Chinese research status in emergency medicine journals: a bibliometric analysis based on Science Citation Index Expanded database

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Abstract

Background. Emergency medicine in China has undergone tremendous growth. This study was conducted to evaluate the Chinese scientific output on emergency medicine in Science Citation Index Expanded (SCIE) in the Web of Science during the period of 2000–2013.

Methods. A bibliometric analysis was applied in this study. Articles published by China in SCIE emergency medicine journals were included. They were analyzed in terms of publication outputs, document type, language of publication, journals, countries/territories, institutions, and collaboration patterns. Distributions of article titles and keywords were also studied to reveal research focuses and trends.

Results. During the period, a total of 1043 articles from China were published in SCIE emergency medicine journals. Seven documents types

were found, and the journal article was the most frequently used. All articles were written in English. The *Hong Kong Journal of Emergency Medicine* is the most productive journal. The most productive institutes were Prince Wales Hospital, followed by Tuen Mun Hospital, Chinese University Hong Kong; USA dominated the collaborative countries. The "injury/injuries", "trauma", "acute", "rat/rats", "arrest", "emergency", and "cardiopulmonary", "resuscitation" were the hot spots of emergency medicine research in China.

Conclusion. The results map emergency medicine (EM) development and research trends in China, and potentially guide Chinese EM physicians in evaluating and orienting their research.

Key words: emergency medicine, china, bibliometric, science citation index expanded, research

Introduction

Emergency medicine (EM) in China started in the 1980s as an independent discipline. (1) Since then, EM in China has undergone tremendous growth. Up to now, emergency departments have been established in hospitals at different levels. At the same time, a large pool of specialists involving in clinical practice, research and teaching has been formed. Numerous studies (2-7) have been carried out on the various aspects of emergency medicine development in China; however, there is no report to analyze Chinese research status and trends in emergency medicine.

Bibliometrics, first introduced by Pritchard, are an effective method for analyzing scientific production and research trends. (8) As the most important and frequently used source database for the study of scientific output, the Science Citation Index Expanded (SCIE) database from the Web of Science had widely been used for bibliometric analysis of various fields. (9-14) Therefore, in this study, we used the bibliometric method to study the status of Chinese research and trends in emergency medicine journals based on SCIE database, during the period 2000–2013. The

document type, language of publication, output of different journals, and collaboration patterns were analyzed. Distribution of article titles, and keywords were studied to reveal research focuses and trends.

Materials and methods

The data used in this study were derived from the database of SCIE, Thomson Reuters Web of Science, Philadelphia, USA. According to Journal Citation Reports (JCR) for 2014, it indexes 8474 journals with citation references across 176 scientific disciplines. There was a total of 25 journals in the Web of Science category of ″emergency medicine″. All articles from 2000 to 2013 with “Peoples R China” in the address field (updated March 1, 2014) were collected from the 25 EM journals. Articles only addressed in Taiwan were excluded from the study. Articles from England, Scotland, Northern Ireland, and Wales were reclassified as from the United Kingdom (UK). (15) The impact factor (IF) of each journal was collected from the JCR published in 2014. Contributions of different institutions and collaborated countries were estimated by the affiliation of at least one author to the article. Collaboration type was determined by the addresses of the authors (15): the term “China independent article” was assigned if authors were all from China; the term “institutional independent” was assigned if authors were from the same institution in China; the term “internationally collaborative article” was designated if authors were from China and other countries; the term “national collaboration” was assigned if authors were from different institutions in China. The included articles were analyzed in terms of publication outputs, document type, language of publication, journals, countries/territories, institutions, title words, and keywords. The included articles were downloaded in Microsoft Excel, and additional coding was performed manually.

Results

Publication outputs during the year 2000–2013

Research in emergency medicine in China started in the 1980s. Since then, publications from China can be found in international EM journals. The earliest six articles were entitled "Dehydration therapy and hypotension in post-resuscitation cerebral edema, and application of intraocular-pressure measurement – a review of resuscitation work .1." (16) in *Resuscitation*, "On the intracardiac use of combined adrenaline, isoprenaline and noradrenaline in the resuscitation of the heart beat – a review of resuscitation .2."(17) in *Resuscitation*, "Closed-chest intracardiac injection"(18) in *Resuscitation*, "Hemodynamic-studies of the effect of total alkaloids of datura in experimental hemorrhagic-shock in dogs"(19) in *Resuscitation*, "Large dose atropine alkaloids in the treatment of shock"(20) in *Resuscitation*, and "Experimental-study in rabbits of the antishock effect of anisodamine (654-2), and its mechanism of action" (21) in *Resuscitation*.

