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This information is current as  
of August 6, 2025.

*AJNR Am J Neuroradiol* 1999, 20 (6) 1173-1177  
<http://www.ajnr.org/content/20/6/1173>

## The Fate of Neuroradiologic Abstracts Presented at National Meetings in 1993: Rate of Subsequent Publication in Peer-Reviewed, Indexed Journals

William F. Marx, Harry J. Cloft, Huy M. Do, and David F. Kallmes

**BACKGROUND AND PURPOSE:** Abstract presentations are a valuable means of rapidly conveying new information; however, abstracts that fail to eventually become published are of little use to the general medical community. Our goals were to determine the publication rate of neuroradiologic papers originally presented at national meetings in 1993 and to assess publication rate as a function of neuroradiologic subspecialty and study design.

**METHODS:** Proceedings from the 1993 ASNR and RSNA meetings were reviewed. A MEDLINE search encompassing 1993–1997 was performed cross-referencing lead author and at least one text word based on the abstract title. All ASNR and RSNA neuroradiologic abstracts were included. Study type, subspecialty classification, and sample size were tabulated. Publication rate, based on study design and neuroradiologic subspecialty, was compared with overall publication rate. Median duration from meeting presentation to publication was calculated, and the journals of publication were noted.

**RESULTS:** Thirty-seven percent of ASNR abstracts and 33% of RSNA neuroradiologic abstracts were published as articles in indexed medical journals. Publication rates among neuroradiologic subspecialty types were not significantly different. Prospective studies presented at the ASNR were published at a higher rate than were retrospective studies. There was no difference between the publication rate of experimental versus clinical studies. Neuroradiologic abstracts were published less frequently than were abstracts within other medical specialties. Median time between abstract presentation and publication was 15 months.

**CONCLUSION:** Approximately one third of neuroradiologic abstracts presented at national meetings in 1993 were published in indexed journals. This rate is lower than that of abstracts from medical specialties other than radiology.

Abstract presentation at national scientific meetings serves an important role as a means of rapidly conveying new information, summarizing current research, and focusing future research efforts. It is often assumed that the information contained in an abstract presentation will eventually be published in a journal in full manuscript form. However, multiple previous investigators have determined that less than half of all abstracts are eventually published in peer-reviewed journals, with publication rates varying from 21% to 60% depending on medical specialty (1–10).

Failure to publish data originally presented as an abstract is deleterious in several ways. First, data presented at national meetings are difficult and cumbersome to uncover as compared with data published in peer-reviewed, indexed journals. Although some journals publish the abstracts of society meetings, in general the information included is limited and insufficient to allow critical appraisal of the work. Thus, lack of full manuscript publication after presentation at national meetings renders this material of little use to the general medical community. Second, the validity of material presented in abstract form but not published is difficult to evaluate (11, 12); abstracts usually have not undergone rigorous peer review, and citation of data found only in abstract form may be misleading or inappropriate (11, 13). Last, several studies have shown that abstracts are less likely to be published if their results are considered negative rather than positive, leading to potential problems with publication bias when metaanalyses of the existing literature are performed (14, 15).

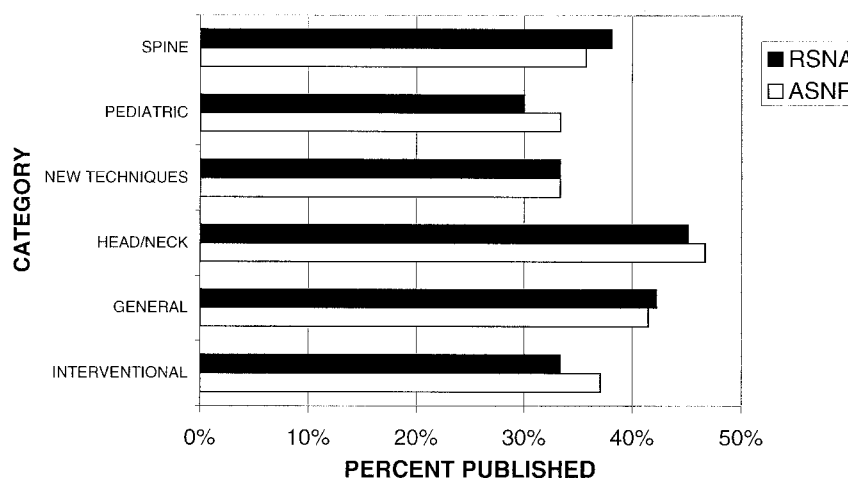
Received November 16, 1998; accepted after revision February 23, 1999.

