

Current status and trend of the publication to the SCI and SCIE journals in the field of radiation oncology in Korea for 30 years

Won Park, MD, Seung Jae Huh, MD

Department of Radiation Oncology, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

Purpose: We collected the data of Science Citation Index (SCI) and SCI Expanded (SCIE) papers written by the members of the Korean Society of Radiation Oncology (KOSRO) to analyze the current status and the future trend.

Materials and Methods: We searched the database of SCIE for the period from 1981 to 2011 at the Web of Knowledge site. Articles, reviews or proceedings written by KOSRO members as the first or corresponding authors were included. Search terms were the following combination of subject headings: therapeut radiol, radiat oncol, Korea. For National Cancer Center, combined search terms such as natl canc ctr, Korea and the names of faculties were applied.

Results: The total number of SCIE papers was 547. Numbers of the published papers in 1995, 2000, 2005, and 2010, were increased continuously, which was 2, 14, 40, and 83, respectively. The average impact factor was 2.9. The papers were published at the 134 different journals. The proportion of "International Journal of Radiation Oncology Biology Physics" was 23.4% of all the papers. The number and proportions of papers by subject categories were 87 (15.9%) in biology, 73 (13.3%) in physics and 387 (70.6%) in clinics. The papers of the top five institutions, based on the number of published papers, occupied 66.3%.

Conclusion: The number of SCIE papers is increasing rapidly in the field of radiation oncology in Korea. To improve the quality of papers, multi-institutional retrospective or prospective randomized studies should be done for the common cancers in Korea.

Keywords: Science Citation Index, Korean Society of Radiation Oncology, Web of Knowledge

Introduction

The total number of Science Citation Index (SCI) papers was 3.2 fold increased from 349,735 in 1974 to 1,108,165 in 2009. The numbers of Korean SCI papers were also rapidly increasing. The proportion of Korean SCI papers increased from 0.0% in 1974 to 3.34% in 2009 [1]. Among those, the papers, especially about various medical science and biological science, have been increasing continuously and occupying 17.6% and 17.1% in 2007, respectively. The cumulative number of papers, in the

fields of biomedical research and clinical medicine according to the SCI subject categories until 2009, were 41,695 and 60,711, respectively. Among the subject categories in clinical medicine, the cumulative number of papers in oncology and radiology, nuclear medicine & medical imaging were 5,322 and 5,296, respectively.

In Korea, the number of radiotherapy facilities is growing steadily. In late 2011, seventy-eight facilities have been opened across the country. The numbers of radiation oncologists and physicists are also increasing and the numbers are about 187

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Correspondence: Seung Jae Huh, MD, Department of Radiation Oncology, Samsung Medical Center, 81 Irwon-ro, Gangnam-gu, Seoul 135-710, Korea. Tel: +82-2-3410-2601, Fax: +82-2-3410-2619, E-mail: sj5201.huh@samsung.com

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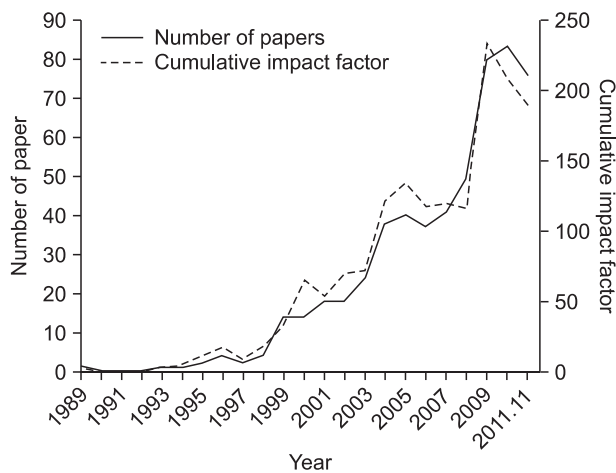


Fig. 1. The number of Science Citation Index Expanded papers and the cumulative impact factor per year.