During the period 2000–2013, there was a total of 1043 articles published by Chinese authors in the Web of Science for the subject category 'emergency medicine'. The cumulative numbers of articles presented an increasing trend, as shown in figure 1. Only five papers were published in 2000, while the number of papers reached 195 in 2011, about 40 times of that in 2000. The fastest-growing period was from 2007 to 2008, reaching a growth rate of 151%.

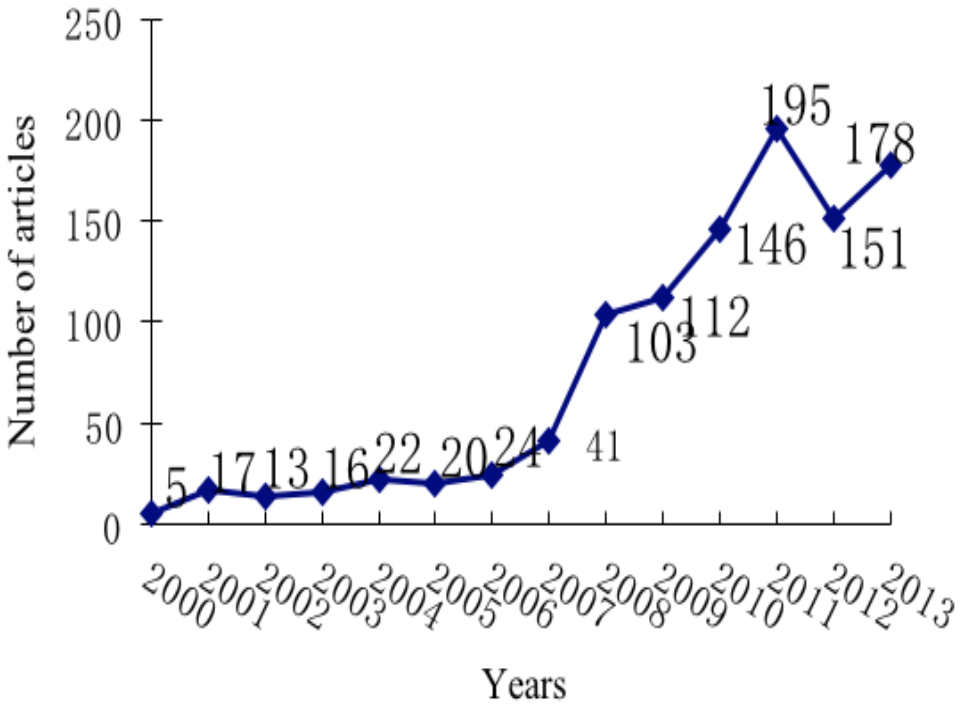

Figure 1. Cumulative number of articles during 2000–2013.

Document type and language of publication

According to the document type classification at the Web of Science, seven document types were found among the total of 1043 publications during 2000–2013. 'Journal article' was the most frequently used document type, with 754 articles, accounting for 72.3% of total productions. The other types were letters (126; 12.1%), editorial materials (92; 8.8%), reviews (41; 3.9%), meeting abstracts (20; 1.9%), proceedings paper articles (9; 0.9%) and corrections (1; 0.1%). In this study, a total of 754 journal articles were extracted from the 1043 documents for further analyses.

Languages of all articles in this study were grouped. English was the only language used for all of these articles.

Distribution of articles in journals

There were 25 journals in the Web of Science (2014) category of 'emergency medicine'. Except *Emergency Medicine Clinics of North America*, *Notarzt*, *Notfall* & *Rettungsmedizin*, and *Prehospital Emergency Care*, the remaining 21 journals published different numbers of articles from China.

Table 1. presents the numbers of articles being published by China, their impact factors in 2013, and impact factor ranks. It is noticed that *Hong Kong Journal of Emergency Medicine* (HKJEM) published the most Chinese articles (240), accounting for 23% of the total, followed by *International Journal of the Care of the Injured* (171; 16.4%) and *Journal of Trauma-Injury Infection and Critical Care* (149; 14.3%).

Table 1. Distribution of articles in journals found in the Web of Science category of 'emergency medicine' during 2000–2013.

