

Clinics in Orthopedic Surgery's Evolution into an International Journal Based on Journal Metrics

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This article is aimed at providing evidence of increased international recognition of *Clinics in Orthopedic Surgery* (CiOS) based on journal metrics. Since 7 years have passed since its launch in 2009, it is time to reflect on the journal's efforts to be recognized as a top-notch journal. The following journal metrics were analyzed from the journal's homepage and Web of Science Core Collection database: number of citable and noncitable articles; number of original articles supported by grants; editorial board members' countries; authors' countries; citing authors' countries; source titles of citing articles; impact factor; total citations; comparison of impact factor with 3 Science Citation Index Expanded journals; and Hirsch index (H-index). Of the total 392 articles, 378 were citable articles (96.4%). Of the total 282 original articles, 52 (18.4%) were supported by research grants. The editorial board members were from 13 countries. Authors were from 20 countries. The number of countries of citing authors was 66. The number of source titles of citing articles was more than 100. The total citations of CiOS have increased from 0 in 2009 to 374 in 2015. The impact factors without self-citations of CiOS were the greatest among 4 Asian journals in 2013 and 2014. The 2015 impact factor was calculated as 0.79 in January 2016. The H-index was 13. CiOS can be considered to have reached the level of top-notch journal in the orthopedic field based on journal metrics. The inclusion of the journal in PubMed Central appears to have increased international relevance of the journal.

Keywords: Asia, Journal impact factor, Orthopedics, PubMed, Publishing

Clinics in Orthopedic Surgery (CiOS), the official English journal of the Korean Orthopaedic Association (KOA), has seen remarkable improvements since its launch in 2009. It has been indexed in PubMed Central/PubMed since November 4, 2009. In November 2010, it became a Medline-indexed journal. It has been listed in SCOPUS since 2010 such that all articles from 2009 are searchable on SCOPUS.

This bibliometric study aims to present a success story of the journal based on journal metric analysis and comparison to 3 other orthopedic journals from Asia that

are indexed in Web of Science Core Collection, which will also show how far-sighted the leaders of the KOA who decided to publish an English journal were. At the same time, I hope this article will be helpful to local journals in paving the way for international circulation.

METHODS

The present study is a cross-sectional observation study. Following metrics were analyzed from the journal's homepage (<http://www.ecios.org>) and Web of Science Core Collection: number of citable and noncitable articles, number of original articles supported by grants, editorial board members' countries, authors' countries, citing authors' countries, source titles of citing articles, impact factor, total citations, comparison of impact factor with that of 3 Science Citation Index Expanded (SCIE) journals (*Acta Orthopaedica et Traumatologica Turcica* from Turkey, *Indian Journal of Orthopaedics* from India, and *Journal of*

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Orthopaedic Science from Japan), and Hirsch index (H-index). Publication types of citable articles are review articles, original articles, brief reports, and case reports. The impact factor of a journal for a given year was calculated by below formula:

- 2015 impact factor = $(C + D) / (A + B)$
- A: number of citable articles from a journal published in 2013
 - B: number of citable articles from a journal published in 2014
 - C: number of citations of a journal published in 2013 by Web of Science Core Collection articles published in 2015
 - D: number of citations of a journal published in 2014 by Web of Science Core Collection articles published in 2015

The H-index was defined as the number of papers with a citation number higher or equal to *h*. A scientist has index *h* if his or her *N_p* (number of published) papers have at least *h* citations each and the other (*N_p-h*) papers have < *h* citations each.¹⁾

Data retrieval and analysis were done on January 28, 2016.

RESULTS

There was a steady increase in the number of articles published in CiOS from 40 in 2009 to 84 in 2015. Accordingly, the number of citable articles has also grown during the same period: 378 (96.4%) of the total 392 articles were citable articles (Fig. 1). Of the total 282 original articles, 52 (18.4%) were supported by research grants. The proportion of funded research has fluctuated during the period: 9.4% in 2010 as opposed to 25.0% in 2014 (Fig. 2). The

