

Alberto Miguel-Dasit
Luis Martí-Bonmatí
Pilar Sanfeliu
Rafael Aleixandre

Scientific papers presented at the European Congress of Radiology 2000: publication rates and characteristics during the period 2000–2004

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R. Aleixandre
Institute of History of Science and
Documentation Lopez Piñero,
University of Valencia-CSIC,
Valencia, Spain

A. Miguel-Dasit
Resonancia Magnética Section,
La Plana de Vila-Real Hospital,
Castellón, Spain

L. Martí-Bonmatí (✉)
Resonancia Magnética,
Servicio de Radiología,
Hospital Universitario Doctor Peset,
Avenida Gaspar Aguilar 90,
46017 Valencia, Spain
e-mail: Luis.Marti@uv.es
Tel.: +34-9-632520
Fax: +34-9-63862534

P. Sanfeliu
Cardenal Herrera-CEU University,
Alfara,
Valencia, Spain

Abstract To determine the rate at which abstracts orally presented at the ECR 2000 were published between 2000–2004, and to identify predictive factors of publication and differences between abstracts and subsequently published papers. Specific search profiles were devised to retrieve items from the Medline database. From 1020 abstracts originating from 39 countries, 479 articles (publication rate 47%) were subsequently published in 139 Medline-indexed journals, most frequently in European Radiology (14%). Country of origin statistically ($P < 0.0001$) influences the subsequent publication of the abstract, Germany having the highest number of presentations ($n=343$) and derived articles (publication rate 54%). Ab-

stracts presented by authors from the USA ($n=21$) had the highest publication rate (76%). Most papers were published within the first 3 years after the meeting, as original articles and in English-language journals. Both the study sample size and the first author frequently changed. Chest and cardiac studies had the highest publication rates (56%, both). In summary, abstracts presented at the ECR 2000 had a high publication rate in Medline-indexed journals. Country of origin and subspecialty of presentation appeared to influence subsequent full publication. More articles were published in European Radiology than in other journal.

Keywords Radiology and radiologists, research · Radiology and radiologists, socioeconomic issues · Publication · Scientific congress · ECR 2000

Introduction

Meetings provide an important method of exchanging scientific information [1]. Although many research studies are important enough to be presented, the most informative and highest quality studies reach full publication in peer-reviewed journals. The rate of publication may be regarded as an indicator of the scientific level of the meeting [2] and of the country where research was performed. The field of radiology encompasses numerous general and subspecialty organizations that offer the opportunity to present data within

the forum of a national or international meeting such as the European Congress of Radiology (ECR), the most relevant European annual meeting in Vienna, which includes sessions in joint sponsorship with several European radiology subspecialty societies [3]. Several thousand abstracts are submitted to this meeting from worldwide investigators.

The purpose of this study was to analyze the subsequent publication rate in Medline-indexed journals from presentations at the European Congress of Radiology in 2000 and the relationship to country of origin of abstracts, publication year, radiology subspecialty, journal, language of pub-

lication, concordance of the order of the first author, and the study sample size in the abstract compared to those of the derived article.

Materials and methods

A list was made of all abstracts orally presented at ECR 2000 and focusing on 15 different radiology subspecialties. The final program abstract book [3] was examined by two authors and all scientific sessions identified. Publication rate in Medline-indexed journals was identified by scanning the PubMed database (<http://www.ncbi.nlm.nih.gov/PubMed/>) to determine whether the abstracts had been published as full articles during the 2000–2004 period. The Medline search was performed using the first author's surname and initial(s) and if necessary those of the other authors or appropriate keywords from the title of the abstract if any publications corresponding to the abstract in question were not identified. We examined the concordance between the information contained in the summary of the published article and that cited in the abstract of the oral presentation. The principal variables were: (a) the publication rates from countries with ten or more derived articles published from abstract presentations (only countries listed in the abstract in the 1st position were considered as submitting countries) (b) the year in which the article was published, (c) the documentary type, including original articles, reviews, and case reports, (d) the language of the publication, (e) the size of the study sample, considered as the number of patients, volunteers, animals, or technical materials (classified as similar, higher or lower than those of the congress presentation), (f) the position of the first author in the abstract compared to the position in the derived article, (g) the radiology subspecialty, and (h) the journal in which article was published (classified as a European radiology journal, radiology journals published in the United States, radiology journals edited in another country than these, and nonradiology journal). Radiology journals were considered to be all those included in the subject listing "diagnostic imaging" and "radiology" of the published list of journals indexed in Index Medicus [4]. The definition of Europe included the 15 countries of the European Union in the year 2000, plus Bosnia-Herzegovina, Bulgaria, Belarus, Czech Republic, Croatia, Cyprus, Estonia, Hungary, Latvia, Lithuania, Macedonia, Malta, Moldavia, Norway, Poland, Romania, Slovakia, Slovenia, Switzerland, Turkey, Ukraine, and Yugoslavia.

