The American Journal of Surgery (2016) 211, 166-171

The American Journal of Surgery®

Clinical Science

The fate of research abstracts submitted to a national surgical conference: a cross-sectional study to assess scientific impact

Vincent E. de Meijer, M.D., Ph.D., M.Sc.[a,*,1], Simon P. Knops, M.D., Ph.D.[a], Joris A. van Dongen, B.Sc.[b], Ben M. Eyck, B.Sc.[b], Wouter J. Vles, M.D., Ph.D.[a]

[a]Department of Surgery, Ikazia Hospital Rotterdam, Montessoriweg 1, Rotterdam, 3083AN, The Netherlands; [b]Faculty of Medicine, Erasmus University, Rotterdam, The Netherlands

KEYWORDS:
Publication rate;
Scientific conference;
Surgical research;
Research abstract;
Publication bias;
5-Year abstract-to-publication ratio

Abstract

BACKGROUND: Conference abstracts often lack rigorous peer review, but potentially influence clinical thinking and practice. To evaluate the quality of abstracts submitted to a large surgical conference, presentation and publication rates were investigated to assess scientific impact.

METHODS: A Cross-sectional study of abstracts submitted to Dutch Surgical Society meetings from 2007 to 2012 was conducted. Presentation rates, publication rates in MEDLINE-indexed journals using PubMed Central database, and actuarial times to subsequent publication were investigated.

RESULTS: Of 2,174 submitted abstracts, 1,305 (60%) abstracts were accepted for presentation. Actuarial 1, 3, and 5-year publication rates were 22.4%, 62.2%, and 68.6% for presented abstracts, compared with 20.9%, 50.3%, and 57.7% for rejected abstracts, respectively (log-rank x^2 23.728, df1, $P < .001$). Publications resulting from abstracts presented at the conference had a significantly higher mean (±standard error) impact factor (4.4 ± .2 vs 3.4 ± .1, $P < .001$), compared with publications from previously rejected abstracts.

CONCLUSIONS: We advocate critical appraisal of the use of findings of scientific abstracts and conference presentations. The 5-year abstract-to-publication ratio is proposed as a novel quality indicator to allow objective comparison between scientific meetings.

Scientific meetings are important for the rapid dissemination of current research findings. Abstracts submitted for consideration, however, often present preliminary results and are limited in conveying and interpretation of the data.[1–3] Despite this limitation, conference abstracts may influence clinical practice because when published in proceeding volumes or in journal supplements they can be cited along with fully published papers.[4] In addition, when a study is reported at a conference the abstract might provide the only permanent information accessible to most readers. Especially in some parts of the world where

The authors declare no conflicts of interest.

Part of the data from this manuscript has been orally presented at the Biannual Dutch Surgical Society Meeting, May 30, 2013, Veldhoven, Netherlands, and 48th Congress of the European Society for Surgical Research, May 31, 2013, Istanbul, Turkey.

* Corresponding author. Tel.: +31107033727; fax: +31107032396.
E-mail address: v.demeijer@erasmusmc.nl

Manuscript received March 21, 2015; revised manuscript May 31, 2015

[1] Present address: Department of Surgery, Erasmus MC - University Medical Center Rotterdam, 's-Gravendijkwal 230, 3015 CE Rotterdam, The Netherlands.

0002-9610/$ - see front matter © 2016 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.amjsurg.2015.06.017

medical professionals often have access to the abstracts only, healthcare decisions may be made on the basis of research abstracts. This emphasizes the importance of conference abstracts, and thus the ability to judge their scientific value.

While the selection criteria for abstracts submitted to scientific meetings may often be rigorous, they fall short of the comprehensive peer-review process required by most scientific journals.[5,6] A significant proportion of abstracts presented at scientific meetings is never subjected for publication or fails the scrutiny of peer review and will never be published.[7] In addition, the fate of research abstracts rejected for presentation is largely unknown.

