Tohoku J. Exp. Med., 2013, **231**, 187-191

Japanese Representation in Leading General Medicine and Basic Science Journals: A Comparison of Two Decades

Tsuguya Fukui,[1] Osamu Takahashi[1] and Mahbubur Rahman[2]

[1]St. Luke's International Hospital, Tokyo, Japan
[2]Department of Obstetrics and Gynecology and the Center for Interdisciplinary Research in Women's Health, University of Texas Medical Branch, Galveston, TX, USA

During 1991-2000, Japan contribution to the top general medicine journals was very small although the contribution to the top basic science journals was sizeable. However, it has not been examined whether the contribution to the top general medicine and basic science journals has changed during the last decade (2001-2010). The objective of this study was to compare Japan representation in high-impact general medicine and basic science journals between the years 1991-2000 and 2001-2010. We used PubMed database to examine the frequency of articles originated from Japan and published in 7 high-impact general medicine and 6 high-impact basic science journals. Several Boolean operators were used to connect name of the journal, year of publication and corresponding authors' affiliation in Japan. Compared to the 1991-2000 decade, Japan contribution to the top general medicine journals did not increase over the 2001-2010 period (0.66% vs. 0.74%, $P = 0.255$). However, compared to the same period, its contribution to the top basic science journals increased during 2001-2010 (2.51% vs. 3.60%, $P < 0.001$). Japan representation in basic science journals showed an upward trend over the 1991-2000 period ($P < 0.001$) but remained flat during 2001-2010 ($P = 0.177$). In contrast, the trend of Japan representation in general medicine journals remained flat both during 1991-2000 ($P = 0.273$) and 2001-2010 ($P = 0.073$). Overall, Japan contribution to the top general medicine journals has remained small and unchanged over the last two decades. However, top basic science journals had higher Japan representation during 2001-2010 compared to 1991-2000.

Keywords: biomedical research; Japan; MEDLINE; periodicals as Topic; publishing
Tohoku J. Exp. Med., 2013 November, **231** (3), 187-191.

Introduction

There appears to be no argument that biomedical research has been dominated by the USA for the past several decades with 52-70% representation in the top general medicine and basic science journals during the years 1991-2000 (Rahman and Fukui 2002). In contrast, Japanese representation ranged between 0.5% and 3.7% during the same time period. Comparing the research productivity among different countries is difficult, as countries vary with respect to gross developmental products, the number of trained researchers, the resources available for research and other socioeconomic indicators. However, examining the trend of research articles originating from different countries published in reputed journals could reveal variations in countries' research activities in a particular field.

Japanese representation in the top general medicine journals was meager and stagnant during the time period of 1991-2000 (Fukui and Rahman 2002). Representation in top basic science journals, however, was sizeable and noteworthy during the same time frame. In addition, Japanese representation in other fields of medicine ranged from 1.1 to 11.4% during 1991-2000 based on top-ranking journals (Rahman et al. 2001, 2002a,b,c, 2003a,b,c,d, 2004, 2005; Takahashi et al. 2002; Morimoto et al. 2003; Hayashino et al. 2003a,b; Rahman and Fukui 2003; Maeda et al. 2003; Okamoto et al. 2004). Scattered and uncoordinated efforts were undertaken as intervention programs to boost clinical research and overcome barriers in Japan. For example, the school of public health (SPH) was established in Kyoto as an independent school affiliated with Kyoto University in 2000 to distribute the research methodology among physicians and allied health personnel, and also to increase the number of specialists in the field of epidemiology and biostatistics (Shoji et al. 2000). After that, several other Universities in Japan replicated this concept and established few more public health schools. However, the results of these interventions have not yet been investigated. Moreover, the status of Japanese representation during the last decade compared to the earlier decade has not been exam-

Received April 3, 2013; revised and accepted October 2, 2013. Published online November 1, 2013; doi: 10.1620/tjem.231.187.
Correspondence: Osamu Takahashi, M.D., M.P.H., Ph.D., St. Luke's International Hospital, 9-1 Akashi-cho, Chuo-ku, Tokyo 104-8560, Japan.
e-mail: otakahas@luke.or.jp

ined.

In this study, we compared Japanese research articles published from 1991 to 2000 and 2001 to 2010 in the top 7 general medicine and the top 6 basic science journals and analyzed trends over time.