ECR 2000 was held between 5–10 March 2000. Sixty articles published in February 2000, January 2000, or in previous years, although with related abstracts presented at the meeting, were excluded from the study. Eight abstracts that were withdrawn by their authors before the scientific assembly were also excluded. The remaining 1,020 communications presented at scientific sessions were analyzed.

Publication rates were compared by using logistic regression analysis. Likelihood ratios of full publication, 95% confidence intervals, Pearson's χ^2 test and *P* values were calculated for the different countries with reference to Austria, which was the host country. The χ^2 test for linear trend was used to compare publications rates according to year of publication. Publication rates were also analyzed according to subspecialty using the χ^2 test. Differences with a *P* less than 0.05 were considered to be statistically significant.

Results

Between March 2000 and December 2004, 479 of the 1020 abstracts orally presented at the ECR 2000 were expanded into articles published in Medline-indexed journals, with a publication rate of 47%. Abstracts originated from 39 countries: 80% European ($n=820$), 2% United States ($n=21$), and 18% other countries ($n=179$). There were ten countries with ten or more abstracts expanded into full-text articles published between 2000 and 2004 (Table 1). The remaining 174 abstracts (17%) originated from 29 countries.

Country of origin was significantly related to subsequent publication of the abstract ($\chi^2=36.34$, $P<0.0001$). With respect to Austria [likelihood ratio, LR, 1], statistically significant differences were found between the ratios of full publication of abstracts originating from the United States (LR=1.52, $P=0.028$), Italy (LR=0.72, $P=0.028$), and "other" (LR=0.68, $P=0.009$). The United States and The Netherlands had the highest subsequent publication rates (76% and 58%, respectively), although Germany had more published articles ($n=185$) than the United States ($n=16$) and The Netherlands ($n=14$). Studies from Italy had the lowest subsequent publication rate (36%). Table 2 shows the publication rates according to year. Overall 80% of papers were published within the first 3 years after the meeting ($\chi^2=18.77$, $P<0.0001$).

With respect to the documentary type of the 479 articles most published abstracts were original articles ($n=436$, 91%). The remaining ones were review articles ($n=33$, 7%) and case reports ($n=10$, 2%). Regarding the language of publication 402 (84%) were published in English, 57 (12%) in German, 10 (2%) in Italian, and 10 (2%) in French. The size of the study sample was similar to that of the abstracts in 59% of articles, higher in 29%, and lower in 12%. Therefore 41% of papers had a different sample size than those in the presentations at ECR 2000.

Figure 1 shows that the position of the first author in the abstract compared to position in the subsequent derived article changed in 31% of the articles (note that this author does not appear in 7% of the papers). Figure 2 shows the publication rates according to subspecialty. "Chest radiology" and "cardiac imaging" had the highest publication rates (both 56%), followed by "breast imaging," "neuro-radiology," and "physics" (all higher than 50%), whereas

Table 1 Publication rates according to country origin

Country	No. of abstracts	No. of abstracts expanded into full articles	Likelihood ratio ^a	χ^2	<i>P</i>
Austria	96	48 (50%)	1.00	–	–
United States	21	16 (76%)	1.52 (1.12–2.08)	4.77	0.028 ^b
The Netherlands	24	14 (58%)	1.17 (0.79–1.73)	0.53	0.46
Germany	343	185 (54%)	1.08 (0.86–1.35)	0.47	0.49
Switzerland	32	17 (53%)	1.06 (0.73–1.56)	0.09	0.75
France	29	15 (52%)	1.03 (0.69–1.55)	0.03	0.87
United Kingdom	76	38 (50%)	1.00 (0.74–1.35)	0	1
Belgium	29	14 (48%)	0.97 (0.63–1.48)	0.03	0.87
Greece	38	16 (42%)	0.84 (0.55–1.29)	0.68	0.40
Italy	158	57 (36%)	0.72 (0.54–0.96)	4.77	0.028 ^b
Other	174	59 (34%)	0.68 (0.51–0.90)	6.70	0.009 ^b

^aParentheses, 95% confidence intervals

^bSignificant difference between the likelihood ratios of studies originating from this country being published vs. the likelihood ratios of studies originating from the remaining countries being published

“computer applications” studies had the lowest publication rate (31%). There were no statistically significant differences between the publication rates according to different subspecialties ($\chi^2=15.27$, $P=0.227$).