It has been proposed that the proportion of abstracts that are subsequently published in full could be used as a quality indicator for scientific meetings.[8,9] Unfortunately, variation in reported publication rates per fixed follow-up interval results in difficult interpretation and subjective comparison.[7] We, therefore, examined all research abstracts submitted to the biannual Dutch Surgical Society meetings to investigate the presentation and publication rate of submitted abstracts and determine its scientific impact. Moreover, we estimated the time course of subsequent full publication of abstracts and investigated the fate of rejected abstracts that were subsequently published in full.

Methods

The biannual Dutch Surgical Society meeting is the major national scientific surgical meeting visited by around 1,500 surgeons and residents. The scientific meeting comprises oral and poster presentations based on submitted research abstracts, as well as panel discussions, invited speakers, and symposia. Submitted research abstracts were blinded for author's name and affiliated institution. Subsequently, each submission was evaluated by at least 5 blinded members of the abstract screening committee (selected for their relevant expertise) and ranked on a 5-point Likert scale. Abstracts were divided into subspecialties and selection for acceptance was based on an average score. Abstracts with the highest scores were chosen for oral presentation. Abstracts that ranked lower were chosen for poster presentation. The number of available oral and poster presentation varied per meeting. All scientific abstracts submitted from 2007 to 2012 (10 meetings in total) were retrieved and data were collected in a computerized database (Microsoft Excel; Microsoft, Inc, Redmond, WA). Data gathered included abstract title, presenting author's name, affiliated institution name, type of presentation (oral or poster), and abstract field (divided into vascular surgery, trauma surgery, gastrointestinal surgery, surgical oncology, and other).

A fixed search algorithm was developed and 2 reviewers (J.A.D., B.M.E.) independently adhered to the algorithm to search the MEDLINE database for published articles from January 1, 2007 to August 8, 2014 using the PubMed Central interface (US National Library of Medicine, National Institutes of Health).[10] The author's name was searched, limited to the selected time window. When the search identified 20 or fewer published articles, all abstracts were scanned by title and keywords. A match was considered successful only if the authorship and the title and content of the published manuscript abstract corresponded with the submitted research abstract. If the initial search revealed more than 20 publications, the search was expanded by adding additional keywords until 20 or fewer publications were identified. The search algorithm was continued until a match was found or it was determined that there was no match. In rare cases when there was some doubt about the abstract publication status, the principal investigator (V.E.M.) served as the adjudicator.

Bibliometric data retrieved from the MEDLINE database were collected and added to the computerized database. The 5-year journal impact factor (IF), the "Eigenfactor" score, and the "Article Influence" score were retrieved for each scientific journal using the ISI Web of Knowledge Journal Citation Reports (2011).[11] Time between presentation and publication was calculated and modeled using Kaplan–Meier survival analysis.[12] The month of publication was used as the cut-off point for censoring. Distribution of survival time and time to publication were analyzed in relation to the different variables collected. Univariate tests (log-rank [Mantel Cox]) were used to test for differences in these distributions by any single factor. The factors that solely appeared to have a significant impact were selected for entrance into a Cox proportional hazards model to analyze their effect on survival while adjusting for each other.[13] A backward elimination procedure was used for further covariate selection in the Cox proportional hazards model. Differences between 2 continuous variables were assessed using the unpaired 2-tailed Student t test, or if nonparametric, by using the Mann–Whitney U test. Datasets involving more than 2 groups were assessed by analysis of variance. Categorical variables were tested using Pearson's chi-square test. Data are expressed as mean ± standard error of the mean. Significance was determined at the 95% confidence interval (95% CI, $P < .05$). The analysis was performed using SPSS Statistics (version 21, IBM Corporation, Armonk, NY) and figures were created using GraphPad Prism (version 5.0, GraphPad Software, Inc, La Jolla, CA) software.