Methods

Journal and article selection

Thirteen journals were selected to obtain the relevant data based on the highest impact factors. Seven high-impact general medicine journals (New England Journal of Medicine [NEJM], Journal of American Medical Association [JAMA], Annals of Internal Medicine [Annals], Archive of Internal Medicine [Archives], American Journal of Medicine [AJM]), Lancet, and British Medical Journal [BMJ]) were included from the "General Medical and Internal Medicine" category of journals set by the Institute for Scientific Information (JCR 2010) to examine the Japanese representation over the period of time. Six top basic science journals (Cell, Nature, Nature Genetics, Nature Medicine, Neuron, and Science), excluding journals which publish review articles only, related to human health were also selected to compare Japanese representation between general medicine and basic science journals. We selected only journal articles published in the selected journals during 1991-2010.

PubMed (http://www.ncbi.nlm.nih.gov/pubmed/) was used as a tool for data abstraction. The number of journal articles originating in Japan and published in the selected journals during 1991-2010 was generated using the search strategy shown in Table 1. The PubMed database was searched in September 2011 to obtain the number of total journal articles published (denominator) in the selected journals, and the Japanese representation was calculated by journal and publication year. Several Boolean operators ("AND", "OR", and "NOT") were used to determine the overall number of "Journal Articles" and the Japanese representation by different journals and years.

Statistical Analyses

Chi-square tests were used to compare Japanese representation between the periods 1991-2000 and 2001-2010 and between general medicine and basic science journals. We used a simple linear regression analysis to examine the trend of Japanese representation in top general medicine and basic science journals during 1991-2000 and 2001-2010, separately. Japanese representation in each year was considered to be a dependent variable, and the year of publication was considered to be an independent variable. All analyses were conducted using STATA 11 (Stata Corp., College Station, TX, USA).

Results

The overall number of journal articles published during the time periods of 1991-2000 and 2001-2010

From the 7 general medicine journals, 39,255 and 36,038 journal articles were published during the years 1991-2000 and 2001-2010, respectively. The respective numbers for the 6 basic science journals were 33,779 and 37,908.

Japanese representation in the top general medicine journals

The Japanese contribution to the top general medicine journals was 0.66% (260/39,255) and 0.74% (265/36,038) in the years 1991-2000 and 2001-2010, respectively. The representation did not differ between 1991-2000 and 2001-2010 ($P = 0.255$). No specific trend was observed with respect to the representation observed during 1991-2000 ($P = 0.273$) and 2001-2010 ($P = 0.073$; a downward trend was observed, but it was not significant; Figs. 1 and 3). Fig. 2 shows the Japanese representation by specific general medicine journals during the years 1991-2000 and 2001-2010. The representation was stable in JAMA, Archives, Lancet and BMJ but decreased in NEJM and Annals. Only AJM showed an increase in Japanese representation.

Japanese representation in the top basic science journals

The Japanese contribution to the top basic science journals was 2.51% (849/33,779) and 3.60% (1,364/37,908) in 1991-2000 and 2001-2010, respectively ($P < 0.001$). A

Table 1. PubMed search strategy with queries.

	PubMed commands
#1	Japan[ad] OR Tokyo[ad] OR Kyoto[ad] OR* ……. all possible cities/regions/universities
#2	"The New England Journal of Medicine" [Jour]
#3	"Annals of internal medicine" [Jour]
…..	…….
#9	"Cell" [Jour]
#10	"Nature" [Jour]
…..	…….
#15	Journal Article [ptyp]
#16	("1991" [PDat] : "2010" [PDat])
#17~	*Several Boolean terms ("AND", "OR") were used to determine overall number of journal articles and Japan contribution during 1991-2010 and also each of the years.*

*All possible Japanese cities, prefectures and universities name have been included to avoid the possibility of exclusion of articles from Japan due to the fact that some articles are listed without country or city affiliation.

‡Each line indicates the queries used in the search strategy. Name of the target journals along with years and all possible affiliation in Japan were included in it. Not all queries are listed in the table to make the table simple and avoid complexities.

