American Journal of Emergency Medicine (2012) **30**, 1530–1534

ELSEVIER

The American Journal of Emergency Medicine

www.elsevier.com/locate/ajem

Original Contribution

National representation in the emergency medicine literature: a bibliometric analysis of highly cited journals☆,☆☆

Qiang Li MD[a,1], Yuan Jiang MD[b,1], Mao Zhang MD[a,*]

[a]*Department of Emergency Medicine, Second Affiliated Hospital, School of Medicine, Zhejiang University, Hangzhou 310009, China*
[b]*Department of Internal Medicine, Children's Hospital, School of Medicine, Zhejiang University, Hangzhou, China*

Received 10 November 2011; revised 14 December 2011; accepted 16 December 2011

Abstract

Objective: In recent years, significant growth has been seen in the field of emergency medicine. However, the national productivity to the field of emergency medicine remains unknown. This study aimed to reveal the national contributions in the field of emergency medicine.

Methods: Articles published in 13 highly cited journals in emergency medicine in 2006 to 2010 were retrieved from PubMed and Science Citation Index. The number of total articles, the per-capita numbers, impact factors (IFs), and citations were tabulated to assess the contribution of different countries.

Results: A total number of 9775 articles were published in the 13 journals from 2006 to 2010 worldwide. West Europe, North America, and East Asia were the most productive regions. High-income countries published 87.9% of the total articles. United States published the most number of articles in 2006 to 2010 (4523/9775, or 46.3%), followed by United Kingdom, Australia, China, and Canada. Besides, United States also had the highest total IFs (8729.73) and total citations (22 117). When normalized to population size, Australia had the highest number of articles per million persons (26.00). Germany had the highest mean IF (2.27) and mean citations (6.87).

Conclusions: United States is the most productive country in the field of emergency medicine.

1. Introduction

In recent years, significant growth has been seen in the field of biomedical research, including emergency medicine, along with the progress of other branches of science and technology. The number of original articles published by a country or an institution is one indicator of their contribution to the production of new knowledge [1]. Because of the great advancement of Internet technology, communication in scientific information of biomedical research is much more convenient than before, especially after the wide utilization of some databases including the Science Citation Index (SCI) and PubMed. Based on the available search tools, large-scale bibliometric analysis is currently feasible.

To date, a literature survey in the field of emergency medicine is not available. The national productivity to the

☆ Conflicts of interest: None.
☆☆ Financial sponsorship and support: None.
* Corresponding author. Tel.: +86 21 81885346.
E-mail address: zjzhangmao@yeah.net (M. Zhang).
[1] Q. Li and Y. Jiang contributed equally to this study.

0735-6757/$ – see front matter © 2012 Elsevier Inc. All rights reserved.
doi:10.1016/j.ajem.2011.12.023

Table 1 Journals included in search

Journal	Abbreviation	2010 IF
Annals of Emergency Medicine	*AOEM*	4.232
Resuscitation	*RES*	2.712
Academic Emergency Medicine	*AEM*	2.478
Injury	*INJ*	2.383
American Journal of Emergency Medicine	*AJEM*	1.542
Emergency Medicine Journal	*EMJ*	1.477
Prehospital Emergency Care	*PEC*	1.297
Journal of Emergency Medicine	*JEM*	1.265
Emergency Medicine Clinics of North America	*EMCNA*	0.964
Pediatric Emergency Care	*PEC*	0.916
Emergency Medicine Australasia	*EMA*	0.901
European Journal of Emergency Medicine	*EJEM*	0.733
Journal of Emergency Nursing	*JEN*	0.359

field of emergency medicine remains unknown. Thus, we performed this bibliometric analysis to quantify national contributions based on the databases SCI and PubMed.

2. Methods

2.1. Search strategy

Emergency medicine refers to a medical specialty in which physicians care for patients with acute illnesses or injuries that require immediate medical attention. A total of 19 journals related to the field of emergency medicine were selected from the "critical care medicine" category of SCI subject categories in Journal Citation Reports (JCR) 2010 established by the Institute for Scientific Information [2]. We only included the journals published in English and both indexed by PubMed and SCI. Finally, 13 journals were included in this study and are listed in Table 1.