The 479 articles were published in a total of 139 journals (167 in European radiology journals, 35%; 196 in United States radiology journals, 41%; 5 in other radiology journals, 1%; and 111 in nonradiology journals, 23%). A total of 275 articles (57%) were published in only 11 journals. These journals were, in decreasing order of frequency, *European Radiology* ($n=68$, 14%), *Radiology* ($n=50$, 10%), *Rofo-Fortschritte auf dem Gebiet der Rontgenstrahlen und der Bildgebenden Verfahren* ($n=36$, 7%), *American Journal of Roentgenology* ($n=30$, 6%), *Investigative Radiology* ($n=20$, 4%), *Clinical Radiology* ($n=15$, 3%), *La Radiologia Medica* ($n=14$, 2.9%), *Abdominal Imaging* ($n=11$, 2.3%), *Academic Radiology* ($n=11$, 2.3%), *Journal of Magnetic Resonance Imaging* ($n=10$, 2%), and *Magnetic Resonance Imaging* ($n=10$, 2%). The other 204 (43%) articles were published in a total of 128 journals (fewer than ten articles published in each).

Table 2 Publication rate of articles following oral presentation at the ECR 2000

	No. of publications ^a	Cumulative percentage ^b
2000	119 (25%)	25
2001	156 (33%)	58
2002	104 (22%)	80
2003	74 (15%)	95
2004	26 (5%)	100

^aParentheses, percentages based on a total of 1,020 abstracts that were expanded into articles published in Medline-indexed journals

^bCalculated as the cumulative number of articles published; for example, for 2001 the cumulative number of articles published was 275 (119+156)/1,020 abstracts

Discussion

Our results indicate that nearly one-half of abstracts orally presented at the ECR 2000 were subsequently published in Medline-indexed journals. Several studies [5–9] in different medical specialties have analyzed the full publication of the results orally presented as abstracts to their meetings. The highest proportion of full publication was in the fields of oncology (74%) [5] followed by otolaryngology (69%) [6], orthopedics (64%) [7], ophthalmology (68%) [8], and anesthesiology (50%) [9]. These percentages are higher than those (9–37%) published for the field of radiology in previous original articles [10–13]. Therefore our study shows the highest publication rate (47%) from a radiology meeting. Von Elm et al. [14] reported a systematic review of ultimate publication rates of abstracts from various medical fields over the period 1957–1999, with a 44% mean publication rate, a percentage similar to that of the ECR 2000 presentations.

The country from which the abstracts originated was related to the likelihood of subsequent publication. Compared to the results of Arrivè et al. [11], we found a much lower number of abstracts originating from the United States at the ECR 2000 than at the 1995 meeting of the Radiological Society of North America (RSNA) ($n=21$ vs.