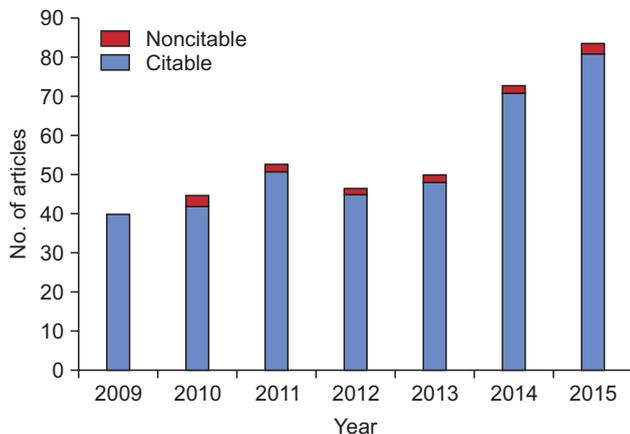


Fig. 1. Number of citable and noncitable articles of *Clinics in Orthopedic Surgery*.

editorial board consists of 61 specialists in their respective fields from 13 different countries: 25 from Korea, 13 from USA, 11 from Japan, and 12 from 10 other countries (Fig. 3). Authors of CiOS were from 20 countries: most of the authors were Korean (319, 81.4%), followed by American (22, 5.6%), Japanese (13, 3.3%), and Indian (12, 3.1%) (Fig. 4).

Of the 392 articles published between 2009 and 2015, 263 (67.1%) were cited at least once by articles in the Web of Science Core Collection database. The number of countries of citing authors was 66. The largest number of citing authors was in the USA (321), followed by Korea (170), and China (132) (Fig. 5). The number of journals that published articles citing CiOS publications was more than 100. In particular, the top ranking 7 journals that frequently cited CiOS were *Knee Surgery Sports Traumatology Arthroscopy* (46), *Arthroscopy the Journal of Arthroscopic*

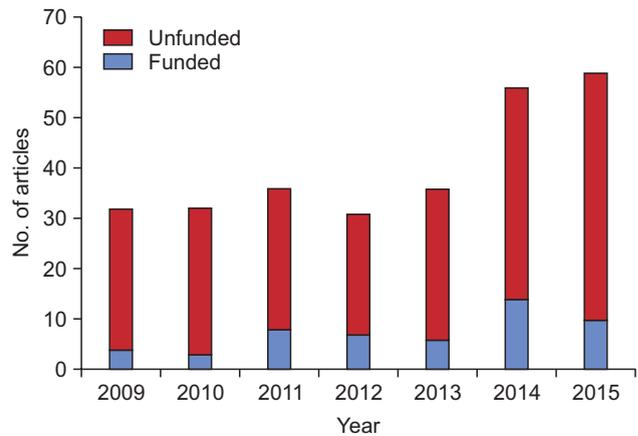


Fig. 2. Number of funded and unfunded articles of *Clinics in Orthopedic Surgery*.

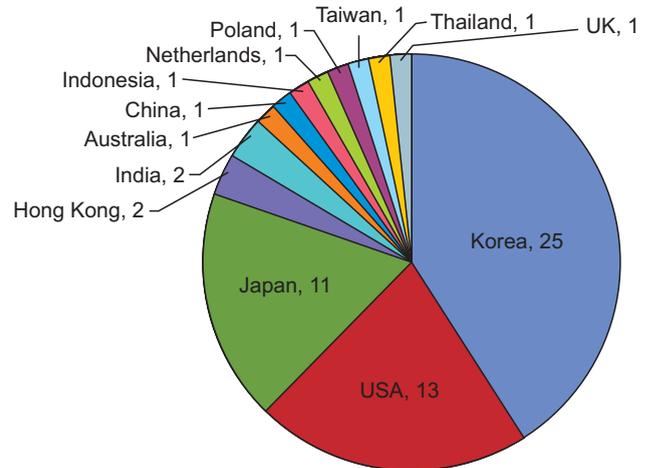


Fig. 3. Countries of editorial board members of *Clinics in Orthopedic Surgery* [cited 2016 Jan 28].

