

Publication rates of abstracts presented at major interventional radiology conferences

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PURPOSE

We aimed to determine the publication rate and factors predictive of publication of oral presentations at the annual meetings of the Cardiovascular and Interventional Radiology Society of Europe (CIRSE) and the Society of Interventional Radiology (SIR).

METHODS

Keywords and authors from oral presentation abstracts at the 2012 CIRSE and SIR annual meetings were used to search PubMed and GoogleScholar for subsequent publication. Logistic regression was performed to identify whether number of authors, country of origin, subject category, methodology, study type, and/or study results were predictive of publication.

RESULTS

A total of 421 abstracts (CIRSE-126, SIR-295) met the inclusion criteria. The overall publication rate across both conferences was 44.9%. Time from conference presentation to publication was 15 ± 8.9 months for CIRSE and 16.3 ± 8.8 months for SIR ($P > 0.05$), with a combined time interval of 15.9 ± 8.8 months for both. The median impact factor of published abstracts was 2.075 (interquartile range, 2.075–2.775) for CIRSE and 2.093 (2.075–2.856) for SIR ($P > 0.05$). The most common country of origin for published abstracts was Germany (27.1%) at CIRSE and the United States (69%) at SIR. Logistic regression did not identify factors that were predictive of future publication.

CONCLUSION

Publication rates were similar for CIRSE and SIR. Factors such as country of origin, topic of study and study results were not predictive of future publication. Authors should not be discouraged from submitting their work to journals based on these factors.

Presentation at research conferences serves as a valuable channel for individuals to share new knowledge and advances in a given clinical field. The ultimate goal of a conference presentation is usually subsequent manuscript publication. The process of submitting a manuscript for publication typically requires extensive peer review and revisions (1). Research quality plays a major role in whether a study is accepted by a journal. Therefore, assessing the rate at which presentations at major conferences are published can serve as a surrogate marker of the quality of conference presentations.

Insight into publication rate raises the question of which factors, if any, increase the likelihood of a conference abstract ultimately being published in a peer-reviewed journal. For example, past studies have demonstrated publication bias, in which studies with positive or statistically significant results are more likely to be accepted by a journal compared with those with nonsignificant results (2).

The publication rate of presentations at major conferences varies depending on the specialty and conference. Publication rates for various national surgical conferences have been shown to range from 36% to 65% (3–6). Other example publication rates include 32% for emergency medicine, 35%–50% for pediatrics, and 50% for cardiology (3, 7). A previous meta-analysis reviewed the number of abstracts that went on to publication for several specialty conferences and reported publication rates that varied from 32%–67% (3).

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The aim of the current study was to determine the publication rate of research presented at the annual Cardiovascular and Interventional Radiology Society of Europe (CIRSE) and Society of Interventional Radiology (SIR) conferences and to identify factors predictive of publication.

Methods

Data collection

All oral presentation abstracts at the 2012 annual CIRSE and SIR meetings were identified through their respective online conference databases. Scientific sessions were included from SIR, while scientific posters and educational exhibits were excluded. Special sessions and free papers from CIRSE were included, while electronic posters were excluded. Studies were included regardless of subject category, country of origin, or number of authors. Institutional ethics board approval was not required for this study as it was retrospective and there was no direct patient impact.

In order to determine if a given abstract was published in a peer-reviewed journal, a computer-based search was performed using both PubMed and Google Scholar databases. The date range for manuscript search was from the 2012 conference date until approximately 3 years later (Apr 1, 2015). CIRSE was held from September 15–19, 2012, and SIR from March 24–29, 2012. The protocol for manuscript search began with PubMed, in which the first authors last name and first initial was used to identify possible articles with a similar title. If a corresponding manuscript was not discovered, the process was repeated for a possible second and third author. Following this, if a manuscript was still not

found, keywords from the abstract were entered into the PubMed search without an associated author name to search for a corresponding publication. If there were no relevant results, the same process was repeated using the Google Scholar database.