Results

A total of 2,174 submitted abstracts were evaluated, of which 1,305 (60.0%) abstracts were accepted for presentation. Of these, 870 (66.7%; 95% CI 64.1 to 69.2) abstracts went on to successful publication with a median actuarial time to publication of 25.0 months (95% CI 23.0 to 27.0). Of the 869 abstracts rejected for presentation, 488 (56.2%; 95% CI 52.9 to 59.5) abstracts went on to successful publication after a median time of 36.0 months (95% CI 30.1 to 41.9). Fig. 1 depicts the proportion of submitted

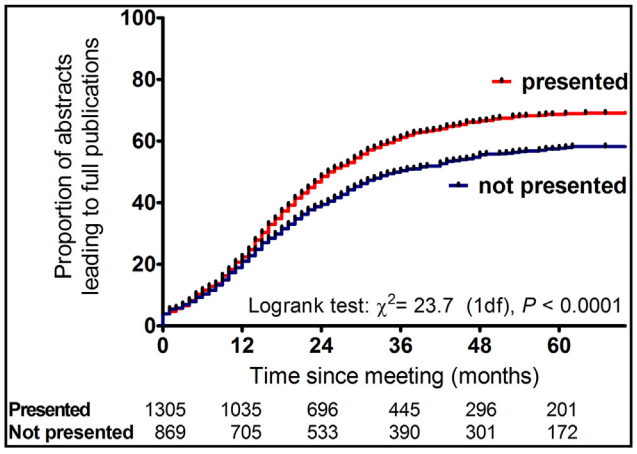

Figure 1 Proportion of submitted abstracts leading to full publication for those presented at the scientific meetings, and those that were not presented.

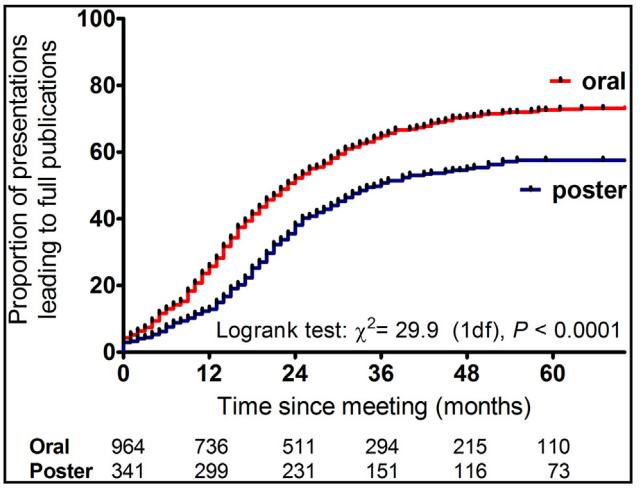

Figure 2 Proportion of abstracts leading to full publication for those presented at the scientific meetings as an oral or poster presentation.

abstracts leading to full publication for those presented, and those that were not presented. Actuarial 1, 3, and 5-year publication rates were 22.4%, 62.2%, and 68.6% for presented abstracts, compared with 20.9%, 50.3%, and 57.7% for rejected abstracts, respectively (log-rank x^2 23.728, df1, $P < .001$). Cox regression analysis showed that abstract presentation was significantly related to the time to publication with a hazard ratio (HR) of 1.31 and a 95% CI of 1.18 to 1.47 ($P < .001$). Publications resulting from presented abstracts had a significantly higher IF (4.4 ± .2 vs 3.4 ± .1, $P < .001$), Eigenfactor score (.047 ± .003 vs .031 ± .002, $P < .001$), and Article Influence score (1.56 ± .08 vs 1.16 ± .05, $P < .001$), compared with publications resulting from rejected abstracts.

When evaluating all 1,305 presented abstracts, 964 (74%) abstracts were accepted for oral presentation. Of these, 680 (70.5%; 95% CI 67.7 to 73.4) abstracts went on to successful publication with a median actuarial time to publication of 23.0 months (95% CI 20.9 to 25.1). Of the 341 abstracts accepted for poster presentation, 190 (55.7%; 95% CI 50.5 to 61.0) abstracts went on to successful publication after a median time of 36.0 months (95% CI 26.6 to 45.4). Fig. 2 depicts the proportion of abstracts leading to full publication for those presented as an oral or poster presentation. Actuarial 1, 3, and 5-year publication rates were 25.7%, 64,9%, and 72.6% for oral presentations, compared with 12.9%, 50.7%, and 57.6% for poster presentations, respectively (log-rank x^2 29.904, df1, $P < .001$). Cox regression analysis showed that oral presentation was significantly related to the time to publication with an HR of 1.55 and a 95% CI of 1.32 to 1.82 ($P < .001$), when compared with poster presentation. Publications resulting from oral presentations had a significantly higher mean IF (4.7 ± .2 vs 3.4 ± .2, $P < .001$), Eigenfactor score (.053 ± .004 vs .028 ± .003, $P < .001$), and Article Influence score (1.69 ± .10 vs 1.12 ± .06, $P < .001$), compared with publications resulting from abstracts presented as a poster presentation.