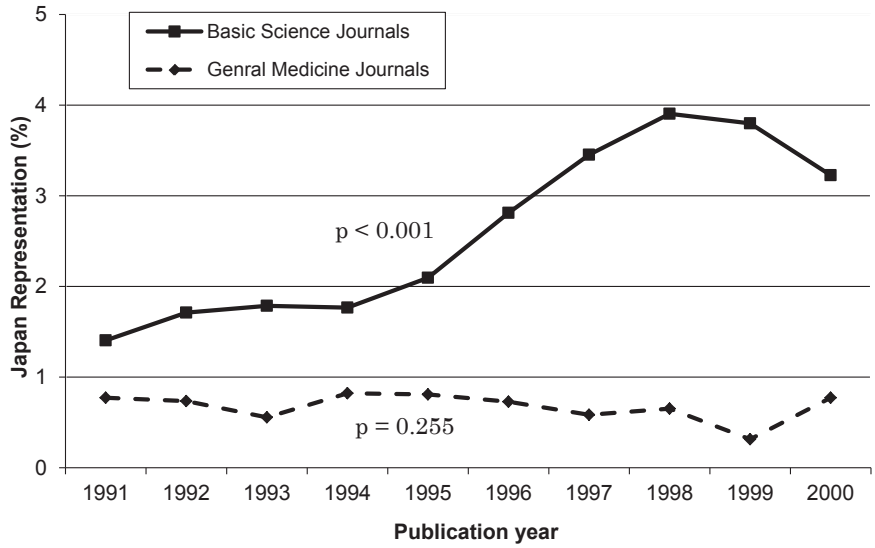

Fig. 1. Japanese representation in genearal medicine journals and basic science journals between 1991 and 2000.

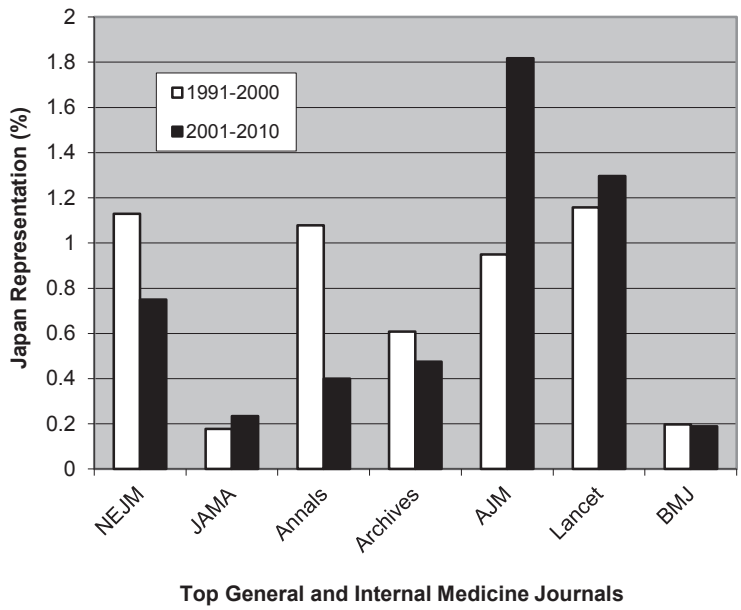

Fig. 2. Japanese representation by specific general medicine journals during the years 1991-2000 and 2001-2010.

significant upward trend was observed during 1991-2000 ($P < 0.001$) but not during 2001-2010 ($P = 0.177$; a downward trend during 2001-2010 was observed, although it was not significant; Figs. 1 and 3). Fig. 4 shows the Japanese representation by specific basic science journals during 1991-2000 and 2001-2010. The representation was stable in Cell, Nature, Neuron and Nature Genetics but decreased in Neuron and increased in the Science and Nature Medicine journals.

Comparison between general medicine and basic science journals

Compared to the top general medicine journals, Japanese representation was significantly higher in basic science journals both during 1991-2000 ($P < 0.001$) and 2001-2010 ($P < 0.001$).

Discussion

Our study showed that Japanese representation in the top 7 general medicine journals was meager and has not changed in the last decade compared to the representation observed in 1991-2000. In contrast, Japanese representation in basic science journals has increased significantly during the last decade compared to 1991-2000, although there was no upward trend during 2001-2010. Based on the findings of this study, it is obvious that the gap between clinical and basic science research has widened. Moreover, these results imply that the interventions adopted over the