A computerized literature search was conducted using the databases PubMed and SCI. Articles published in these 13 journals from January 2006 to December 2010 were identified. The search terms (International Standard Serial Number [ISSN]) used were as follows: "0196-0644 or 0300-9572 or 1069-6563 or 0020-1383 or 0735-6757 or 1472-0205 or 1090-3127 or 0736-4679 or 0733-8627 or 0749-5161 or 1742-6731 or 0969-9546 or 0099-1767." When there was more than 1 institutional affiliation listed, the institution of the first author determined the designated institutional affiliation. The primary outcome was the number of original articles attributed to each country. Countries were ranked in order of their productivity. For other secondary outcomes, we calculated the proportion of articles that was attributed to high-income, upper-middle-income, lower-middle-income, and low-income countries, as categorized by the World Bank. This categorization is according to gross national income per capita and includes the following: high income, $12 276 or more; upper middle income, $3976 to $12 275; lower middle income, $1006 to $3975; and low income, $1005 or less [3].

To evaluate the contribution of different countries, we analyzed the publication of the main productive countries (countries that produced at least 1% of the total publications) and the 13 selected journals in 2006 to 2010, including the total numbers, the per-capita numbers, impact factors (IFs), and citations. Country-specific data were gathered from the United Nations Populations Division for the most recent reported period for each country [4].

We further performed comprehensive analysis of publications from the productive countries. The accumulated IFs and the average IF for each country were generated according to 2010 JCR. Afterward, citation reports of the articles were

Fig. 1 The world map of the productive regions in 2006 to 2010 (in black).

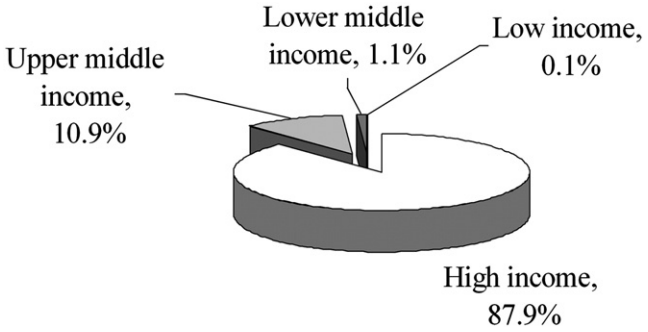

Fig. 2 Publications grouped by gross national income in 2006 to 2010.

also conducted. Besides, the publications in the 13 journals from the top countries (countries that produced at least 3% of the total publications) were generated. Finally, the top 5 countries in the high-impact journals (IF >2) were also listed.

2.2. Statistical analysis

Because our only goal is to describe trends and not to test hypotheses about the relative contributions of different countries, only simple descriptive statistics (eg, sum and average) are used.

3. Results

A total number of 9775 articles were published in the 13 journals from 2006 to 2010 worldwide. Fig. 1 is the world map of the productive areas, which showed that West Europe, North America, and East Asia were the most productive regions.

In our data set from 2006 to 2010, high-income countries published 8589 articles (87.9%) (Fig. 2). Taken together, middle-income countries (sum of lower-middle-income and upper-middle-income countries) published 1177 articles (12.0%). However, low-income countries published just 9 articles (0.1%).

As shown in Table 1, there were 14 countries that produced at least 1% of total articles (Table 2). United States (USA) published the most number of articles from 2006 to 2010 (4523/9775, or 46.3%), followed by United Kingdom (UK), Australia, China, and Canada. As for the production per capita, Australia had the highest number of articles per million population (26.00), followed by UK (20.00), USA (14.57), Israel (13.48), Canada (9.67), and Greece (9.24).

Among the 14 countries, USA had the highest total IFs (8729.73), followed by UK (2189.37), Australia (849.05), China (820.08), Canada (689.08), and Germany (552.46). Germany had the highest mean IF (2.27), followed by the Netherlands (2.11), Canada (2.09), Japan (2.00), Greece (2.00), and USA (1.93).