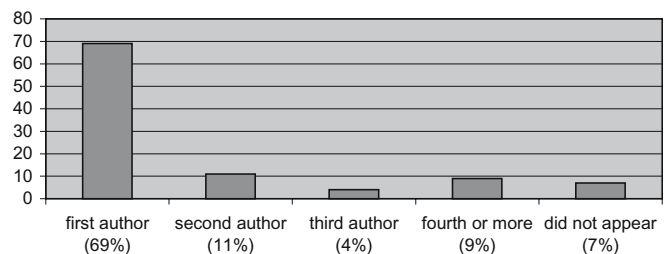
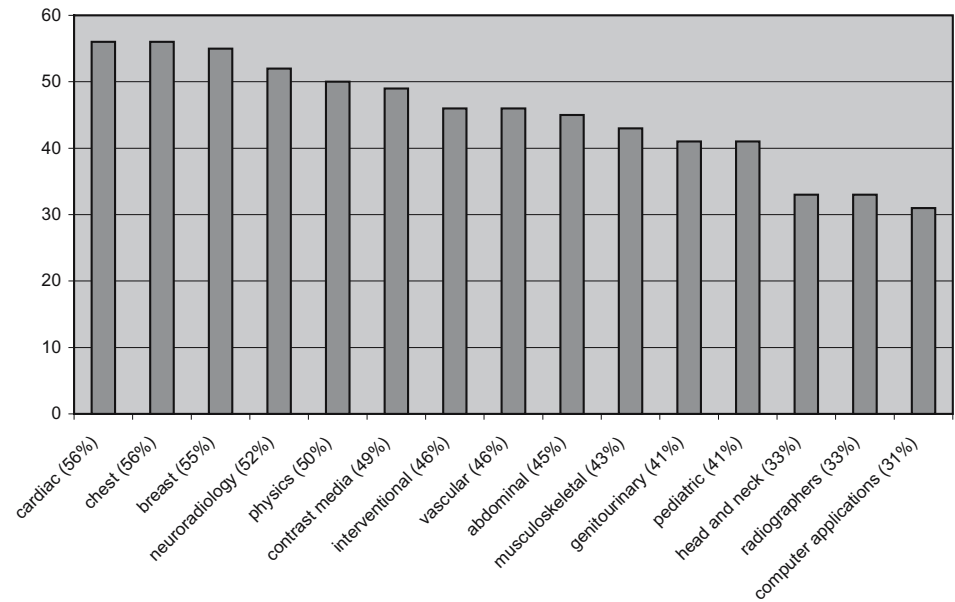
**Fig. 1** Position of the first author in the abstract compared to position in the derived article

Fig. 2 Publication rates according to subspecialty



$n=1,202$, respectively). However, the United States full publication rate from ECR 2000 was higher than that from RSNA 1995 (76% vs. 33%, respectively), perhaps because fewer but better papers from the United States were presented in Europe. Comparing these two radiology events only, The Netherlands and Italy had a similar publication ratio from presentations at the ECR 2000 (58% and 36%, respectively) with respect to those at 1995 RSNA (59% and 35%, respectively). Germany, Switzerland, France, Austria, and the United Kingdom had higher proportion of full publication at the ECR 2000 than at the 1995 RSNA.

Presentations from the United States at ECR 2000 and from The Netherlands at 1995 RSNA, respectively, had the highest publication rates (76% and 59%, respectively). It must be noted that the number of presentations at the ECR 2000 and derived articles originated from the United States and The Netherlands are too small to make meaningful conclusions.

Similar to the findings of other studies [9, 11, 15], the highest proportion of articles was published within the first 3 years after the meeting, with 80% of papers from ECR 2000 being published between 2000 and 2002. Other studies [7, 16] have found that the mean time to publication after oral presentations at orthopedics and ophthalmology conferences were 16 and 13 months, respectively. Interestingly, we found that 20% of abstracts were published as full papers during the fourth and fifth years after the ECR 2000, whereas the publication rate during the fourth and fifth years after 1995 RSNA markedly decreased (6% of publications) [11]. Although, according to Marx et al. [10], if an abstract is not published by 3 years after presentation, its data should be carefully viewed in the context of the

multiple uncertainties that plague unpublished abstract reports, other factors may influence late publication in Europe.

The majority of articles were published in English-language journals, as English is the predominant language in contemporary medical research [17]. It should also be noted that German was second in frequency, due to the high number of presentations from Germany and Austria that were published in *Rofö* and other local journals. It is noteworthy that 73% of the articles derived from German presentations at the ECR 2000 were published in English-language journals, while the others were published in German. In this respect, Egger et al. [17] showed that, in a sample of randomized controlled trials emanating from Germany, only 35% were published in German-language journals, compared with 62% in English-language journals.

Sample size in the derived articles compared to abstracts was higher in 29% but lower in 12% of the articles. In another work that analyzed the publication rates from an anesthesiology meeting [18] the size of the series were higher in 18% but lower in 36%. An increase in the size of the series should be related to the completion of the research work, while a decrease in the size must express a cleaning of the series to increase the quality of the paper. Therefore the improved research quality in 41% of the cases in the ECR 2000 series may be related to the reviewing process before publication.

Changes in the position of authors (especially the first author) in the paper with respect to abstracts were also analyzed. Interestingly, in our data the first author of the presentation had changed or disappeared in 31% of publications. Our results are comparable with those at other conferences [18, 19] in which the first author was found to

have changed in 22–36% of cases. It seems reasonable that in derived papers of greater scientific quality and interest the most relevant scientist wishes to be first.