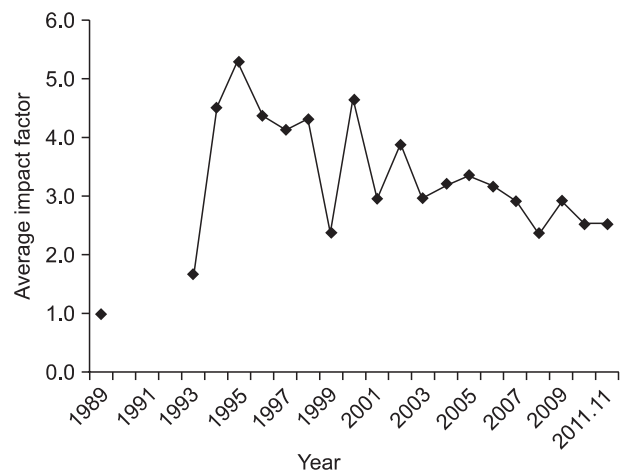


Fig. 2. Average impact factor of Science Citation Index Expanded papers per year.

and 77, respectively. With the increase in man power and the efforts in the field of radiation oncology, the SCI papers, written by the members of the Korean Society of Radiation Oncology (KOSRO), are increasing continuously.

In this study, we collected the SCI and SCI Expanded (SCIE) papers written by the members of KOSRO and analyzed the current status and trend for forward direction.

Materials and Methods

We searched the SCIE database for the period from 1981 to the end of November, 2011 at the site of Web of Knowledge (<http://apps.webofknowledge.com>; Thomson Reuters). Articles, reviews and proceeding, written by KOSRO members as the first or corresponding authors, were acceptable.

Search terms included the following combinations of subject headings: therapeut radiol, radiat oncol, Korea. For National Cancer Center, combined search terms such as natl canc ctr, Korea and the name of faculties were applied. The date of publication was also included for the search and the impact factor was applied by the 2010 Journal Citation Reports.

Results

Total numbers of SCIE papers written by KOSRO members was 547 from 1981 to November, 2011. Among them, 35 papers are reported by the authors from different institutions. There was no published SCIE paper from 1981 to 1988 and from 1990 to 1992. The title of first SCIE paper was "ESR alanine dosimetry of high-energy electrons in radiotherapy" by Chu S affiliated

with Severance Hospital at 1989 in "Applied Radiation and Isotopes." Fig. 1 shows the number of Korean papers and the cumulative impact factors.

The numbers of papers, published in 1995, 2000, 2005, and 2010, increased continuously, which was 2, 14, 40, and 83, respectively. Also, the cumulative impact factors are increasing in proportion to the increasing numbers of SCIE papers. However, interestingly, the average impact factors tend to decrease with years (Fig. 2). The average impact factor was 2.9 for all the published papers during the study period. The highest average impact factor was 5.3 in 1996. The average impact factors were 3.3 and 2.5 in 2005 and 2010, respectively. Three papers, which had published in "Journal of Clinical Oncology" with the highest impact factor of 18.97, were "Angiocentric lymphoma of the head and neck: patterns of systemic failure after radiation treatment" by Kim GE affiliated with Severance Hospital in 2000; "Incidence of BRCA1 and BRCA2 mutations in young Korean breast cancer patients" by Choi DH affiliated with Soonchunghyang University Hospital in 2004; "Low initial human papilloma viral load implicates worse prognosis in patients with uterine cervical cancer treated with radiotherapy" by Kim JY affiliated with National Cancer Center in 2009. The Korean SCIE papers were published in 134 different kinds of journals. One-hundred twenty eight papers were reported in "International Journal of Radiation Oncology Biology Physics (IJROBP)" (Table 1). It occupied 23.4% of all papers. Subsequently, "Radiotherapy and Oncology (RTO)," "Journal of Korean Medical Science," and "Japanese Journal of Clinical Oncology" published 26 (4.7%), 25 (4.6%), and 24 (4.4%) papers, respectively. Table 2 shows the top 10 countries

ranked by the number of papers published in IJROBP. United States of America (USA) occupies more than half of the papers. Korea ranked on 9th place in 2007 and came to 7th place in 2011. The percent shares of Korea are increasing from 2.3% in 2007 to 4.4% in 2011.