Among the 14 countries, USA had the highest total citations (22 117), followed by UK (6540), Australia (2536), Canada (1918), Germany (1669), and China (1329). Germany had the highest mean citations (6.87), followed by Canada (5.83), the Netherlands (5.68), Italy (5.32), UK (5.27), and USA (4.89).

There were 5 countries that produced more than 3% of total articles. The top 5 journals in the 5 countries are shown in Table 3. Among the top 5 countries, *Journal of Emergency Medicine*, *Emergency Medicine Journal*, *Emergency Medicine Australasia*, *American Journal of Emergency Medicine*, and *Academic Emergency Medicine* were the most popular journal in USA, UK, Australia, China, and Canada, respectively.

There were 4 high-impact journals (IF >2) among the 13 selected ones. The 5 most productive countries in the high-impact journals are listed in Table 4. United States was the most productive country in 2 journals, *Annals of Emergency Medicine* and *Resuscitation*; UK was the most productive

Table 2 Publications from the most productive countries from 2006 to 2010

Country	n	%	n per million population	Total IF	Mean IF	Total citation	Mean citation
USA	4523	46.3	14.57	8729.73	1.93	22 117	4.89
UK	1241	12.7	20.00	2189.37	1.76	6540	5.27
Australia	579	5.9	26.00	849.05	1.47	2536	4.38
China	446	4.6	0.33	820.08	1.84	1329	2.98
Canada	329	3.4	9.67	689.08	2.09	1918	5.83
Germany	243	2.5	2.95	552.46	2.27	1669	6.87
Turkey	234	2.4	3.22	340.28	1.45	782	3.34
France	156	1.6	2.48	264.90	1.70	743	4.76
The Netherlands	148	1.5	8.91	312.76	2.11	841	5.68
Korea	126	1.3	2.61	222.43	1.77	394	3.13
Italy	124	1.3	2.05	237.93	1.92	660	5.32
Japan	124	1.3	0.98	247.49	2.00	574	4.63
Greece	105	1.1	9.24	210.07	2.00	464	4.42
Israel	100	1.0	13.48	178.14	1.78	462	4.62

Table 3 Top 5 journals in the top countries

Rank	USA	UK	Australia	China	Canada
1	*JEM* (778)	*EMJ* (697)	*EMA* (293)	*AJEM* (185)	*AEM* (74)
2	*AEM* (774)	*INJ* (282)	*EMJ* (91)	*INJ* (89)	*PEC* (51)
3	*AJEM* (610)	*RES* (128)	*INJ* (78)	*RES* (54)	*INJ* (44)
4	*PEC* (582)	*EJEM* (80)	*RES* (50)	*EMJ* (53)	*AOEM* (37)
5	*AOEM* (525)	*AJEM* (15)	*PEC* (20)	*JEM* (34)	*RES* (32)

country in the other 2 journals, *Academic Emergency Medicine* and *Injury*.

To explore the publication trends of the most productive countries, we also conducted a search of total numbers of articles of the top 5 countries from 2001 to 2005. United States published the most number of articles from 2000 to 2005 (3981/7586, or 52.5%), followed by UK (1288/7586, or 17.0%), Australia (274/7586, or 3.6%), Canada (223/7586, or 2.9%), and China (184/7586, or 2.4%).

4. Discussion

In this analysis, we found that contributors from USA published far more articles than any other country. As we all know, USA has been recognized as the most productive region in scientific and biomedical research for about several decades. Besides the field of emergency medicine, USA had overwhelming dominance in many other subfields of biomedical research, such as laboratory medicine, critical care medicine, gastroenterology, and others [5-7]. The proportions of USA and UK dropped from 52.5% and 17.0% in 2000 to 2005 to 42.3% and 12.7% in 2006 to 2010, respectively, whereas Australia and China increased their proportions from 3.6% and 2.4% in 2000 to 2005 to 5.9% and 4.6% in 2006 to 2010, respectively.