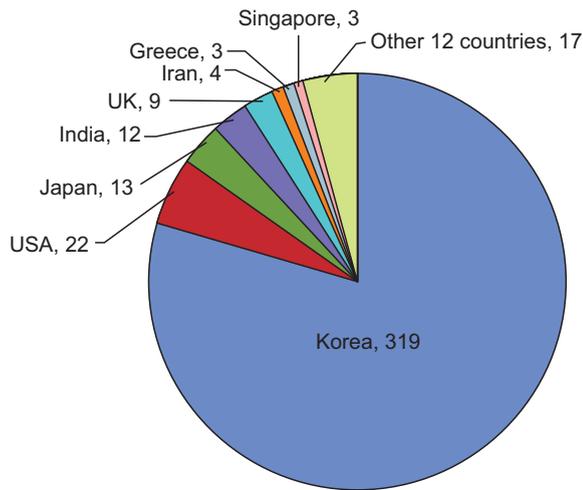


Fig. 4. Countries of authors of 392 articles published in *Clinics in Orthopedic Surgery* between 2009 and 2015.

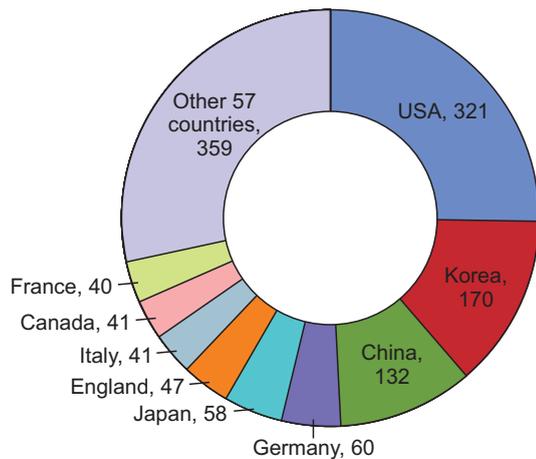


Fig. 5. Countries of authors who cited *Clinics in Orthopedic Surgery* articles from Web of Science Core Collection database [cited 2016 Jan 28].

and *Related Surgery* (33), *American Journal of Sports Medicine* (30), *International Orthopedics* (27), *Journal of Hand Surgery American Volume* (26), *Journal of Arthroplasty* (26), and *Clinical Orthopedics and Related Research* (26). The total citations of CiOS have increased from 0 in 2009 to 374 in 2015 (Fig. 6). The impact factor without journal self-citations was compared with that of 3 SCIE journals from Asia: *Acta Orthopaedica et Traumatologica Turcica from Turkey*, *Indian Journal of Orthopaedics from India*, and *Journal of Orthopaedic Science from Japan*. The impact factor excluding self-citations was the greatest for CiOS among the 4 Asian journals in 2013 and 2014 (Fig. 7). In addition, the impact factor of 1.10 in 2013 corresponded to the percentile rank of 59.7% (40th of the 67 journals related to orthopedic surgery) and 0.94 in 2014 correspond-

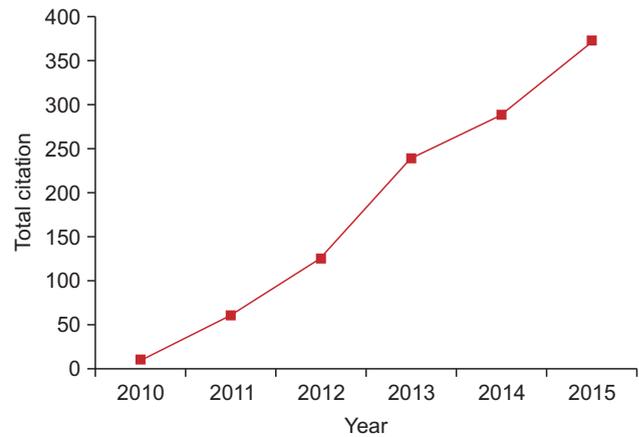


Fig. 6. Changing pattern of total citations of *Clinics in Orthopedic Surgery* articles from Web of Science Core Collection database [cited 2016 Jan 28].