The topic of the presentation may be related to the publication rate, but in our study the frequency of publication according to the 15 different subspecialties did not markedly differ. The estimated rate of full publication varied from 56% (corresponding to both “chest radiology” and “cardiac imaging”) to 31% (“computer applications in radiology”). Larger differences in the frequency of publication (48% to 14%) corresponded to the 14 subspecialties presented at 1995 RSNA [11]. “Chest radiology” studies had the highest publication rates from both ECR 2000 and 1995 RSNA. Interestingly, some societies may develop changes in policies or procedures to pursue full publication (e.g., European Association for the Promotion of Information Exchange on PACS research and “computer applications in radiology” studies).

Although not a focus of our study, we noted that similar research from the same group was sometimes presented at more than one meeting [20]. To detect possible dual presentations we compared the 479 abstracts presented at the ECR 2000 and subsequently published as full papers during 2000–2004 to the 1,617 presentations at scientific sessions at ECR 1999 [21]. For each abstract the list of authors and appropriate keywords from the title were recorded. When the title or the authors coincided, the abstracts were read to accurately detect similarities, defined when the methods and data were identical or quite similar. We observed 21 abstracts with clear duplications, giving a replication rate of 4.4% for abstracts presented both at the ECR 1999 and ECR 2000 and published as full papers during 2000–2004. This duplication rate is lower than the 7–48% observed at several other medical meetings [20]. To be noted, the duplication rate that we found may underestimate the true rate because our comparison was made from only 479 abstracts which were expanded into full-text articles following ECR 2000 from the total presentations at this meeting. Although the main reason for duplication is probably to embellish authors’ curriculum vitae, replicate presentations at meetings is an example of inappropriate academic conduct that tarnishes the reputation of the duplicating author. As this misconduct represents an unfair practice in terms of displacing the work of others, improved strategies are needed to detect and prevent duplication, possibly via a computerized database.

Although published articles appeared in a large number of Medline-indexed journals, more articles were published in *European Radiology* (14%) than in any other journal. Regarding the North American journals, *Radiology* had the highest number of papers published between 2000 and 2004 from ECR 2000 presentations (10%). Additionally, it must be noted that one-third of original studies presented at 1995 RSNA were published in *Radiology* between 1996 and 2000 [11]. This difference may be related to the fact that,

according to *Radiology* policy, all scientific abstracts accepted by RSNA should first be submitted as a manuscript to *Radiology* [11]. Clearly, journals do not exist merely to disseminate presentations at meetings, and meetings do not exist merely to help screen research for journals. However, since one of the primary purposes of presenting research at scientific meetings is to disseminate important research findings as soon as possible, radiologists who present to scientific meetings need encouragement to expand abstracts into full-text articles. Societies should persuade researchers whose abstracts are accepted for oral presentation to complete and submit their manuscript for publication.

Although abstracts of papers presented at scientific meetings of professional societies are part of the broader category of conference literature, fewer than one-half of presented material at ECR 2000 may not survive in derived articles and may not be fully scientifically valid. In general, reasons for not publishing abstracts are multifactorial and include a negative study result, results not important enough, statistical analysis not positive, small sample size, low priority to write a full paper, not worth the hypothesis, a desire to further expand the study, existence of other papers with similar findings, report not completed by the researchers, too much trouble with coauthors, lack of time, and lack of funds [5, 14, 22]. These reasons suggest that publication in a scientific journal is not the goal of every abstract presentation. Could it also be that some research is only important enough to be presented but not to be published. Alternatively, perhaps in some cases the methods or results of presentations are flawed, and the fault for not detecting such defects lies with the review committees who accept too many abstracts for presentation at radiology meetings based on quite short summaries.

The present study has some limitations that could potentially bias the results. Our search was restricted to Medline-indexed journals, and it is likely that we missed some published articles which were published in journals not indexed in this database. It is also difficult to ascertain how many manuscripts were actually submitted but not published. Moreover, when determining whether an abstract was published, it is primarily ensured that the article and the proposed published study have similar hypotheses and designs. If information from the abstract were ultimately buried in another article, this abstract would not have been deemed as published. This would evidently decrease the true rate of publication [23].

In conclusion, our study shows that ECR 2000 appears to have had a high publication rate (47%) in Medline-indexed journals following a radiology meeting. Articles were mostly published less than 3 years after the meeting. More articles were published in *European Radiology* than in any other journal. The publication rate differed significantly according to the country origin of the abstract, having “chest radiology” and “cardiac imaging” studies the highest publication rates.

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