Of all 2,174 submitted abstracts, 1,154 (53.1%) abstracts were submitted by authors with an academic affiliation. Of these, 724 (62.7%) abstracts led to a presentation. Of all 1,154 submitted abstracts, 853 (73.9%; 95% CI 71.4 to 76.5) abstracts went on to successful publication with a median actuarial time to publication of 21.0 months (95% CI 19.5 to 22.5). Of the 1,020 abstracts submitted by non–academic-affiliated authors, 581 (57.0%) abstracts led to a presentation. Of all 1,020 submitted abstracts, 505 (49.5%; 95% CI 46.4 to 52.6) abstracts went on to successful publication after a mean time of 51.0 months (95% CI 49.0 to 53.1). Fig. 3 depicts the proportion of submitted abstracts leading to full publication for those submitted by authors with an academic affiliation, and those by non–academic-affiliated authors. Actuarial 1, 3, and 5-year publication rates were 27.5%, 68.6%, and 75.2% for authors with an academic affiliation, compared with 15.4%, 43.5%, and 51.8% for non–academic-affiliated authors, respectively (log-rank x^2 149.240, df1, $P < .001$). Cox

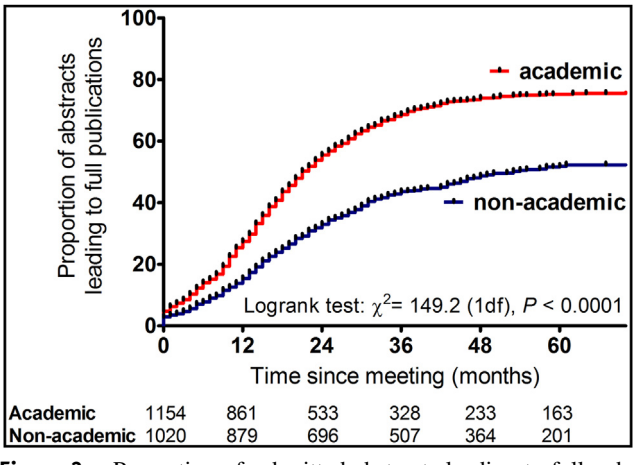

Figure 3 Proportion of submitted abstracts leading to full publication for those submitted by authors with an academic affiliation, and for those submitted by non–academic-affiliated authors.

regression analysis showed that academic-affiliated authorship was significantly related to time to publication with an HR of 1.95 and a 95% CI of 1.75 to 2.18 ($P < .001$), when compared with non–academic-affiliated authorship. Publications by authors with an academic affiliation had a significantly higher mean IF (4.4 ± .2 vs 3.4 ± .1, $P < .001$), Eigenfactor score (.046 ± .003 vs .032 ± .003, $P < .001$), and Article Influence score (1.57 ± .07 vs 1.16 ± .06, $P < .001$), compared with publications by non–academic-affiliated authors.

Of the 870 presented abstracts that were subsequently published, 496 (57%) abstracts were published in a surgical journal (mean IF 3.7 ± .1, Eigenfactor score .031 ± .001, Article Influence score 1.24 ± .04), whereas 374 (43%) abstracts were published in a nonsurgical journal (mean IF 5.5 ± .4, Eigenfactor score .070 ± .007, Article Influence score 2.02 ± .18). Of the 488 rejected abstracts that were subsequently published as a full article, 298 (61%) abstracts were published in a surgical journal (mean IF 3.3 ± .1, Eigenfactor score .027 ± .001, Article Influence score 1.08 ± .04), whereas 190 (39%) abstracts were published in a nonsurgical journal (mean IF 3.7 ± .3, Eigenfactor score .038 ± .006, Article Influence score 1.32 ± .12). The top 10 journals by total count of publications are presented in Table 1.