Journals	TA (%)	Rank (IF 2013)	Journal Country/Territory
Hong Kong Journal of Emergency Medicine	240 (23)	25 (0.154)	Peoples R China
International Journal of the Care of the Injured	171 (16.4)	5 (2.462)	England
Journal of Trauma-Injury Infection and Critical Care	149 (14.3)	3 (2.961)	United States
American Journal of Emergency Medicine	106 (10.2)	13 (1.152)	United States
Resuscitation	97 (9.3)	2 (3.960)	Ireland
Annals of Emergency Medicine	68 (6.5)	1 (4.333)	United States
Emergency Medicine Journal	65 (6.2)	9 (1.776)	England

European Journal of Emergency Medicine	35 (3.4)	10 (1.500)	United States
Journal of Emergency Medicine	32 (3.1)	12 (1.175)	United States
Pediatric Emergency Care	16 (1.5)	16 (0.923)	United States
Academic Emergency Medicine	13 (1.3)	6 (2.198)	United States
Scandinavian Journal of Trauma Resuscitation & Emergency Medicine	12 (1.2)	7 (1.926)	England
Emergency Medicine Australasia	10 (0.96)	11 (1.220)	Australia
European Journal of Trauma and Emergency Surgery	9 (0.86)	21 (0.380)	Germany
Turkish Journal of Trauma & Emergency Surgery	6 (0.58)	22 (0.379)	Turkey
World Journal of Emergency Surgery	4 (0.38)	15 (1.062)	England
Journal of Emergency Nursing	3 (0.3)	14 (1.131)	United States
Signa Vitae	3 (0.3)	24 (0.173)	Croatia
Unfallchirurg	2 (0.2)	19 (0.608)	Germany
Canadian Journal of Emergency Medicine	1 (0.1)	18 (0.660)	Canada
Emergencias	1 (0.1)	4 (2.583)	Spain

IF 2013, impact factor in 2013; Rank, rank in order of impact factor in the Web of Science; TA (%), total number and percentage of articles.

Distribution of institutes and international collaborations

Contributions of institutions were identified as the participation of at least one author. The 754 journal articles were distributed among 253 Chinese affiliations. A total of 647 (85.8 %) articles were China independent publications and 107 (14.2 %) papers were international collaborations. Table 2 shows the top 20 institutes based on the number of papers. We found that 9 (45%) institutes were from Hong Kong, followed by institutes from Beijing (3; 15%). Table 3 displays the top ten internationally collaborative countries, total number of articles collaborated with China, and the rank and percentage of first author articles and corresponding author articles. USA ranked first place, followed by Canada and Australia.

Table 2. Top 20 most productive institutes during the year 2000–2013.

Universities/Hospitals	TA (%)	Area
Prince Wales Hospital	90 (11.9)	Hong Kong
Tuen Mun Hospital	64 (8.5)	Hong Kong
Chinese University Hong Kong	32 (4.2)	Hong Kong
Beijing Chaoyang Hospital	25 (3.3)	Beijing
United Christian Hospital	25 (3.3)	Hong Kong
West China Hospital	20 (2.7)	Sichuan Province

Chinese Peoples Liberation Army General Hospital	20 (2.7)	Beijing
Queen Mary Hospital	19 (2.5)	Hong Kong
Queen Elizabeth Hospital	18 (2.4)	Hong Kong
Third Mil Med Univ, Daping Hospital	17 (2.3)	Chongqing
Shanghai Sixth Peoples Hospital	14 (1.9)	Shanghai
Hebei Medical University, Hospital 3	14 (1.9)	Hebei Province
Sun Yat-Sen University, Affiliated Hospital 1	13 (1.7)	Guangdong Province
Alice Ho Miu Ling Nethersole Hospital	13 (1.7)	Hong Kong
University Hong Kong	13 (1.7)	Hong Kong
Nanjing Jinling Hospital	13 (1.7)	Jiangsu Province
Pamela Youde Nethersole Eastern Hospital	13 (1.7)	Hong Kong
Beijing Union Medical College Hospital	12 (1.6)	Beijing
Zhejiang University, Affiliated Hospital 2	11 (1.5)	Zhejiang Province
Shanghai Changhai Hospital	11 (1.5)	Shanghai

TA (%), total number and percentage of journal articles.

Table 3. Top ten internationally collaborative countries/territories during the year 2000–2013.

