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Original Article

Longitudinal analysis of meta-analysis literatures in the database of ISI Web of Science

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Abstract: The meta-analysis is regarded as an important evidence for making scientific decision. The database of ISI Web of Science collected a great number of high quality literatures including meta-analysis literatures. However, it is significant to understand the general characteristics of meta-analysis literatures to outline the perspective of meta-analysis. In this present study, we summarized and clarified some features on these literatures in the database of ISI Web of Science. We retrieved the meta-analysis literatures in the database of ISI Web of Science including SCI-E, SSCI, A&HCI, CPCI-S, CPCI-SSH, CCR-E, and IC. The annual growth rate, literature category, language, funding, index citation, agencies and countries/territories of the meta-analysis literatures were analyzed, respectively. A total of 95,719 records, which account for 0.38% (99% CI: 0.38%-0.39%) of all literatures, were found in the database. From 1997 to 2012, the annual growth rate of meta-analysis literatures was 18.18%. The literatures involved in many categories, languages, fundings, citations, publication agencies, and countries/territories. Interestingly, the index citation frequencies of the meta-analysis were significantly higher than that of other type literatures such as multi-centre study, randomize controlled trial, cohort study, case control study, and cases report ($P<0.0001$). The increasing numbers, intensively global influence and high citations revealed that the meta-analysis has been becoming more and more prominent in recent years. In future, in order to promote the validity of meta-analysis, the CONSORT and PRISMA standard should be continuously popularized in the field of evidence-based medicine.

Keywords: Meta-analysis, databases, Web of Science

Introduction

Meta-analysis uses a statistical approach to combine results of individual studies. By meta-analysis, we can make the best use of all the available information in our systematic review by increasing the power of the analysis. Due to overcoming the disadvantages of individual studies, the meta-analysis was regarded as strong evidence for making scientific decision. Especially, meta-analysis of high-quality randomized controlled trials is crucial to evidence-based medicine [1].

Recent years, more and more meta-analysis literatures have been published in various fields and journals, however, it is significant to understand the general characteristics of meta-analysis literatures. The database of ISI Web of Science collected a great number of high quality literatures including meta-analysis literatures. In this present study, we performed a longitudinal analysis to summarize the general characteristics of meta-analysis literatures in the database of ISI Web of Science.

Materials and methods

The description of database

The database of ISI Web of Science included the sub-databases of Science Citation Index Expanded (SCI-E), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Conference Proceedings Citation Index-Science (CPCI-S), Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH), Current Chemical Reactions (CCR-E), and Index Chemicus (IC).

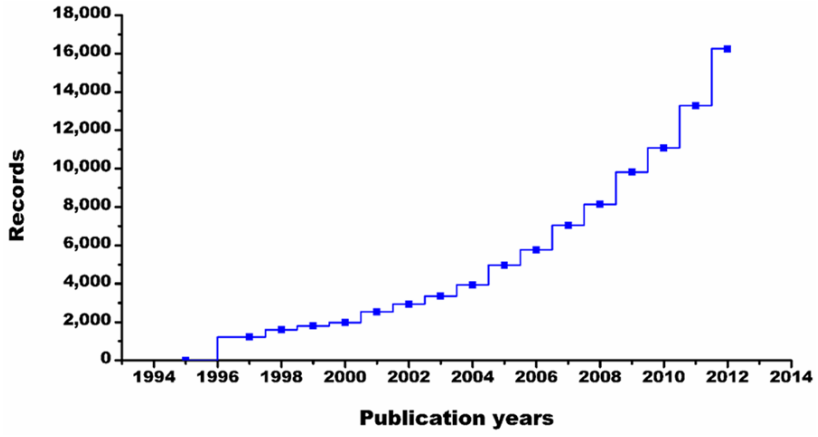

Figure 1. The numbers of the meta-analysis literatures according to the publication years in the database of ISI Web of Science: 18.86%; 18.64%; 18.18%; 5-10-15.