A publication was considered to correspond to a conference abstract if both of the following criteria were met: 1) at least one author on the abstract was also included as an author in the published manuscript, and 2) at least one conclusion from the presented abstract was identical to the conclusions drawn in the published manuscript (9). In cases where a given author would publish multiple manuscripts on the same topic, the methodology and conclusions were compared in detail to find an identical match to the original abstract.

Data analysis

Prior to the manuscript search, the following information was collected about each oral abstract: number of authors, country of origin of the first author, number of subjects or patients in the study, study methodology, subject category, and study outcome (positive, negative, or neither). The study type was classified as a randomized controlled trial, cohort, cross-sectional survey, case-control, case-report, clinical review, systematic review, or other. The subject categories included 12 possible areas: Dialysis, Musculoskeletal, Vascular Arterial, Vascular Venous, Oncology, Pediatrics, Gastrointestinal, Genitourinary, Neurology, Policy, Obstetrics and Gynecology, or Other. If a study was found to overlap in two or more subject categories, the abstract was reviewed by two investigators to determine which individual category was the most relevant. In particular, arterial interventions

for oncological purposes were classified as "Oncology." Following documentation of these data, the search for subsequent publication was performed.

If a corresponding manuscript was found, the year of publication, time to publication, journal name of publication, associated impact factor, number of authors, and whether the conclusion was overall unchanged compared with the original conference abstract, were recorded. The time interval from conference presentation to publication was recorded. Publications in the same month as the meeting were defined as the 0-month point. The impact factor of each journal was retrieved from the 2012 CiteFactor impact factor list (8), and the median for each conference was reported with interquartile ranges (IQR). In terms of changes to the conclusion, the published manuscript was compared to its corresponding abstract to determine if additional conclusions or any changes were made. Any discrepancies with data collection and analysis were discussed between investigators and, if necessary, decided by a majority vote.

Statistical methods

Statistical significance for journal impact factor and time to publication were assessed using the Mann-Whitney U test. Statistical significance for publication rates was assessed using the chi-squared test. In all causes, $P < 0.05$ was considered significant.

Binomial logistic regression was used to identify various abstract factors that may predict future publication. The tested outcome was a binary of either "published" or "not published." The predictors tested are listed in Table 1. First, a model was built, fit-

Main points

- The rate of abstracts that go on to further manuscript publication in the 2012 annual CIRSE and SIR meetings was 44.9% overall, with no significant difference in publication rate among both conferences.
- The number of authors, country of origin, subject category, methodology, study type, and study results were not found to be predictive of future publication for abstracts presented at the 2012 SIR and CIRSE conferences.
- The overall publication rate among these conferences is higher than previously reported publication rates for other international radiology conferences.

Table 1. Factors impacting publication assessed by logistic regression analysis

Variable	Type	Values
Number of subjects	Numerical	Continuous
Number of authors	Numerical	Continuous
Location of first author	Categorical	North America, South America, Europe, Asia, Middle East
Study type	Categorical	Randomized controlled trial, cohort, case series, cross-sectional survey, other
Data collection	Binary	Prospective, retrospective
Human subjects	Binary	Yes, No
Result type	Categorical	Positive, negative, not applicable

Table 2. Overall publication rates of SIR and CIRSE abstracts

	SIR	CIRSE
Submitted abstracts, n	295	126
Published abstracts, n	130	59
Average time to publication (months)	16.3	15.0
Median impact factor	2.093	2.075

SIR, Society of Interventional Radiology; CIRSE, Cardiovascular and Interventional Radiology Society of Europe.