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FIG 1. Percentage of abstracts published by category type.



The field of radiology encompasses numerous general and subspecialty organizations that offer the opportunity to present data within the forum of a national meeting. The fate of abstracts initially presented at national radiologic meetings has not previously been evaluated. In this study we catalog the rate of publication of neuroradiologic articles based on data presented at the 1993 annual meetings of the American Society of Neuroradiology (ASNR) and the Radiological Society of North America (RSNA), and determine the rate of publication as a function of neuroradiologic subspecialty and type of study design. In addition, the average time between abstract presentation and publication was calculated. Our study was undertaken to identify features that predict high or low rates of subsequent publication, to compare the publication rate of neuroradiologic abstracts with that of other medical specialties, and to determine the typical time course between presentation and publication.

### Methods

The proceedings from the 1993 annual meetings of the ASNR in Vancouver, BC, and the RSNA in Chicago, IL, were reviewed. We searched the MEDLINE database from 1993 through 1997 and cross-indexed the abstract's lead author with a major text word or words in the abstract title to identify all articles that were published in peer-reviewed journals. The date and journal of publication were noted. If no subsequent publication was located, another search was performed, substituting the senior author for the lead author. Abstracts were categorized on the basis of neuroradiologic subspecialty as defined in the proceedings of each respective meeting. Some categories were combined. Study design was described as clinical or experimental. For clinical studies, retrospective versus prospective methods were noted when such information was available in the abstract, and the number of patients was also identified. Overall rates of publication were calculated. In addition, rates of publication for specific category type and study design were determined. Univariate significance testing using the  $\chi^2$  method was used to determine whether there were significant differences in publication rate based on subspecialty designation or study design. Study design types included clinical versus experimental and prospective versus retrospective. We also calculated the mean number of patients per study in clinical ab-

stracts and compared clinical studies enrolling more patients than the mean with studies enrolling fewer patients than the mean to determine whether population size was an independent predictor of publication likelihood. For those abstracts that were eventually published, the median time, in months, between presentation and publication was determined. Using data provided in a previously published analysis, we compared rates of publication for neuroradiologic abstracts with rates of publication for other medical specialties by using the  $\chi^2$  test.

### Results

Results are shown in Figures 1–4. The overall rates of publication of neuroradiologic abstracts presented at the 1993 ASNR and RSNA meetings were 37% and 33%, respectively. The highest rate of publication was in the subspecialty of head and neck radiology, with 40% published, while the lowest rates were those in the new techniques and pediatrics categories. No statistically significant difference in rate of publication was noted among subspecialty types.

Clinical studies presented at the RSNA meeting were published at a statistically significantly higher rate than were experimental studies ( $P < .05$ ), but there was no significant difference in publication rate between clinical and experimental studies presented at the ASNR meeting. Prospective studies presented at the ASNR meeting were published at a statistically significantly higher rate than were retrospective studies ( $P = .01$ ), but no difference was noted for such studies presented at the RSNA meeting.

The time course between abstract presentation and journal publication is shown in Figure 2. The mean delay between presentation and publication was 15 months. Among the abstracts published to date, approximately 90% were published within 2 years and 98% within 3 years of presentation.

The 194 articles published to date appeared in 52 different journals (Fig 3). Of the eventually published abstracts presented at the RSNA, 25% were published in *Radiology*. Fifty-five percent of eventually published ASNR abstracts were published in the *American Journal of Neuroradiology (AJNR)*.

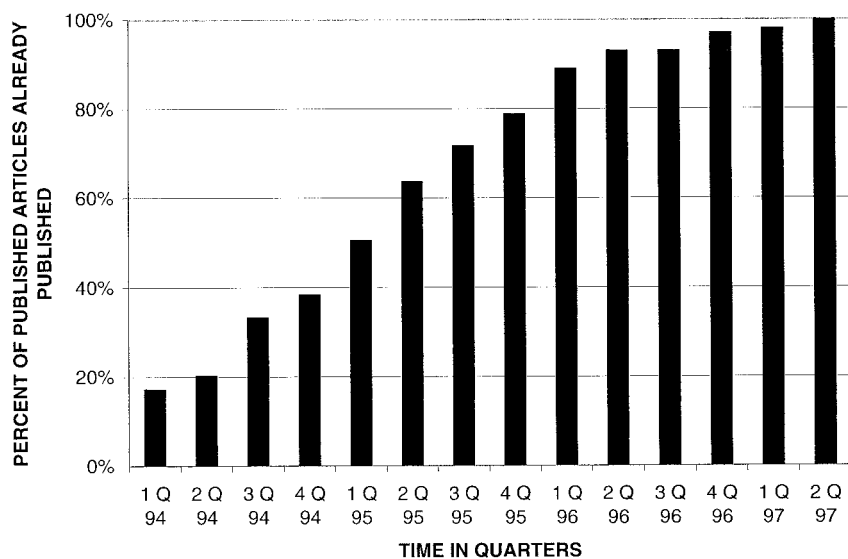


FIG 2. Time course between abstract presentation and journal publication.