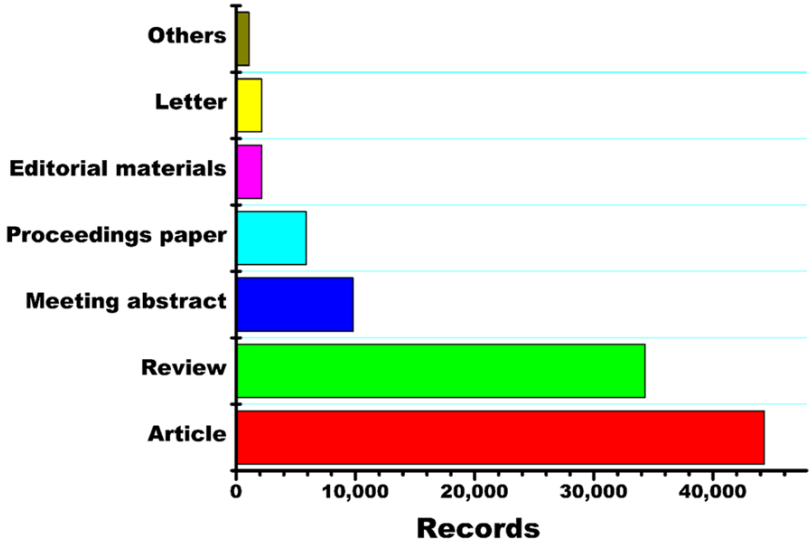

Figure 2. The literature category of the meta-analysis in the database of ISI Web of Science.

Search strategy and statistics analysis

We searched the database of ISI Web of Science by computer. The retrieve date was Jan 9, 2014. The retrieve terms were as following: topic = (meta-analysis) OR topic = systematic review) OR mesh = (meta-analysis) OR mesh = (systematic review); Timespan = 1985-2012; the database were limited by SSCI, A&HCI, CPCI-S, CPCI-SSH, CCR-E, and IC. The analytic literatures according to publication years, countries/territories, funding, and research areas were automatically refined by the ISI (Institute for Scientific Information) Web of Knowledge System.

In order to understand the citations of the meta-analysis literatures, we conducted the cited frequency analysis of the meta-analysis literatures compared with other category's literatures. The topic terms were meta-analysis, multicenter study OR multi-center study OR multicenter studies OR multi-center studies, randomise controlled trials OR randomize controlled trials OR randomize control trials OR randomise control trials, cohort study, case control study, cases report; publication years were limited between 2010 and 2009 and the database was the Database of ISI Web of Science. The retrieve date was January 15, 2014. However, the retrieving for cases report was refined by surgery.

The retrieving was independently performed by two researchers and any discrepancies were resolved by consensus.

The Origin version 8.0 statistical software is used for this study.

Results

There were found in 95,719 records, which account for 0.38% (99% CI: 0.38%-0.39%) of total records (25,037,305) of the database up to Dec, 31, 2012. According to the publication years, a steadily increasing trend of the meta-analysis records has been from 1997 to 2012, the annual growth rates in last fifteen, ten and five years were 18.18%, 18.64% and 18.86%, respectively (**Figure 1**). According to literature category in the ISI Web of Science database, the meta-analysis were mainly divided into article, review, meeting abstract, and proceedings paper (**Figure 2**). The authors of the meta-analysis literatures were from 107 countries/terri-