Table 3. Published SIR and CIRSE abstracts by country of origin

Country	SIR, n (%)	CIRSE, n (%)
USA	90 (69.2)	6 (10.2)
Germany	1 (0.77)	16 (27.1)
Japan	8 (6.15)	3 (5.1)
Greece	1 (0.77)	1 (1.69)
Singapore	1 (0.77)	2 (3.39)
Portugal	1 (0.77)	2 (3.39)
Brazil	2 (1.54)	2 (3.39)
Spain	1 (0.77)	1 (1.69)
United Kingdom	1 (0.77)	5 (8.47)
South Korea	6 (4.62)	2 (3.39)
Switzerland	2 (1.54)	2 (3.39)
France	1 (0.77)	7 (11.9)
China	3 (2.31)	2 (3.39)
Italy	1 (0.77)	7 (11.9)
Netherlands	3 (2.31)	1 (1.69)
Canada	5 (3.85)	0 (0)
Israel	1 (0.77)	0 (0)
Taiwan	1 (0.77)	0 (0)
India	1 (0.77)	0 (0)

SIR, Society of Interventional Radiology; CIRSE, Cardiovascular and Interventional Radiology Society of Europe.

Table 4. Published SIR and CIRSE abstracts by presentation of human-based data

Human subjects among total submitted abstracts	SIR, n (%)	CIRSE, n (%)
Yes	246 (83.4)	115 (91.3)
No	49 (16.6)	11 (8.73)

SIR, Society of Interventional Radiology; CIRSE, Cardiovascular and Interventional Radiology Society of Europe.

ted and evaluated using all predictors. Subsequently, backward stepwise elimination using the Akaike information criterion was used to reduce the number of predictors. After every elimination step, a new model was built, fitted and evaluated. The regression analysis was performed using the R Statistical Package version 3.3.1 (9). Backward stepwise elimination was performed

using the Modern Applied Statistics with S (MASS) library version 7.3-47 (10).

Results

A total of 421 abstracts were assessed from both the 2012 CIRSE and SIR annual meetings: 126 from CIRSE and 295 from SIR. In total, 145 poster presentation abstracts

were excluded from this study. Of the included abstracts, 189 abstracts were found to have associated published manuscripts in peer-reviewed journals (59 from CIRSE, 130 from SIR). The overall publication rate at these two conferences combined was 44.9%. No significant difference was present in the publication rates between CIRSE (46.8%) and SIR (44.1%) ($P = 0.623$).

The time interval from presentation to publication across both conferences was 15.9 ± 8.8 months. The time interval was 15 ± 8.9 months and 16.3 ± 8.8 months for CIRSE and SIR respectively ($P = 0.311$; Table 2). The median impact factor of the journals in which the abstracts from CIRSE and SIR were published was 2.075 (IQR, 2.075–2.775) and 2.093 (IQR, 2.075–2.856), respectively. There was no statistically significant difference in the impact factors between either of these interventional radiology conferences ($P = 0.357$).

At CIRSE, Germany was the most common country of origin for first authors (27.1%) (Table 3). Vascular Arterial was the most common subject category of submitted abstracts (40.7%) (Fig.). At SIR, the most common country of origin for first authors of presented abstracts was the United States (69%). The most common subject category was Oncology (43.8%). In aggregate, the top 3 subject categories in both conferences in decreasing order of frequency were Oncology, Vascular Arterial, and Vascular Venous. Additionally, the majority of abstracts submitted to SIR and CIRSE involved human subjects, a case-series study design and an overall prospective study type (Tables 4, 5, and 6).

The regression analysis did not reveal significant associations between any of the tested factors and subsequent publication. In the initial model where all variables in Table 1 were tested, P values for all predictors were >0.05 . This result remained unchanged after each step of the backward elimination. Ultimately, the minimum Akaike information criterion was obtained with a model in which all predictors were eliminated. Thus, it was concluded that no significant associations were found.