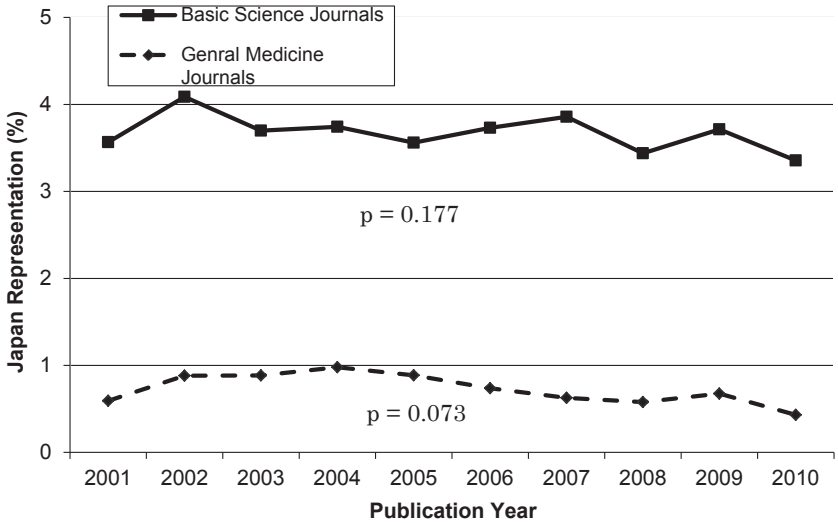

Fig. 3. Japanese representation in genearal medicine journals and basic science journals between 2001 and 2010.

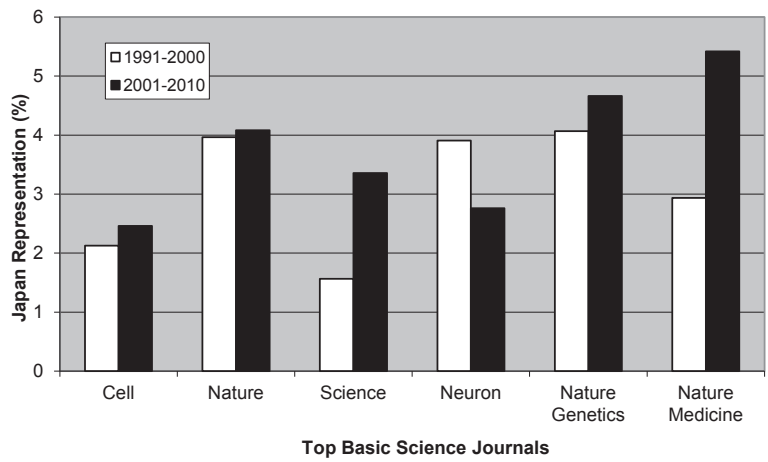

Fig. 4. Japanese representation by specific basic science journals during the years 1991-2000 and 2001-2010.

last two decades to bridge the gap have failed.

Our findings that research productivity in top general medicine journals has remained almost flat during last 20 years is a testimony to the fact that undergraduate and graduate medical students in Japan have not been trained appropriately in clinical research methodology. As a remedy, protected time should be ensured for clinicians who are otherwise busy with patients and do not have the time to conduct research. A separate pool of research-only faculty members could be helpful.

Language could be a barrier to publishing high quality articles from Japan, as Japanese researchers prefer to publish their research papers in Japanese. However, considering the difference in world ranking between general medicine (14th in the world) and basic science journals (4th in the world) for the period 1991-2000 (Rahman and Fukui 2002), it appears that language is not the sole explanation for the notably low representation of Japan in the top general medicine journals. Thus, there is a need to investigate the current system of clinical research in Japan and to overhaul it to make it suitable for high-quality clinical research in Japan.

Our findings have several limitations. Although we selected journals with the highest impact factors, we studied only a small subgroup of all general medicine and basic science journals. The number of publications generated from the selected journals is only a gross estimate of the proportion of Japan representation in general medicine and basic science journals. The absolute number of high-quality journal articles originating from Japan is certainly different from our findings because there are more journals other than the journals included in this study. However, the contribution proportion obtained in this study is likely to reflect the actual situation. In addition, a portion of studies are conducted with multinational collaborations, and the Medline database identifies only the affiliation of the corresponding author. Finally, there are some discrepancies between the numbers of journal articles we identified using

the Medline database between our search strategies used in 2001-2002 (for an earlier, similar publication) and 2011. These discrepancies could be due to various reasons, including changes in the definition of different MeSH words we used for our search strategies over the period of time.