When stratifying all submitted abstracts (n = 2,174) by topic, 324 abstracts were vascular surgery (15%), 200 were trauma surgery (9%), 430 were gastrointestinal surgery (20%), 711 were surgical oncology (33%), and 509 were other (23%). Significant differences existed between publication rates (Table 2). Abstracts in the field of surgical oncology were more often published in journals with significantly higher impact, whereas abstracts in the field of trauma were less likely to be published in journals with lower impact (Table 2).

Comments

More than two thirds of the abstracts presented at the biannual Dutch Surgical Society meetings from 2007 to 2012 ultimately went on to successful publication. A significant proportion of submitted abstracts, however, was never subjected to or had failed the critical peer-review process of scientific journals. With an evaluated total of 2,174 submitted abstracts, this is the single largest study to date to investigate the fate of research abstracts submitted to a scientific meeting over a time course of 5 years and a follow-up of at least 2 years.

Peer review is the gold standard for determining quality and validity of research papers as well as its consequent worthiness of publication. In our study, submitted research abstracts were double-blinded evaluated by at least 5 members of the abstract screening committee (selected for their relevant expertise) and ranked on a 5-point Likert scale. While this approach has served the scientific community well for years as a means to identify and communicate new and impactful research to clinicians and scientists, more rigorously structured peer review may greatly improve the selection process. Unfortunately, no uniform criteria for abstract requirements or for abstract peer review exist. Because of the aforementioned limitations at the abstract review phase, subsequent publication rates of research abstracts therefore may become instrumental in the judgment of the quality of data presented at scientific meetings. Unfortunately, variation in reported publication rates per fixed follow-up interval results in difficult interpretation and subjective comparison.[7] To overcome this, we have used survival analysis methodology to calculate actuarial times to subsequent full publication. This has led us to propose a 5-year abstract-to-publication ratio that could easily be calculated as a novel quality indicator to allow objective comparison between scientific meetings. The 5-year abstract-to-publication ratio for the biannual Dutch Surgical Society meeting would be .686 (or 68.6%). In analogy with, for example, the 5-year IF for scientific journals, the 5-year abstract-to-publication ratio allows for more objective comparison between scientific meetings among disciplines.

Publication rates of abstracts presented at scientific meetings have been documented previously.[7] A meta-analysis combining data on 79 reports on this subject

Table 1 Top 10 journals by total count of publications

	Journal	Total count n	Presented at meeting n (%)	5-year IF	Eigenfactor score	Article Influence score
1.	Ann Surg Oncol	78	51 (65)	4.279	.04728	1.371
2.	Br J Surg	73	48 (66)	4.931	.03011	1.617
3.	Eur J Surg Oncol	66	45 (68)	2.499*	NA	NA
4.	Ann Surg	63	50 (79)	8.875	.07066	3.036
5.	Surg Endosc	54	35 (65)	3.636	.03758	.952
6.	Ned Tijdschr Geneeskd	48	30 (63)	NA	NA	NA
7.	Eur J Vasc Endovasc Surg	44	22 (50)	2.885	.01768	.877
	World J Surg	44	23 (52)	2.768	.02782	.856
8.	J Vasc Surg	38	21 (55)	3.725	.04484	1.077
9.	Colorectal Dis	31	23 (74)	2.699	.01157	.764
10.	Dig Surg	29	13 (45)	1.496	.00307	.459

IF = impact factor; NA = data not available.
*Impact factor 2011.

Table 2 Distribution of all scientific abstracts submitted to the biannual Dutch Surgical Society meetings from 2007 to 2012

	Vascular surgery	Trauma surgery	Gastrointestinal surgery	Surgical oncology	Other	
	n = 324 (%)	n = 200 (%)	n = 430 (%)	n = 711 (%)	n = 509 (%)	*P* value*
Presented	186 (57)	120 (60)	255 (59)	437 (61)	307 (60)	.800
Published	203 (63)	116 (58)	272 (63)	483 (68)	284 (56)	<.001
5-Year impact factor	3.5 ± .3	2.6 ± .2	4.0 ± .3	4.6 ± .2	4.0 ± .3	<.001
Eigenfactor score	.043 ± .006	.020 ± .002	.037 ± .004	.049 ± .004	.039 ± .005	.012
Article Influence score	1.24 ± .14	.83 ± .05	1.38 ± .0.12	1.69 ± .09	1.39 ± .13	<.001