The numbers and proportions of the papers by subject

Table 1. Science Citation Index Expanded journals published more than 5 papers

Journal	No. of papers (%)	Impact factor
International Journal of Radiation Oncology Biology Physics	128 (23.4)	4.503
Radiotherapy and Oncology	26 (4.7)	4.337
Journal of Korean Medical Science	25 (4.6)	0.834
Japanese Journal of Clinical Oncology	24 (4.4)	1.856
Journal of the Korean Physical Society	19 (3.5)	0.478
Tumori	16 (2.9)	1.014
Gynecologic Oncology	14 (2.6)	3.76
Yonsei Medical Journal	13 (2.4)	1.02
Radiation Oncology	13 (2.4)	2.409
Medical Physics	13 (2.4)	3.075
Journal of Radiation Research	12 (2.2)	2.007
Journal of the Korean Medical Association	8 (1.5)	0.096
Journal of Breast Cancer	8 (1.5)	0.179
Cancer	8 (1.5)	5.131
Head and Neck	7 (1.3)	2.182
Acta Oncologica	7 (1.3)	3.137
Medical Dosimetry	6 (1.1)	0.941
Americal Journal of Clinical Oncology	6 (1.1)	1.768
Lung Cancer	5 (0.9)	3.356
International Journal of Neuroscience	5 (0.9)	0.818

categories were 87 (15.9%) in biology, 73 (13.3%) in physics, and 387 (70.6%) in clinical studies, respectively (Table 3). The most common subject of clinical studies was gynecology in which 77 papers (14.1%) were published. Head & neck and low gastrointestinal categories were following; 55 (10.0%) and 49 (8.9%) papers, respectively. The average impact factor by subjective categories ranged from 1.8 to 3.9. The highest average impact factor was 3.9 in hematologic subjects.

Among 78 treatment facilities, 45 institutions published at least one SCIE paper. Severance Hospital reported the highest number of SCIE papers. This institution published 91 papers and it took 15.6% of total papers (Table 4). The SCIE

Table 3. Number of Science Citation Index Expanded papers and average impact factors by subject categories

Subject category	No. of papers (%)	Average impact factor
Biology	87 (15.9)	3.2
Physics	73 (13.3)	1.9
Clinics		
Brain	13 (2.4)	3.5
Head & neck	55 (10.0)	2.8
Thoracic	34 (6.2)	3.6
Breast	39 (7.1)	2.4
Hepatobiliary	46 (8.4)	3.4
Upper gastrointestinal	6 (1.1)	3.0
Low gastrointestinal	49 (9.0)	3.2
Gynecologic	77 (14.1)	3.4
Genitourinary	6 (1.1)	1.9
Sarcoma	6 (1.1)	2.7
Hematologic	18 (3.3)	3.9
Etc.	38 (6.9)	1.8

Table 2. Top 10 countries which ranked in the number of published papers in "International Journal of Radiation Oncology Biology Physics" from 2007 to 2011

Country	No. of papers (%)			
	2007-2011	2007	2009	2011
USA	1,700 (53.3)	353 (55.0)	304 (47.6)	312 (51.4)
Canada	307 (9.6)	64 (10.0)	59 (9.2)	54 (8.9)
Netherlands	232 (7.3)	52 (8.1)	56 (8.8)	38 (6.3)
Germany	230 (7.2)	48 (7.5)	37 (5.8)	51 (8.4)
Japan	204 (6.4)	38 (5.9)	54 (8.5)	39 (6.4)
England	135 (4.2)	33 (5.1)	28 (4.4)	23 (3.8)
France	120 (3.8)	33 (5.1)	25 (3.9)	28 (4.6)
China	117 (3.7)	14 (2.2)	28 (4.4)	19 (3.1)
Korea	109 (3.4)	15 (2.3)	29 (4.5)	27 (4.4)
Italy	109 (3.4)	16 (2.5)	29 (4.5)	17 (2.8)

Table 4. Number of papers and the distribution of subject categories of top 10 institutions according to the number of published Science Citation Index Expanded papers

