, Journal citation report; IF, Impact factor; RCT, randomized controlled trial; SCIE, Science citation index expanded.

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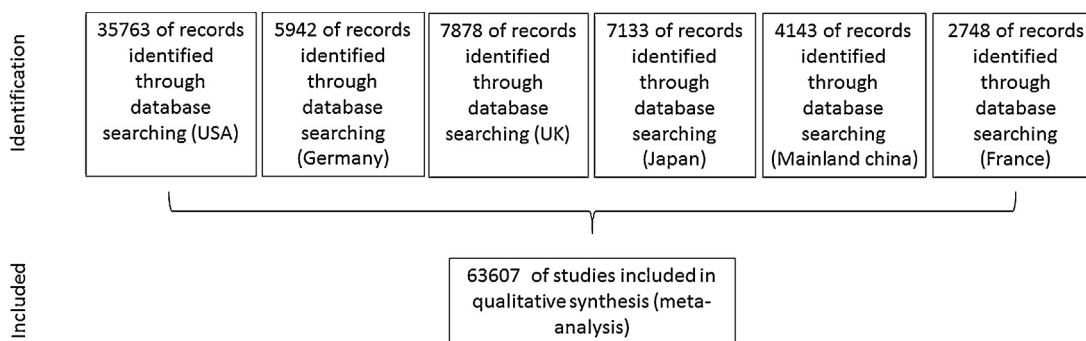


Fig. 1. Flow of information through the different phases of a systematic review.

2. Methods

2.1. Search strategy

Seventy-two orthopaedics journals were selected from the orthopaedics category of the Science Citation Index Expanded (SCIE) subject categories [8]. The 72 journals are all indexed by PubMed, a comprehensive database containing articles from high-quality medical journals [9], and the citations are all indexed by Web of Science. The ISSN (print) and publication date (print) were used to perform searches in the PubMed database. The search terms were provided in Appendix A.

2.2. Statistical analysis

SPSS (IBM SPSS Statistics 21) was used for statistical analysis. Regression analysis was used to determine if there are significant changes in time trend from 2005 to 2014. The differences among the three regions were detected with the Kruskal-Wallis test, and rank-sum test if necessary for differences between the two

countries. The test for significance was two tailed and  $P$  value  $< 0.05$  was considered significant.

3. Results

3.1. Total number and share of articles

A total of 143138 articles were published (Fig. 1) between 2005 and 2014 in the 72 orthopaedics-related journals. The USA accounted for the largest proportion (35,763/143,138 [24.9%]), followed by UK (7878/13,138 [5.5%]), Japan (7133/143,138 [5.0%]), Germany (5942/143,138 [4.2%]), Mainland China (4143/143,138 [2.9%]), and France (2748/143,138 [1.9%]). The changes in the annual number from each country were shown in the Fig. 2. As shown in Fig. 2, there is a significant increase of articles from 2005 to 2014 in China (from 42 to 973,  $R^2 = 0.983$ ,  $P < 0.001$ ), the number of papers published from China surpassed that published from France in 2010 for the first time, and in 2013 surpassed that from Germany and approached that from UK. The number of papers from France is

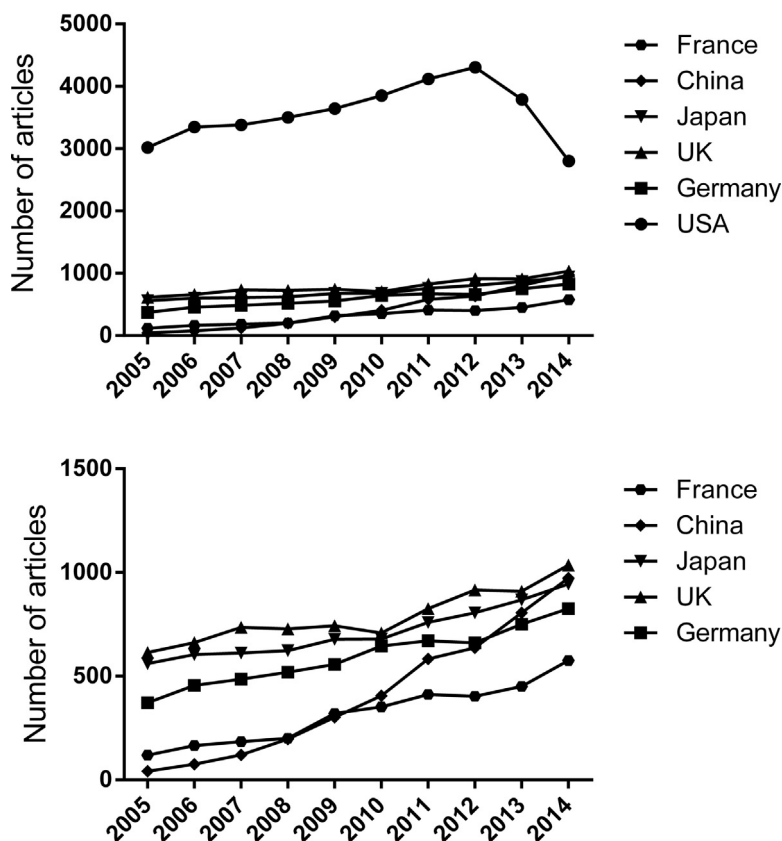


Fig. 2. Number of articles published in orthopaedics journals from the six countries (2005–2014) (two scales are provided to distinguish trend after USA was excluded).

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