Data are expressed as means ± standard error of the mean.
*Assessed by analysis of variance.

published before July 2003 (number of abstracts ranged from 9 to 1,465) showed a weighted mean full publication rate of 44.5% (95% CI 43.9 to 45.1). The estimated publication rate at 9 years was 52.6%.[7] In our study, the overall publication rate for presented abstracts was 66.7% (95% CI 64.1 to 69.2) with an actuarial 5-year publication rate of 68.6%. Because the meta-analysis included several reports with a follow-up of only 2 to 3 years, full publication may have occurred later resulting in an underestimation of their calculated weighted mean publication rate.

Our study also investigated the fate of research abstracts rejected for presentation at the scientific conference. We found that 56% (95% CI 52.9 to 59.5) of the abstracts rejected for presentation ultimately went on to successful full publication, albeit after a significantly longer time to publication and in journals with significantly lower impact. In the literature, only an average 31% of the abstracts (range 12% to 66%) rejected for presentation eventually resulted in publications.[7] This indicates that a substantial proportion of initiated studies will never appear in print at all.

Underreporting of research may result in publication bias.[14] We found that authors with an academic affiliation were significantly more successful in publishing their research abstracts as full publication, more timely, and in journals with higher impact. This could be explained, for example, by dedicated research time for academic-based authors. Exact reasons for lack of publication, however, remain unclear because we did not attempt to contact the authors of unpublished studies. This could either mean that manuscripts were never submitted for publication or that they had failed the critical peer-review process required for publication. A previous study found that authors whose abstracts were rejected from the meeting were significantly more pessimistic about the chances of publication, and were less likely to pursue full publication.[15] Another study found that lack of time or low priority was the main reason given by unpublished authors for their failure to prepare and submit a manuscript for publication.[16] Publication bias has been documented before in the step between presentation of a study at a meeting and subsequent full publication.[17] A possible remedy for publication bias at this level could be mandatory publication of all research abstracts submitted to scientific meetings, and indicating whether they were chosen to be presented. In analogy with, for example, the MEDLINE database with the PubMed Central interface,[10] a freely searchable database for submitted research abstracts should be initiated. This would also allow digital coupling with the eventual published full paper. Also, some surgical associations already require full manuscripts to be turned in for full peer review before the presenter is allowed at the podium. This would encourage authors to pursue submission of results with negative findings, thus minimizing publication bias.[17]

Results from research abstracts presented as a poster presentation were published in full less often than results from abstracts presented as an oral presentation. In the literature, an average 50% of abstracts presented as oral presentation resulted in full publication, compared with an average 35% of abstracts presented as poster presentation.[7] In addition, our study demonstrates that publications resulting from abstracts presented as an oral presentation were published in journals with significantly higher impact. These findings suggest a difference in quality between work presented as an oral presentation or as a poster presentation.

In our study, it was impossible to fully account for abstracts submitted to scientific meetings that were not always similar to the eventual peer-reviewed publication. These events occur at a different time and in some cases time lag could be up to several years. We have tried to overcome this to include only abstracts with a follow-up time of at least 2 years, and used a time-to-event analysis instead of only calculating an average publication rate. In our study, average publication rate (66.7%) and actuarial 5-year publication rate (68.8%) were almost identical, indicating that we published a representable estimate. Also, data contained within some abstracts may be different from that in the full publications. The subsequent full papers may have included new data, and/or data from multiple abstracts that had been combined into a single manuscript. Related to this, data from abstracts classified as not published could have been included in a publication with a much different title, different author list, and so on. This could have led to an underestimation of the publication rates. A large effect, however, is unlikely because a

robust, predetermined search algorithm was used to minimize unidentified publications.