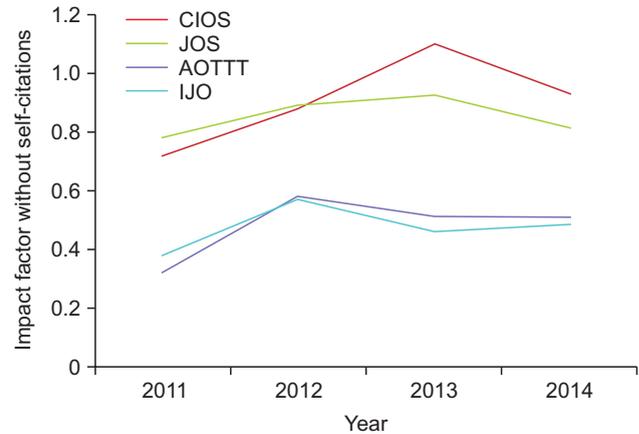


Fig. 7. Comparison of the impact factor without journal self-citations among 4 Asian journals from Journal Citation Reports and Web of Science Core Collection database [cited 2016 Jan 28]. CiOS: *Clinics in Orthopedic Surgery*, JOS: *Journal of Orthopaedic Science*, AOTTT: *Acta Orthopaedica et Traumatologica Turcica*, IJO: *Indian Journal of Orthopaedics*.

ed to the percentile rank of 61.1% (44th of 72 journals in the same field). The 2015 impact factor was calculated as 0.79 in January 2016.

Thirty-seven articles had been cited at least 10 times each. Fifteen articles had been cited at least 13 times each by Web of Science Core Collection journals; therefore, the H-index was 13 (Table 1). The publication types of the most frequently cited 15 articles were original article (14) and review article (1).

DISCUSSION

Publication of 84 articles, the impact factor of 0.79, the total citations of 374, and the H-index of 13 are the evidence

Table 1. Most Frequently Cited Articles and Their Publication Types with a Hirsch Index of 13

Ranking	Title	Year	Volume	Page	Publication type	Cited frequency
1	Treatment of isolated ankle osteoarthritis with arthrodesis or the total ankle replacement: a comparison of early outcomes	2010	1	1	Original article	28
2	The factors affecting the clinical outcome and integrity of arthroscopically repaired rotator cuff tears of the shoulder	2009	1	96	Original article	28
3	Subsidence and nonunion after anterior cervical interbody fusion using a stand-alone polyetheretherketone (PEEK) cage	2011	3	16	Original article	22
4	Fusion rates of instrumented lumbar spinal arthrodesis according to surgical approach: a systematic review of randomized trials	2011	3	39	Original article	18
5	Acetabular labral tears in patients with sports injury	2009	1	230	Original article	17
6	Apoptosis in the osteonecrosis of the femoral head	2010	2	250	Original article	17
7	The first clinical trial of beta-calcium pyrophosphate as a novel bone graft extender in instrumented posterolateral lumbar fusion	2011	3	238	Original article	16
8	Reliability of MRI findings of peroneal tendinopathy in patients with lateral chronic ankle instability	2010	2	237	Original article	16
9	Radiographic results of single level transforaminal lumbar interbody fusion in degenerative lumbar spine disease: focusing on changes of segmental lordosis in fusion segment	2009	1	207	Original article	15
10	Computer assisted navigation in knee arthroplasty	2011	3	259	Review article	14
11	Long-term survivals of stage IIB osteosarcoma: a 20-year experience in a single institution	2011	3	48	Original article	14
12	The increased expression of matrix metalloproteinases associated with elastin degradation and fibrosis of the ligamentum flavum in patients with lumbar spinal stenosis	2009	1	81	Original article	14
13	Treatment of femoroacetabular impingement with surgical dislocation	2009	1	146	Original article	14
14	Efficacy of multimodal pain control protocol in the setting of total hip arthroplasty	2009	1	155	Original article	13
15	Surgical results of intradural extramedullary tumors	2009	1	74	Original article	13

of dramatic evolution of CiOS in 2015 into an internationally recognized journal. In addition, the editorial board includes 13 members outside the country, and authors from 20 different countries have contributed their works to the journal. Although the definition of an international journal has yet to be determined, it seems reasonable to use the following features as criteria: editorial board members from a variety of countries; contributing authors from various countries; worldwide circulation and citations; and inclusion in international indexing databases. From this standpoint, CiOS seems to deserve high recognition from the international community.