Institution	No. of papers (%)	Subject categories, no (%)		
		Biology	Physics	Clinics
Severance Hospital	91 (15.6)	20 (22.0)	1 (1.1)	70 (76.9)
National Cancer Center	89 (15.3)	13 (14.6)	26 (29.2)	50 (56.2)
Samsung Medical Center	83 (14.3)	3 (3.6)	10 (12.0)	70 (84.3)
Asan Medical Center	65 (11.2)	17 (26.2)	8 (12.3)	40 (61.5)
Seoul National University Hospital	58 (10.0)	3 (5.2)	6 (10.3)	49 (84.5)
Korea Cancer Center Hospital	22 (3.8)	1 (4.5)	1 (4.5)	20 (90.9)
Seoul St. Mary's Hospital	20 (3.4)	6 (30.0)	1 (5.0)	13 (65.0)
Ajou University Hospital	16 (2.7)	7 (43.8)	0	9 (56.3)
Seoul National University Bundang Hospital	13 (2.2)	6 (46.2)	2 (15.4)	5 (38.5)
Wonkwang University School of Medicine & Hospital	13 (2.2)	1 (7.7)	0	12 (92.3)
Total	481 (82.7)	77 (16.0)	55 (11.4)	338 (80.8)

Table 5. Science Citation Index Expanded papers cited more than 40 times

Author	Institution	Title	Journal	Year	Times cited
Kim JS	Chungnam National University Hospital	Preoperative chemoradiation using oral capecitabine in locally advanced rectal cancer	International Journal of Radiation Oncology Biology Physics	2002	112
Park HC	Severance Hospital	Dose-response relationship in local radiotherapy for hepatocellular carcinoma	International Journal of Radiation Oncology Biology Physics	2002	92
Kim GE	Severance Hospital	Angiocentric lymphoma of the head and neck: patterns of systemic failure after radiation treatment	Journal of Clinical Oncology	2000	83
Lee SW	Asan Medical Center	Stereotactic body frame based fractionated radiosurgery on consecutive days for primary or metastatic tumors in the lung	Lung Cancer	2003	72
Seong J	Severance Hospital	Combined transcatheter arterial chemoembolization and local radiotherapy of unresectable hepatocellular carcinoma	International Journal of Radiation Oncology Biology Physics	1999	69
Seong J	Severance Hospital	Clinical results and prognostic factors in radiotherapy for unresectable hepatocellular carcinoma: a retrospective study of 158 patients	International Journal of Radiation Oncology Biology Physics	2003	67
Kim YB	Severance Hospital	Overexpression of cyclooxygenase-2 is associated with a poor prognosis in patients with squamous cell carcinoma of the uterine cervix treated with radiation and concurrent chemotherapy	Cancer	2002	62
Kim JC	Asan Medical Center	Preoperative concurrent radiotherapy with capecitabine before total mesorectal excision in locally advanced rectal cancer	International Journal of Radiation Oncology Biology Physics	2005	61

Table 5. Continued

Author	Institution	Title	Journal	Year	Times cited
Yoon SC	Seoul St. Mary's Hospital	Clinical results of 24 pituitary macroadenomas with linac-based stereotactic radiosurgery	International Journal of Radiation Oncology Biology Physics	1998	60
Seong J	Severance Hospital	Local radiotherapy for unresectable hepatocellular carcinoma patients who failed with transcatheter arterial chemoembolization	International Journal of Radiation Oncology Biology Physics	2000	56
Kim GE	Severance Hospital	Synchronous coexpression of epidermal growth factor receptor and cyclooxygenase-2 in carcinomas of the uterine cervix: a potential predictor of poor survival	Clinical Cancer Research	2004	56
Park W	Samsung Medical Center	Local radiotherapy for patients with unresectable hepatocellular carcinoma	International Journal of Radiation Oncology Biology Physics	2005	51
Ju SG	Samsung Medical Center	Film dosimetry for intensity-modulated radiation therapy: dosimetric evaluation	Medical Physics	2002	47
Huh SJ	Samsung Medical Center	Radiotherapy of intracranial germinomas	Radiotherapy Oncology	1996	45
Choi DH	Soonchunhyang University Hospital	Incidence of BRCA1 and BRCA2 mutations in young Korean breast cancer patients	Journal of Clinical Oncology	2004	45
Shin YK	National Cancer Center	Radiosensitivity enhancement by celecoxib, a cyclooxygenase (COX)-2 selective inhibitor, via COX-2-dependent cell cycle regulation on human cancer cells expressing differential COX-2 levels	Cancer Research	2005	45
Kim JH	Seoul National University Hospital	Susceptibility and radiosensitization of human glioblastoma cells to trichostatin A, a histone deacetylase inhibitor	International Journal of Radiation Oncology Biology Physics	2004	44
Suh Y	Asan Medical Center	Aperture maneuver with compelled breath (AMC) for moving tumors: a feasibility study with a moving phantom	Medical Physics	2004	41
Shin KH	National Cancer Center	Mutational analysis of promoters of mismatch repair genes hMSH2 and hMLH1 in hereditary nonpolyposis colorectal cancer and early onset colorectal cancer patients: Identification of three novel germ-line mutations in promoter of the hMSH2 gene	Cancer Research	2002	40
Song SY	Asan Medical Center	FDG-PET in the prediction of pathologic response after neoadjuvant chemoradiotherapy in locally advanced, resectable esophageal cancer	International Journal of Radiation Oncology Biology Physics	2005	40