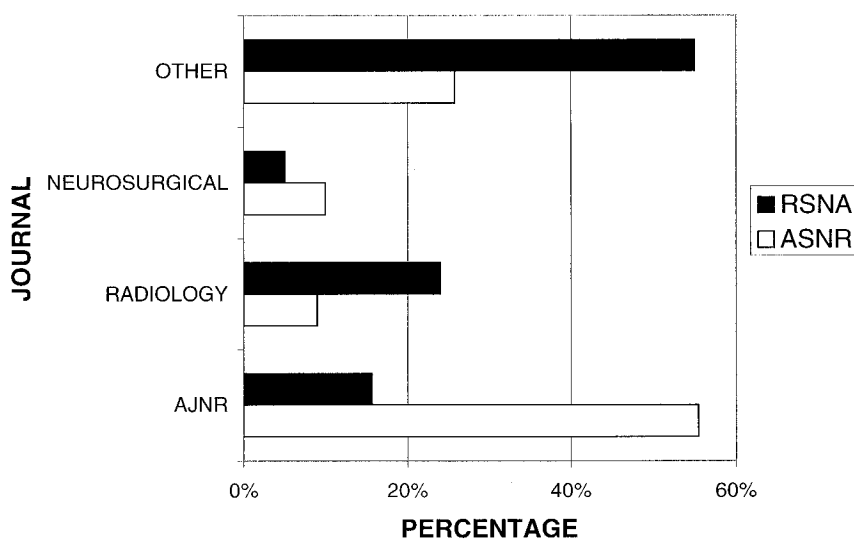


FIG 3. Publication of abstracts by journal.

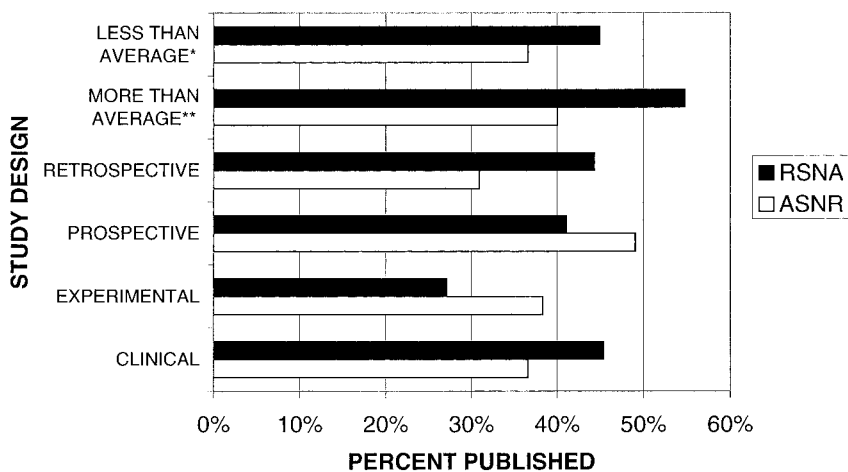


FIG 4. Percentage of abstracts published by study design.

Previous reports have documented the rate of subsequent publication of abstracts for a variety of medical specialties. A metaanalysis of these studies appeared in the *Journal of the American Medical*

*Association (JAMA)* in 1994, in which it was found that the overall rate of publication, after eliminating one article limited to randomized clinical trials, was 49%. The overall publication rate of neuroradiolog-

ic articles was significantly lower than the overall average of other medical specialties ( $P < .001$ ).

### Discussion

Our results indicate that approximately one third of neuroradiologic abstracts presented at national meetings are later published in indexed journals. This rate of publication is significantly lower than that of abstracts from other, nonradiologic, medical specialties (1–9). For ASNR abstracts, prospective studies were published at a greater rate than were retrospective studies. For RSNA abstracts, clinical studies were published at a greater rate than were experimental studies. There was no significant difference in publication rates among the various neuroradiologic subspecialty types.