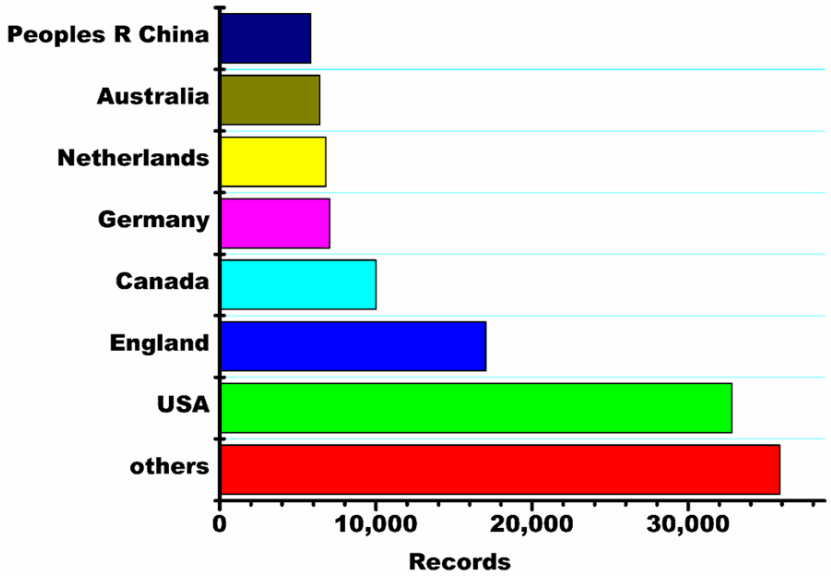

Figure 3. The countries/territories of the meta-analysis literatures in the database of ISI Web of Science.

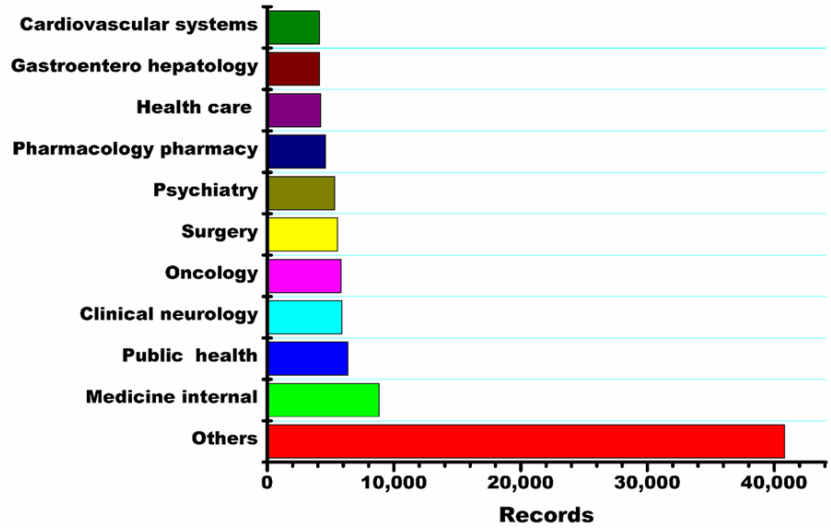

Figure 4. The Web of Science categories of the meta-analysis literatures of publications in the database of ISI Web of Science.

tories, respectively, and USA England, Canada, Germany, Netherland, Australia, and China ranked the top lists (**Figure 3**). Totally, there had 189 ISI Web of Science categories and medicine predominated in them. The ranking orders were general internal medicine, public environmental occupational health, clinical neurology, oncology, surgery, and psychiatry (**Figure 4**). The publications were involved in 5,364 journals. According to the numbers of meta-analysis literatures, Cochrane Database of Systematic Reviews ranked the first of the top publication lists (S1). However, a majority of meta-analysis literatures were published by English (**Table 1**). In addition, there had 12,494 author agencies involving meta-analysis literatures including University Toronto, Harvard University, Mcmaster University, and University Oxford so on (S2). The analytic results also showed that the meta-analysis literatures were funded by 5,938 funding agencies including National Institutes of Health, National Natural Science Foundation of China and Pfizer so on (S3).

Interestingly, we found that the meta-analysis literatures had higher cited frequencies and h-citations, compared with other category literatures such as multi-centre study, randomize controlled trial, cohort study, case control study, and cases report ($P<0.0001$) (**Table 2**; **Figure 5**). Of the retrieved meta-analysis papers, 15 literatures published in the journals including Lancet, British Medical Journal, Journal of The American Medical Association, Nature, New England Journal Medicine and Statistics in Medicine were cited by more than 1,500 frequencies per paper [2-16], however, there were a total of 39 literatures with more than 1,000 cited frequencies.