Discussion

The annual CIRSE and SIR meetings are perhaps the largest platforms for the presentation of new research in the field of interventional radiology, a specialty dedicated to the use of minimally invasive

Table 5. Published SIR and CIRSE abstracts by study design type

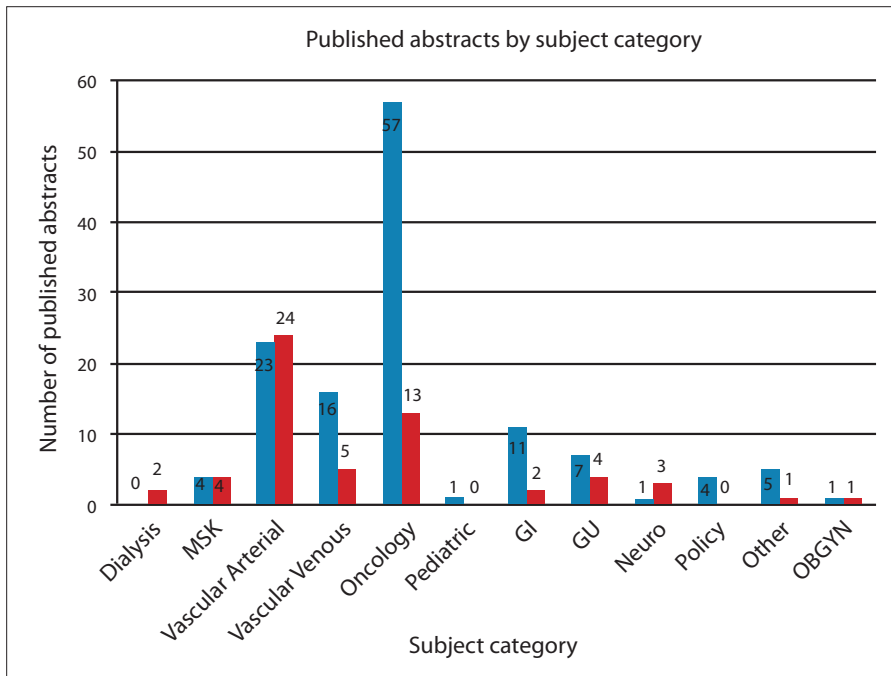
Study design	SIR, n (%)	CIRSE, n (%)
Randomized controlled trial	0 (0)	2 (1.59)
Cohort	87 (29.5)	49 (38.9)
Cross-sectional	1 (0.34)	0 (0)
Case-control	2 (0.68)	1 (0.79)
Case series	131 (44.4)	53 (42.1)
Case report	0 (0)	0 (0)
Clinical review	0 (0)	1 (0.79)
Systematic review or meta analysis	0 (0)	0 (0)
Other experimental study	74 (25.1)	20 (15.9)

SIR, Society of Interventional Radiology; CIRSE, Cardiovascular and Interventional Radiology Society of Europe.

Table 6. Published SIR and CIRSE abstracts by retrospective or prospective design

Study type among total submitted abstracts	SIR, n (%)	CIRSE, n (%)
Prospective	153 (51.9)	65 (51.6)
Retrospective	142 (48.1)	61 (48.4)

SIR, Society of Interventional Radiology; CIRSE, Cardiovascular and Interventional Radiology Society of Europe.

**Figure.** Published abstracts by subject category at the 2012 SIR (blue bars) and CIRSE (red bars) annual conferences. SIR, Society of Interventional Radiology; CIRSE, Cardiovascular and Interventional Radiology Society of Europe; MSK, musculoskeletal; GI, gastrointestinal; Neuro, neurology; OBGYN, obstetrics and gynecology.

and image-guided procedures for both diagnosis and therapy. These conferences seek to provide avenues for physicians to learn about and contribute to the work being performed on the frontiers of interventional radiology. They also serve as a

stepping-stone to subsequent submission for publication in interventional radiology peer-review journals.

There are several benefits to the scientific community when presented abstracts progress to publication (9–11). The process

of peer-review and evaluation from experts ensures that the study has made appropriate conclusions within inherent limitations of the study, which often are not included in the abstract presentation. Publication also provides an opportunity for individuals across the world to access the research in reputed journals without attending the conferences directly (10).