The above-described journal metrics were comparable to those of other medical journals published in Korea. The proportion of funded original articles (18.4%) was comparable to the following journals (Fig. 2): *Diabetes*

& *Metabolism Journal*, 43.9%;²⁾ *Clinical and Experimental Reproductive Medicine*, 39.8%;³⁾ *International Neurology Journal*, 38.6%;⁴⁾ *Clinical Endoscopy*, 38.2%;⁵⁾ *Annals of Rehabilitation Medicine*, 34.2%;⁶⁾ *Neurointervention* 29.0%;⁷⁾ and *Journal of Educational Evaluation for Health Professions*, 29.0%.⁸⁾ The proportion of funded articles is important in that it can inform researchers of important current topics not only in the academic society but also in a specific country and researchers can learn about the development trends in specific fields based on the observation of funding sources and frequent research topics. In addition, it is often difficult to obtain research funding in the surgical clinical field; therefore, the proportion of 18.4% cannot be underestimated.

Currently, the editorial board members of CiOS are from 13 different countries; there should be additional

recruitment from more than 20 countries to promote submission of manuscripts from all over the world (Fig. 3). To this end, the editors and board members should contact orthopedic surgeons in their network. Especially, more board members should be recruited from Africa and Latin America to widen the author and reviewer pool. A predominantly large number of articles (366 out of 392, 91.8%) were submitted only by authors from Korea, USA, Japan, and India, which can be overcome by recruiting new editorial board members from a variety of countries (Fig. 4). Citation of articles by researchers from 66 different countries can be considered an indication that the journal has strived to fulfill the aim of promoting communication regarding orthopedic problems and advanced patient care (Fig. 5). The higher frequency of citation by articles published in USA, Korea, and China also reflects a trend in research production in the world. USA and China are the two top countries in terms of the number of publication of research articles. Frequent citation by Korean researchers can be construed as showing that the results of the articles were especially useful for Korean orthopedic surgeons. Considering that most frequently citing journals were all top-notch orthopedic journals, it can be assumed that CiOS has already attained a central position in the network of prestigious orthopedic journals (Fig. 6). The total citations of CiOS articles have been soaring since it was accepted for indexing in PubMed Central/PubMed in November 2009. The journal began to be exposed to the world researchers and physicians through PubMed Central/PubMed, which resulted in more than 300 citations. Therefore, it is not an overstatement that PubMed Central is the most important platform for local English journals to become leading international journals.⁹⁾

Impact factor reflects the influence of a journal as a medium for communication or development in a certain scientific field. In 2015, the median impact factor of orthopedic journals was 1.490 and the aggregate impact factor was 2.079. Hence, the 2015 impact factor of 0.79 of CiOS can be considered relatively good. The impact factor without self-citations of CiOS was compared with that of 3 Asian orthopedic journals indexed in Journal Citation Reports, which showed that CiOS attained the highest impact factor among the groups (Fig. 7). Therefore, based on journal metrics, CiOS can be considered the most valuable journal at least among the orthopedic journals published in Asia.

With regard to the H-index, CiOS obtained an excellent score of 13 compared to that of other medical journals published in Korea: the value was 7 for 80 citable articles of *Neurointervention*;⁷⁾ 5 for 141 citable articles of

Journal of Educational Evaluation for Health Professions;⁸⁾ 11 for 930 articles of *Korean Journal of Urology*;¹⁰⁾ 6 for 352 articles of *Archives of Plastic Surgery*;¹¹⁾ and 15 for 1,305 articles of *Korean Journal of Internal Medicine*.¹²⁾ Considering that 37 articles have been cited at least 10 times each, it can be expected that the H-index score would increase rapidly in the future. Among the 15 highly cited articles, the publication type of 14 articles was original article, which was comparable to other journals: twelve out of 15 highly cited articles were original articles in case of *Korean Journal of Urology*.¹⁰⁾