The reasons underlying the observed lower publication rate of neuroradiologic abstracts as compared with numerous nonradiologic specialties are unknown. In general, reasons for not publishing abstracts are multifactorial. The peer-review process for accepting a paper for presentation at a national meeting is markedly different from that for a peer-reviewed manuscript being considered for publication in an indexed journal (11, 13). It is therefore expected that many abstracts would fail to stand up to the rigorous analysis of multireviewer inspection. In addition, preparation of an abstract requires only a fraction of the effort that manuscript preparation requires. Dickersin et al (14, 16) found that the primary reason cited by investigators for failure to publish an abstract was “lack of time” for manuscript preparation. Furthermore, training programs frequently underwrite the cost of travel to a national meeting for trainees who have prepared abstracts. This practice encourages preparation of abstracts, without similar rewards for manuscript preparation.

The *Uniform Requirements for Manuscripts Submitted to Biomedical Journals* explicitly advises authors to “try to avoid using abstracts as references” (17). Our research supports this advice, since two thirds of neuroradiologic abstracts fail to result in publication in indexed journals. In other words, a high percentage of neuroradiologic abstracts either fail to undergo rigorous peer review at all or fail to pass the peer-review process to emerge as published manuscripts in indexed journals.

There is a wide variability between different journals with respect to policy regarding abstract citation in published manuscripts. A survey of journals conducted by Goldman et al (9) demonstrated that the proportion of articles that cited abstracts in their reference lists ranged from 4% to 50%. A recent survey of 19 major health care related journals found that only three specifically did not permit abstracts to be cited in reference lists. None of the journals that permitted abstract citation defined any restriction on recency of abstract presentation.

The observation that, for abstracts presented at the RSNA, clinical studies were published at a greater rate than experimental studies was unanticipated. Experimental studies by nature are prospective rather than retrospective, and require careful forethought and planning to carry out. Clinical studies, in contrast, frequently are retrospective and take advantage of imaging data that already exist in patient databases.

As expected, ASNR abstracts for prospective studies were published at significantly higher rates than those for retrospective studies. In contrast, no difference in rates of publication between prospective and retrospective studies was noted for RSNA abstracts. Observed differences between publication rates for RSNA and ASNR abstracts may relate to the contractual arrangements associated with publication of papers presented at national meetings, in which *AJNR* holds the right of first refusal for ASNR abstracts and *Radiology* holds this right for RSNA abstracts.

We noted slightly higher rates of publication for head and neck abstracts and lower rates of publication for abstracts identified as new techniques and pediatrics, although these differences were not statistically significant. The higher rate of publication for head and neck abstracts may reflect the greater than average number of journals considered appropriate for publication of this type of research. The low rate of publication of abstracts in the new techniques category may reflect the preliminary data contained in such studies.

We chose to study abstracts presented at the 1993 national meetings, because this ensured that a reasonable amount of time would have elapsed to allow publication of journal articles. Previous authors have noted that the vast majority of abstracts that result in publication in indexed journals are published within 4 years of abstract presentation (1, 2, 4, 5, 8, 9, 18). Our data indicate that the mean time lag between abstract presentation and publication was 15 months. Eighty-nine percent of all eventually published abstracts were in print 2 years after presentation. Previous studies have indicated that the average delay between presentation and publication is 9.5 months, and that nearly all abstracts are published within 3 years of presentation. Our results support the assertion that if an abstract is not published by 3 years after presentation, its data should be viewed in the context of the multiple uncertainties that plague unpublished abstract reports.

One factor influencing the rate of subsequent publication of an abstract is that of publication bias, in which positive results tend to be published preferentially over studies with negative findings (19). We did not specifically evaluate this variable in our survey, so we cannot comment on its importance to the neuroradiologic literature. An additional factor that may influence rate of subsequent abstract publication is the amount of data required by societies for abstract submission. It is possible that

more rigorous requirements lead to greater likelihood of eventual full publication.

The methods we used for searching MEDLINE may have overlooked some published manuscripts. We cross-indexed at least the first and last authors' names with relevant text words from the abstract title. It is possible but unlikely that the final published form of some papers would fail to include both the presenting author and the senior author. Similarly, it is unlikely that the subject of the paper would change so radically that the most identifying word in the title would not appear in the text of the abstract.

### Conclusion

Abstract presentation at national scientific meetings constitutes an invaluable method for rapid dissemination of state-of-the-art knowledge and promising new techniques; however, those abstracts that fail to achieve subsequent publication are of little or no use to the general medical community at large because the data they contain are difficult to access and are of questionable validity, owing to lack of rigorous peer review.

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