Country/territory	TA	TAR (%)	FAR (%)	RAR (%)
United States	55	1 (7.3)	1 (2.3)	1 (0.4)
Canada	14	2 (1.9)	5 (0.3)	2 (0.3)
Australia	13	3 (1.7)	2 (0.5)	3 (0.3)
United Kingdom	8	4 (1.1)	4 (0.4)	4 (0.3)
Italy	8	5 (1.1)	3 (0.5)	–
Germany	5	6 (0.66)	6 (0.3)	–
Israel	3	7 (0.4)	–	–
Switzerland	3	8 (0.4)	–	5 (0.1)
Norway	2	9 (0.3)	–	–
Spain	2	10 (0.3)	–	–

TAR (%), FAR (%), RAR (%), rank and percentage of total articles, first author articles, corresponding author articles in total articles; TA, total number of collaborative articles with China.

Research emphasis and trend

Title-words analysis

The title indicates what the article is about and distinguishes it from other articles. (22) An analysis of single words in the title could be used to make inferences of the scientific literature or to identify the subjective focus and emphasis specified by authors. (23) Therefore, in this study, all single words within the title of articles were analyzed. Some prepositions and common words such as “in” “of” “and” “with” “the” “a” “by” “for” “using” were excluded, as they have no usefulness for the analysis of research trends. The top 20 most frequently used single words in the title

are listed in table 4. We noticed that among the 784 article titles, "Injury/Injuries" ranked first, followed by "patient" and "emergency". These words showed a decreasing trend with the year of publication.

Table 4. Top 20 most frequently used single words in the title, 2000–2013.

Words in titles	TA	2000-2013 R (%)	2000-2005 R (%)	2006-2009 R (%)	2010-2013 R (%)
Injury/Injuries	139	1 (18.4)	1 (1.9)	1 (4.8)	2 (11.8)
Patient	130	2 (17.2)	1 (1.9)	3 (3.2)	1 (12.2)
Emergency	95	3 (12.6)	3 (1.2)	2 (3.8)	3 (7.6)
Fracture	80	4 (10.6)	4 (1.1)	7 (2.5)	4 (7.0)
Acute	78	5 (10.3)	7 (0.8)	4 (2.8)	5 (6.8)
Hong Kong	65	6 (8.6)	7 (0.8)	5 (2.7)	7 (5.2)
Trauma	60	7 (8.0)	5 (0.9)	9 (2.3)	10 (4.8)
Resuscitation	59	8 (7.8)	11 (0.4)	10 (2.1)	6 (5.3)
Rats	58	9 (7.7)	9 (0.5)	5 (2.7)	12 (4.5)
Department	55	10 (7.3)	5 (0.9)	7 (2.5)	16 (3.8)
Cardiac	53	11 (7.0)	13 (0.3)	13 (1.7)	8 (5.0)
Effect/s	51	12 (6.8)	11 (0.4)	12 (1.9)	12 (4.5)
Model/s	49	13 (6.5)	19 (0)	11 (2.0)	12 (4.5)
Study/studies	46	14 (6.1)	13 (0.3)	16 (1.1)	10 (4.8)
Treatment	46	15 (6.1)	9 (0.5)	16 (1.1)	12 (4.5)
Arrest	45	16 (6.0)	17 (0.1)	18 (0.9)	9 (4.9)

Traumatic	38	17 (5.0)	13 (0.3)	14 (1.5)	18 (3.3)
Cardiopulmonary	32	18 (4.2)	17 (0.1)	15 (1.3)	20 (2.9)
Earthquake	31	19 (4.1)	19 (0)	20 (0.3)	16 (3.8)
Clinical	30	20 (4.0)	13 (0.3)	19 (0.8)	19 (2.9)

R (%), rank and percentage of single words in title in total articles; TA, total number of articles.

'Keywords plus' analysis

Keywords plus provides additional search terms extracted from the titles of articles cited by authors in their bibliographies and footnotes in the ISI database. (24) Keywords plus may appear in articles that have no author keywords, or may include important terms that are not listed in the titles, abstracts, or authors keywords. Distribution of keywords plus in different periods has been used to provide further information for research trends. (25) The top 20 most frequently used 'keywords plus' were listed in table 5. The analysis of 'keywords plus' shows that similar to the results of author title-words, "injury/injuries", "trauma", "resuscitation", "acute", "rat/rats", "arrest", "emergency", and "cardiopulmonary" were also hot spots in 'keywords plus' analysis; "injury/injuries" ranked first, followed by "management" and "trauma".

Table 5. Top 20 most used keywords, 2000–2013.