papers from the top five institutions, ranked by the number of published papers, occupied 66.3% of the total published papers. Among the top ten institutions, there was a great difference in the proportions of subject categories. According to the percent share of subject categories in each institution,

Seoul National University Bundang Hospital is the most common in biology, National Cancer Center in physics and Wonkwang University School of Medicine & Hospital in clinical studies, respectively.

Table 5 showed twenty papers, which were cited more than

40 times. The most commonly cited paper was "Preoperative chemo-radiation using oral capecitabine in locally advanced rectal cancer" by Kim JS affiliated with Chungnam National University Hospital at 2002 in IJROBP which was quoted 112 times. Among those 20 papers, there were two papers in each of biology and physics. The remaining was all about clinical result. Hepatocellular carcinoma was the most common subject, where there were five papers. The institution was Severance Hospital, where the number of highly quoted papers was highest, and seven papers were published.

Discussion and Conclusion

From 2000 to 2009, the total numbers of Korean SCI papers of biomedical research and clinical medicine increased by 2.7 times and 3.2 times, respectively [1]. The number of papers from the KOSRO members, also, increased by 5.7 times. The proportion sharing by radiation oncology, however, was decreased from 8.3% to 7.4% of the papers of Korean oncology categories from the period of 2000-2004 to 2005-2009. The quantitative increase in papers was rapid due to the increase in radiotherapy facilities and man-power such as radiation oncologists and physicists in Korea. However, the average impact factors tend to decrease with years. To publish the papers in good journal, which has high impact factor, is now becoming a parameter ranking the researcher and institutions and competitive challenge.

Most commonly published journal is IJROBP, which takes 23.4%, followed by RTO occupying just 4.7%. In the previous report by Kang [2], IJROBP constituted 31.5% of all the published Korean SCIE papers until 2006. Recently, the kind of reported journals is being diversified. Until 2006, the papers were published in 49 different journals, but now papers are printed in 134 kinds of journals.

Gynecologic oncology consists 14.1% and is the most common clinical category to be published. It makes sense because the gynecological cancer patients were more common in Korea than in western countries. The Head & Neck cancer is not a common category but it takes the second place occupying 10.0%. It might be accomplished by the distinguishing role of radiotherapy, which is combined with or without chemotherapy, for organ preservation

Kang [2] reported that 81.4% of the SCIE papers were

published from the top five institutions and only 19 institutions had experienced the print on SCIE journals until 2006. The number of institutions, however, has increased in 45 institutions. Moreover, the proportion of top five institutions is reduced to 66.3%. National Cancer Center ranks first place among the top five in the number of papers. We think it might be possible that National Cancer Center has good man power, especially, in the field of biology and physics and moreover, unique environment where one can concentrate on the specialized field. The number of citation has increased with time. Until 2006, just five papers (2.8%) were cited more than 30 times [2] but, it increased up to 36 papers (6.6%). All of 20 papers cited more than 40 times had been published before 2005. Half of them were published in IJROBP.

This study has several limitations. First, there might be some missing papers in this analysis which have different search terms to our search terms. Second, the subject categories for each paper were determined subjectively. Some papers might be divided into different categories if it is done by others.

In conclusion, the SCIE papers, in the field of radiation oncology in Korea, are increasing continuously because of the increase in man power and the efforts of KOSRO members. To raise the quality of the papers, multi-institutional studies including retrospective or prospective randomized trials should be taken especially for the common cancers in Korea. For designing, accomplishing and supervising such trials, Korean Radiation Oncology Group and each disease-specific societies of KOSRO should play the pivotal role to enhance the quality of researches in the field of radiation oncology in Korea.

Conflict of Interest

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

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