Discussion

The term “meta-analysis” was coined by Gene V. Glass, who was the first modern statistician to formalize the use of the term meta-analysis

Table 1. The publication languages of the meta-literatures in the database of ISI Web of Science

Ranks	Languages	Records	Percents
1	English	92582	96.723
2	German	1195	1.248
3	French	771	0.805
4	Spanish	584	0.610
5	Portuguese	268	0.280
6	Chinese	52	0.054
7	Russian	48	0.050
8	Italian	43	0.045
9	Polish	28	0.029
10	Japanese	27	0.028
11	Turkish	26	0.027
12	Korean	22	0.023
13	Czech	18	0.019
14	Slovenian	10	0.010
15	Croatian	9	0.009
16	Dutch	9	0.009
17	Hungarian	8	0.008
18	Romanian	6	0.006
19	Serbian	2	0.002
20	Slovak	2	0.002
21	Swedish	2	0.002

[17]. Recent years, the meta-analysis has been greatly improved by the work of the statisticians such as Nambury S. Raju, Harris Cooper, Ingram Olkin, Larry V. Hedges, John E. Hunter, Jacob Cohen, Thomas C. Chalmers, Robert Rosenthal and Frank L. Schmidt. The outlined advantages of meta-analysis are the precision and accuracy of estimates can be improved as more data is used and the inconsistency and controversies across studies can be quantified and clarified. Recent years, meta-analysis was widely to be used to in systematic reviews in many disciplines and fields. Especially, the meta-analysis plays an important role in the field of evidence-based medicine and public health.

According to our results, the meta-analysis literatures account for 0.38% of the total records of the database of ISI Web of Science, that is to say, there is about one meta-analysis out of 260 literatures, suggesting the numbers of the meta-literatures is rather large. However, we also found that an increasing trend of the numbers of the records has been from 1997 to 2012, especially in last five years. In addition, the results showed that the authors of the meta-analysis literatures were from 107 countries/territories, and involved in 189 ISI Web of Science categories, 12,494 author agencies, 5,938 fund agencies, and more than 5,000 publications, suggesting that the meta-analysis was popular world-widely and became more important. According to the numbers of meta-analysis literatures, Cochrane Database of Systematic Reviews ranked the first of the publication lists, however, Lancet, Hepatology, Chest, Journal of Clinical Oncology, Circulation, and Blood also published more meta-analysis literatures. The meta-analysis literatures were funded by some important funding agencies such as National Institute of Health. Just like the other studies, a majority of meta-analysis literatures were published by English and were done by Western countries. However, Chinese scholars have contributed a great number of meta-analysis.

According to literature category in the database of ISI Web of Science, the meta-analysis were mainly divided into article, review, meeting abstract, proceedings paper, ect. However, it is perplexed for readers and researchers about the category of meta-analysis-belongs to article or review? The meta-analysis could draw a new conclusion, which possessions the characteristics of article. But, the meta-analysis only relies on the analysis of the available data of other literatures and lacks substantial studies and trials, so it seems to be more like a review. We propose that the meta-analysis should be divided into single category in the database.

Interestingly, we found that the meta-analysis literatures had higher cited frequencies and h-citations, compared with other category literatures such as multi-centre study, randomized controlled trial, cohort study, case control study, and cases report. However, there were 15 literatures with more than 1,500 cited frequencies and 39 literatures with more than 1,000 cited frequencies per paper. The publications including Lancet, British Medical Journal, Journal of The American Medical Association, Nature, and New England Journal also contributed many a meta-analysis literatures, which reveals that meta-analysis exerted the immense influence on the researchers and editors.

Why are meta-analysis literatures increasingly prevalent? The main causes are interpreted as

Table 2. The analysis of the citations of the meta-analysis literatures compared with other studies in the database of ISI Web of Science

	Records	Total cited frequency	RSF cited frequency
Meta-analysis	6445	135695	134101
RCTs	7191	102545	101576
Cohort study	4556	50622	50121
Multi-centre study	2323	21443	21374
Case control study	2996	23455	23213
Case report	3554	7948	7825
Cross-sectional study	1618	12500	12427

RCTs: Randomize controlled trials, RSF: Remove self citations.