Words in titles	TA	2000-2013 R (%)	2000-2005 R (%)	2006-2009 R (%)	2010-2013 R (%)
Injuries/injury	147	1 (19.5)	1 (1.6)	1 (3.8)	1 (13.8)
Management	76	2 (10.1)	3 (0.7)	2 (3.1)	2 (6.4)

Trauma	67	3 (8.9)	2 (1.1)	3 (2.6)	4 (5.2)
Care	63	4 (8.4)	5 (0.5)	4 (2.3)	3 (5.6)
Cardiopulmonary resuscitation/CPR	52	5 (6.9)	14 (0.1)	6 (1.6)	4 (5.2)
Acute	49	6 (6.5)	10 (0.3)	9 (1.5)	7 (4.8)
Mortality	49	7 (6.5)	7 (0.4)	15 (1.1)	6 (5.0)
Cardiac	48	8 (6.4)	14 (0.1)	6 (1.6)	8 (4.6)
Arrest	45	9 (6.0)	14 (0.1)	6 (1.6)	10 (4.2)
Cells	43	10 (5.7)	10 (0.3)	17 (0.9)	9 (4.5)
Shock	43	11 (5.7)	7 (0.4)	5 (1.9)	11 (3.4)
Expression	33	12 (4.4)	3 (0.7)	11 (1.3)	18 (2.4)
Heart	32	13 (4.2)	19 (0)	15 (1.1)	12 (3.2)
Rat/rats	32	14 (4.2)	10 (0.3)	13 (1.2)	13 (2.8)
Child/children	31	15 (4.1)	14 (0.1)	11 (1.3)	15 (2.7)
Emergency	31	16 (4.1)	7 (0.4)	13 (1.2)	17 (2.5)
Diagnosis	28	17 (3.7)	5 (0.5)	17 (0.9)	19 (2.3)
		18			19

Dysfunction	28	(3.7)	19 (0)	9 (1.5)	(2.3)
Survival	28	19 (3.7)	10 (0.3)	20 (0.8)	15 (2.7)
Risk	27	20 (3.6)	14 (0.1)	19 (0.7)	13 (2.8)

CPR, cardiopulmonary resuscitation; TA (%), total number and percentage of articles; R (%), rank and percentage of each key words plus in total articles.

Discussion

In the present study, we observed that during the period 2000 to 2013, a total of 1043 papers articles were published, and the cumulative numbers presented an increasing trend. This increase indicates that Chinese authors are putting more effort into describing emergency medicine research than they formerly did. Meanwhile, the fast increase since the year 2007 is partly associated with the research assessment system and promotion system in China, in which SCIE papers play an important role. (26)

HKJEM is a biomedical publication of the Hong Kong College of Emergency Medicine and the Hong Kong Society for Emergency Medicine and Surgery. The editorial board members, editors, and peer-review team are located in, and mainly come from Hong Kong, China. Therefore, HKJEM published the most Chinese articles.

The analysis of institutes and countries indicate that 9 (45%) institutes are from Hong Kong. This is partly related to HKJEM, which publishes mainly articles from Hong Kong. Besides, English is one of the official languages in Hong Kong, and is used widely in Government, academic circles, business and the courts. Therefore, compared with authors from mainland China, authors from Hong Kong have better English, and have less difficulty in writing English, which may help them to publish articles easier in international journals.

As for the internationally collaborative countries/territories, USA ranked first place. The reason may be that since 1978/1979, China-U.S. academic exchange has become a steady trend. According to the Institute of International Education, the number of Chinese students in the United States rose to 1000 in 1980, while in the 2012/2013 academic year, 235597 Chinese studied there. China-US academic exchange has been flourishing over the past 35 years. Currently, China is the leading place of origin for students going to the United States, while the United States is the second-biggest sender of students to China.

The results of article titles and keywords plus shows that "injury/injuries", "trauma", "acute", "rat/rats", "arrest", "emergency", and "cardiopulmonary", "resuscitation" were the hot spots of emergency medicine research in China.

Several limitations to this study warrant discussion. First, the analyses may be particularly susceptible to bias and error in determining eligibility and categorization of articles. A more comprehensive overview of emergency medicine research status in China would necessitate a systematic review of MEDLINE, EMBASE, and other medical libraries across a longer time frame.

In conclusion, the current study on China's research performance in emergency medicine journals in SCIE database demonstrates some significant points, which can help to map emergency medicine development and research trends in China, and potentially guide Chinese EM physicians in evaluating and orienting their research.

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