Besides the fact that USA had the most number of articles, USA also had the highest total IFs (8729.73) and total citations (22 117). Most importantly, USA also had high mean IF (1.93) and mean citation (4.89), which showed that publications from USA had not only large quantity but also high quality. Although USA has a large population of about more than 300 million persons [4], the per-capita numbers of articles from USA remained one of the most numbers per million persons (14.57). These results revealed that USA was the most productive country in the field of emergency medicine in the world.

In addition, when normalized to population scale, some countries such as Australia, UK, and Israel were more productive with largest number of articles per capita and high mean IF and citation. In fact, the productive countries are almost all developed ones. In this report, we found that the high-income countries published nearly 90% of the total articles. Besides, it was remarkable that some developing countries with rapid economic development, such as China and Turkey, promoted markedly their ranks. In a way, the scientific publication might be a suggestive reflection of economy.

The 5 most popular journals in USA were *Journal of Emergency Medicine*, *Academic Emergency Medicine*, *American Journal of Emergency Medicine*, *Pediatric Emergency Care*, and *Annals of Emergency Medicine*. Meanwhile, the most productive country in the 3 journals was USA. In fact, these 5 journals are all published in USA. Thus, there might be more submissions from USA than from other countries.

This study only included publications in English because it is well known that English is the most international scientific language [8]. Science Citation Index and PubMed databases mainly include journals in this language, which renders it difficult for journals in other languages to gain high impact [9]. This mainly jeopardized Germany, whose journals (*Unfallchirurg*, *Notfall & Rettungsmedizin*, and *Notarzt*) were not involved in our study because of their relative low international impact.

There are some limitations to this analysis. Although the journals were selected from the emergency medicine category of the JCR, some journals in the fields of critical care medicine, surgery, respiration medicine, circulation, and others also published some articles related to emergency medicine. Besides, some articles published in non-English journals excluded from this report might also have high citations. Nevertheless, the 13 highly cited journals included

Table 4 Top 5 countries in the high-impact journals

Rank	*AOEM*	*RES*	*AEM*	*INJ*
1	USA (525)	USA (322)	USA (774)	UK (282)
2	Canada (37)	UK (128)	Canada (74)	USA (178)
3	Australia (13)	Germany (92)	Australia (12)	Germany (96)
4	France (6)	Norway (56)	China (9)	Australia (78)
5	UK (5)	Austria (52)	Korea (8)	The Netherlands (60)

in this bibliometric analysis could represent the major journals devoted to the discipline of emergency medicine.

5. Conclusions

In conclusion, USA is the most productive country in the field of emergency medicine. When normalized to population size, some countries might be more productive.

References

[1] Bould MD, Boet S, Riem N, Kasanda C, Sossou A, Bruppacher HR. National representation in the anaesthesia literature: a bibliometric analysis of highly cited anaesthesia journals. Anaesthesia 2010;65(8): 799-804.

[2] ISI Journal Citation Reports, Institute for Scientific Information, 2010. Available at: http://isiknowledge.com.

[3] World Bank Data Development Group. World Bank list of economies. 2011. http://data.worldbank.org/about/country-classifications/country-and-lending-groups.

[4] Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2010. World population prospects: the 2008 revision. Available at: http://esa.un.org/unpp.

[5] Gao R, Liao Z, Li ZS. Scientific publications in gastroenterology and hepatology journals from Chinese authors in various parts of North Asia: 10-year survey of literature. J Gastroenterol Hepatol 2008;23(3): 374-8.

[6] Michalopoulos A, Bliziotis IA, Rizos M, Falagas ME. Worldwide research productivity in critical care medicine. Crit Care 2005;9(3): R258-65.

[7] Liu DH, Cui W, Yao YT, Jiang QQ. Scientific publications in laboratory medicine from mainland China, Hong Kong and Taiwan: a ten-year survey of the literature. Clin Chim Acta 2010;411(19-20):1502-5.

[8] Villar J. English, an international language in medicine. Med Clin (Barc) 1988;91(1):23-4.

[9] Van Leewen TN, Moed HF, Tijssen RJW, Visser MS, Van Raan AFJ. Language biases in the coverage of the Science Citation Index and its consequences for international comparisons of national research performance. Scientometrics 2001;51(1):335-46.