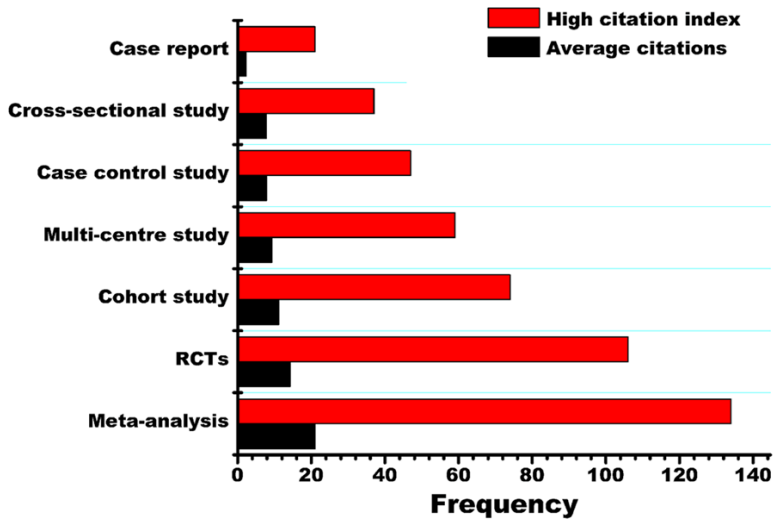

Figure 5. The analysis of the citations of the meta-analysis literatures compared with other studies in the database of ISI Web of Science.

following. Firstly, more and more electric databases such as Medline, Highwire, Springer, Emedicine, Elsevier, Ovid, ProQuest, Wiley Inter Science and ISI Web of Science, were easy to be available, which is convenient to the implement of the literature retrieving. Secondly, the rapid development of the methodology happens and the analytic tools related to the meta-analysis such as Review Manage software, Stata software, Meta Disc, etc were put forward, which simplify the procedures of the boring calculation. In the health and medicine fields, the meta-analysis as merged effect size excellently appeals to the goal of evidence-based medicine and was paid more attention to by scholars. In addition, more controversies have been incurred by more emerging scientific problems in recent years, which evoked the interesting of researchers to task on metaanalysis.

Although meta-analysis is regarded as powerful evidence, there are quite a large proportion of them that were unable to give the definite conclusions, mainly being restricted by the quality of the included literatures. Therefore, it is a key to improve the origin studies for ensuring the validity of meta-analysis. For RCTs, many scales such as Chalmers, Jadad, Delhi list, Imperiale and Reisch so on [18-23], are used to evaluate the methodological quality. High scales of the RCTs must be based on a rigorous procedure recommended by Consolidated Standards of Reporting Trials (CONSORT) [24-30]. However, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA [31-34]) statement suggests a standardized way to ensure a transparent and complete reporting of systematic reviews, and is endorsed by the organizations including the Centre for Reviews and Dissemination, Cochrane Collaboration, Council of Science Editors, National Evidence-based Healthcare Collaborating Agency (NECA) and World Association of Medical Editors, however, the PRISMA was also required for this kind of research by 176 medical journals worldwide [http://www.prisma-statement.org/endorsers.htm]. In future, it is still important to go on promoting the validity of meta-analysis by continuously popularizing the CONSORT and PRISMA.

In brief, meta-analysis is increasingly prevalent and exerts great influence in many fields, especially in the field of medicine. Apparently, the meta-analysis owns higher citation frequencies compared with the other categories of studies. However, some meta-analysis literatures couldn't give persuasive evidence due to the limitations of the quality of the included literatures. In future, to promote the validity of meta-analysis, the CONSORT and PRISMA standard should

be continuously popularized in the field of evidence-based medicine.

Conclusions

The increasing numbers of literatures, intensively global influence and high citations revealed that the meta-analysis has been becoming more and more prominent in recent years. In future, in order to promote the validity of meta-analysis, the CONSORT and PRISMA standard should be continuously popularized in the field of evidence-based medicine.

Disclosure of conflict of interest

None.

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