Our findings indicate that over the past two decades, Japanese representation in top general medicine journals has remained flat. The good news is that there was an increase in Japanese representation in high-impact basic science journals during the years 2001-2010. However, strategies to improve clinical research in Japan should be investigated and adopted. For example, there is a need to focus on innovative infrastructure to support and advance education, collaboration, and research in clinical science like the clinical and translational science awards program funded by the National Institute of Health (NIH) in the US (Rosenblum and Alving 2011). This infrastructure helps clinical researchers to get easy access to tools, resources, and collaborative academic partnerships, which are very important components for research productivity. Studies are also needed to examine the reasons for the stagnancy in basic science research productivity observed during 2001-2010, which had shown an upward trend during 1991-2000.

Conflict of Interest

The authors declare no conflict of interest.

References

Fukui, T. & Rahman, M. (2002) Contribution of research in basic and clinical sciences in Japan. *Intern. Med*., **41**, 626-628.

Hayashino, Y., Rahman, M. & Fukui, T. (2003a) Japan's contribution to research in rheumatology. *Mod. Rheumatol*., **13**, 168-172.

Hayashino, Y., Rahman, M. & Fukui, T. (2003b) Japan's contribution to research on cardiovascular diseases. *Circ. J.*, **67**, 103-106.

JCR Science Edition (2010) The institute for scientific information. *Thomson Reuters*. [*Accessed*: 2011-09-18].

Maeda, K., Rahman, M. & Fukui, T. (2003) Japan's contribution to clinical research in gastroenterology and hepatology. *J. Gastroenterol.*, **38**, 816-819.

Morimoto, T., Rahman, M. & Fukui, T. (2003) International comparison of research productivity in hematology. *Int. J. Hematol.*, **77**, 192-195.

Okamoto, S., Rahman, M. & Fukui, T. (2004) Japan's contribution to clinical pediatrics research in the last decade. *Pediatr. Int.*, **46**, 1-4.

Rahman, M. & Fukui, T. (2002) A decline in the U.S. share of research articles. *N. Engl. J. Med.*, **347**, 1211-1212.

Rahman, M. & Fukui, T. (2003) Biomedical publication: global profile and trend. *Public Health*, **117**, 274-280.

Rahman, M., Haque, T.L. & Fukui, T. (2005) Research productivity in clinical radiology: International perspectives. *Acad. Radiol.*, **12**, 825-829.

Rahman, M., Sakamoto, J. & Fukui, T. (2002a) Japan's contribution to nuclear medical research. *Ann. Nucl. Med.*, **16**, 383-385.

Rahman, M., Sakamoto, J. & Fukui, T. (2002b) Japan's share of articles in orthopedics. *J. Orthop. Sci.*, **7**, 607-609.

Rahman, M., Sakamoto, J. & Fukui, T. (2002c) Research output in anaesthesia: a quantitative ranking. *Anaesthesia*, **57**, 1213-1214.

Rahman, M., Sakamoto, J. & Fukui, T. (2003a) Publications in epidemiology journals: Japanese perspectives. *J. Epidemiol.*, **13**, 96-98.

Rahman, M., Sakamoto, J. & Fukui, T. (2003b) Japan's share of published research in ophthalmology. *Jpn. J. Ophthalmol.*, **47**, 221-224.

Rahman, M., Sakamoto, J. & Fukui, T. (2003c) Japan's share of research output in urology and nephrology. *Int. J. Urol*., **10**, 353-355.

Rahman, M., Sakamoto, J. & Fukui, T. (2003d) Share of research output in dermatology: a quantitative ranking. *Br. J. Dermatol.*, **149**, 218-220.

Rahman, M., Sakamoto, J. & Fukui, T. (2004) Japan's share of research output in basic medical science. *Keio J. Med.*, **53**, 172-177.

Rahman, M., Sekimoto, M., Morimoto, T. & Fukui, T. (2001) Randomized controlled trials conducted in Japan as a comparison with top-ranking countries. *J. Epidemiol*., **11**, 46-47.

Rosenblum, D. & Alving, B. (2011) The role of the clinical and translational science awards program in improving the quality and efficiency of clinical research. *Chest*, **140**, 764-767.

Shoji, S., Fukui, T., Hamaguchi, H. & Hori, M. (2000) The present condition and a future survey of Japanese medical graduate schools (Master's Course) 1999. *Medical Education*, **31**, 159-165.

Takahashi, O., Rahman, M. & Fukui, T. (2002) Japan's contribution to research on infectious disease. *Jpn. J. Infect. Dis.*, **55**, 139-141.