The search was restricted to the use of the MEDLINE database only and, therefore, it is possible that publications in journals not indexed in MEDLINE were potentially missed. Nevertheless, MEDLINE remains the most important database of medical literature. Although it is unlikely, abstract title and authorship could have significantly changed from presentation to publication. This could give the possibility that a corresponding full article could not be located. This, however, typically represents less than 5% of all published research abstracts.[18]

The generalizability of our study may be limited because it was confined to one specialty. The publication rate in our study, however, was comparable with many other society meetings.[7] Abstracts leading to full publication were published in 277 different medical journals, of which 70 were surgical journals and 207 of them were outside this specialty. We believe that our work illustrates the scientific impact of a major national scientific surgical meeting.

Conclusions

Our study demonstrates that a substantial proportion of initiated studies is presented only as research abstract and may never appear in print at all. Using this data, a 5-year abstract-to-publication ratio was proposed as a novel quality indicator to aid in the judgment of the scientific value and educational quality of research meetings. Implementation of the 5-year abstract-to-publication ratio may introduce more transparency in the comparison of scientific meetings.

References

1. De Sio M, Yakoubi R, De Nunzio C, et al. Reporting quality of abstracts presented at the European Association of Urology meeting: a critical assessment. J Urol 2012;188:1883–6.
2. Ghimire S, Kyung E, Kang W, et al. Assessment of adherence to the CONSORT statement for quality of reports on randomized controlled trial abstracts from four high-impact general medical journals. Trials 2012;13:77.
3. Hopewell S, Ravaud P, Baron G, et al. Effect of editors' implementation of CONSORT guidelines on the reporting of abstracts in high impact medical journals: interrupted time series analysis. BMJ 2012;344:e4178.
4. Bhandari M, Devereaux PJ, Guyatt GH, et al. An observational study of orthopaedic abstracts and subsequent full-text publications. J Bone Joint Surg Am 2002;84-A:615–21.
5. Bydder S, Marion K, Taylor M, et al. Assessment of abstracts submitted to the annual scientific meeting of the Royal Australian and New Zealand College of Radiologists. Australas Radiol 2006;50:355–9.
6. Bornmann L, Mutz R, Daniel HD. A reliability-generalization study of journal peer reviews: a multilevel meta-analysis of inter-rater reliability and its determinants. PLoS One 2010;5:e14331.
7. Scherer RW, Langenberg P, von Elm E. Full publication of results initially presented in abstracts. Cochrane Database Syst Rev; 2007:MR000005.
8. Macmillan CD, Moore AK, Cook RJ, et al. Abstract-to-publication ratio for papers presented at scientific meetings: a quality marker for UK emergency medicine research. Emerg Med J 2007;24:425–6.
9. Gorman RL, Oderda GM. Publication of presented abstracts at annual scientific meetings: a measure of quality? Vet Hum Toxicol 1990;32:470–2.
10. A Service of the National Library of Medicine and the National Institutes of Health. Available at: http://www.ncbi.nlm.nih.gov/pubmed/. Accessed December 2012 to August 2014.
11. Web of Knowledge℠ Journal Citation Reports® (©Thomson Reuters). A Bibliometric Analysis of Science Journals in the ISI® Database. Available at: http://www.webofknowledge.com/. Accessed December 2012 to August 2014.
12. Kaplan ES, Meier P. Nonparametric estimation from incomplete observations. J Am Stat Assoc 1958;53:457–81.
13. Cox DR. Regression models and life tables. J R Stat Soc 1972;B34:187–220.
14. Chalmers I. Underreporting research is scientific misconduct. JAMA 1990;263:1405–8.
15. Weber EJ, Callaham ML, Wears RL, et al. Unpublished research from a medical specialty meeting: why investigators fail to publish. JAMA 1998;280:257–9.
16. Song F, Loke Y, Hooper L. Why are medical and health-related studies not being published? A systematic review of reasons given by investigators. PLoS One 2014;9:e110418.
17. Callaham ML, Wears RL, Weber EJ, et al. Positive-outcome bias and other limitations in the outcome of research abstracts submitted to a scientific meeting. JAMA 1998;280:254–7.
18. Roy D, Sankar V, Hughes JP, et al. Publication rates of scientific papers presented at the Otorhinolarygological Research Society meetings. Clin Otolaryngol Allied Sci 2001;26:253–6.