For achievement of such excellent bibliometric status, introduction of a variety of digital publication standards for scholarly journals was essential. Journal Article Tag Suite (JATS) XML, formerly known as PubMed Central (PMC) XML, is a basic digital production form.^{13,14)} Since JATS XML is required to be deposited in PMC, it would not have been possible for CiOS to make its international presence without JATS XML. Digital Object Identifier was also crucial in constructing the journal network with reference hyperlink and cited-by functions. CrossMark and FundRef were new services on the articles' recentness and funder identification (ID).¹⁵⁾ There are further digital standards that need to be incorporated into the journal: Open Researcher and Contributor ID (ORCID),¹⁶⁾ QR code,¹⁷⁾ CrossRef Text and Data Mining,¹⁸⁾ and audio or video presentation of articles.¹⁹⁾ ORCID was introduced as a standard researcher identification solution in October 2012. QR codes are convenient for smartphone users to have access to articles rapidly by taking pictures of codes. CrossRef Text and Data Mining service is a convenient platform for meta-analyses or systemic reviews. Audio or video presentation tends to pique the interest of readers or users to the contents.

Who should be accredited for the success of CiOS as an international journal? At first, Dr. Moon Sang Chung, the founding editor-in-chief, and Dr. Choon-Ki Lee, the second editor-in-chief, should be appreciated for their commitment and dedication. Also, Dr. Shin-Yoon Kim, the incumbent editor-in-chief, has tirelessly devoted himself to development of the journal. The editorial board members' laborious contribution and the KOA's financial support were also instrumental in the evolution of CiOS into a top-notch journal. I believe CiOS will become one of the most influential journals in the orthopedic field in the future considering the continued efforts to serve as a vehicle for communication of valuable information for orthopedic surgeons and patients and their families.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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REFERENCES

- Hirsch JE. An index to quantify an individual's scientific research output. *Proc Natl Acad Sci U S A*. 2005;102(46):16569-72.
- Huh S. Journal metrics-based position of diabetes & metabolism journal after the change of its text language to English. *Diabetes Metab J*. 2014;38(3):187-93.
- Huh S. What is the position of Clinical and Experimental Reproductive Medicine in its scholarly journal network based on journal metrics? *Clin Exp Reprod Med*. 2014;41(4):147-50.
- Huh S. How far has the international neurourology journal progressed since its transformation into an English language journal? *Int Neurorol J*. 2014;18(1):3-9.
- Huh S. Evidence of the internationalization of clinical endoscopy based on journal metrics. *Clin Endosc*. 2015;48(4):317-21.
- Huh S. The elevation of annals of rehabilitation medicine to the status of an international journal after adopting an English-only policy. *Ann Rehabil Med*. 2015;39(5):661-6.
- Huh S. Promotion of Neurointervention to international journal based on journal metrics. *Neurointervention*. 2016;11(1):5-9.
- Huh S. How much is Journal of Educational Evaluation for Health Professions promoted based on journal metrics? *J Educ Eval Health Prof*. 2015;12:57.
- Jeong GH, Huh S. Increase in frequency of citation by SCIE journals of non-Medline journals after listing in an open access full-text database. *Sci Ed*. 2014;1(1):24-6.
- Huh S. How much progress has been made in journal metrics two years after the citation analysis of the Korean Journal of Urology? *Korean J Urol*. 2015;56(4):276-9.
- Huh S. How journal metrics illustrate the transformation of archives of plastic surgery into an international journal. *Arch Plast Surg*. 2014;41(6):617-9.
- Huh S. How far has The Korean Journal of Internal Medicine advanced in terms of journal metrics? *Korean J Intern Med*. 2013;28(6):635-8.
- Huh S. Journal Article Tag Suite 1.0: National Information Standards Organization standard of journal extensible markup language. *Sci Ed*. 2014;1(2):99-104.
- Huh S. Coding practice of the Journal Article Tag Suite extensible markup language. *Sci Ed*. 2014;1(2):105-12.
- Lammey R. CrossRef developments and initiatives: an update on services for the scholarly publishing community from CrossRef. *Sci Ed*. 2014;1(1):13-8.
- Im J. Applying Open Researchers and Contributors ID in scholarly journals. *Sci Ed*. 2015;2(1):28-31.
- Chang JH. An introduction to using QR codes in scholarly journals. *Sci Ed*. 2014;1(2):113-7.
- Lammey R. CrossRef text and data mining services. *Sci Ed*. 2015;2(1):22-7.
- Huh S. Revision of the instructions to authors to require a structured abstract, digital object identifier of each reference, and author's voice recording may increase journal access. *J Educ Eval Health Prof*. 2013;10:3.