In addition to benefits of publishing research, determining the rate of publication and the factors that can influence this metric are increasingly valuable as well. Evidence of publication bias has been found widely across various clinical topics, but has not been previously explored in detail across the field of radiology (4). Nevertheless, researchers in this specialty may be interested in the variables that can influence whether or not their study is likely to be accepted for publication, as this may have significant implications on project planning and design.

In assessing 421 abstracts across both CIRSE and SIR conferences in 2012, 44.9% went on to be subsequently published in peer-reviewed journals during the 3-year study period. Individually, publication rates of abstracts between CIRSE and SIR were quite similar, at 46.8% and 44.1% respectively. Comparatively, the overall publication rate of 44.9% appears to be higher than previously shown for other international radiology conferences. For example, publication rates for the 1993 American Society of Neuroradiology (ASNR) conference, the 1995 Radiological Society of North America (RSNA) conference, and the 2001 European Society of Gastrointestinal and Abdominal Radiology (ESGAR) conference were 37%, 33% and 40%, respectively (12–15). The higher rate of publication of presented abstracts at SIR and CIRSE is likely multifactorial. Most notably, the majority of the reported publication rates are from international radiology conferences held over 10 years prior to the 2012 SIR and CIRSE meetings. Throughout this time, the number of available journals, and publication frequency of established journals, has significantly risen (16). Various models have attempted to predict and identify the growth of scholarly journals over time, quoting exponential rates of increase from 33 393 active scholarly journals in 2003, to 122 273 active scholarly journals in 2011 (16). It is unclear if radiology journals have undergone similar growth. Perhaps more importantly, the

ratio of radiology researchers to radiology journals is also unknown. Nevertheless, it is likely that the increased avenues for publication have contributed to slightly higher rates of publication at SIR and CIRSE compared with other radiology conferences during our reported study time frame.

When comparing the publication rates at the 2012 SIR and CIRSE conferences with more recent conferences in the field of medicine, this metric is more similar. For example, at the 2009 Society of General Internal Medicine conference, 47.4% of abstracts went on to be published in peer-reviewed journals (17). Pediatric critical care abstracts presented at the American Academy of Pediatrics conference between 2007–2011 had a 44% publication rate, while those abstracts presented at the 2005–2010 annual meetings for the Society of American Shoulder and Elbow Surgeons (ASES) was approximately 49.2% (18, 19). However, there is still limited data on this topic among large-scale medical conferences. Further research is necessary to elucidate whether a publication rate of 44.9% at the SIR and CIRSE conferences is comparable to most annual research meetings of other specialties.

The current study also sought to explore a subset of variables that may be predictive of the likelihood of future publication. With continuing pressure on researchers to publish, these metrics are significant for individuals that wish to better structure their work to increase the probability of manuscript publication. Regression analysis did not reveal any associations between the tested variables and the likelihood of future publication. More specifically, evidence of publication bias was not found throughout this study. Therefore, researchers should not be discouraged from completing or submitting their work to journals on the basis of these factors.

The results of this study raise interesting points about future conferences and the impact of the calculated publication rate at CIRSE and SIR. At a publication rate of 44.9%, less than half of the studies presented at the annual meetings go on to be subsequently published. It is arbitrary to define this value as being too low, but it does raise the question of what steps could be taken to increase the overall publication rate (if this is intended to be a goal). Potential means by conference organizers to increase the publication rate include increasing the threshold for accepted abstracts, such as favorably eval-

uating prospective and randomized trials over retrospective studies. By modifying this filter to be more rigorous with the abstract acceptance process, these conferences can theoretically increase the overall quality of research projects included. Implementing such a change, in conjunction with active efforts by the respective organizations to encourage its attendees to submit manuscripts, may help to increase the overall publication rates of abstracts presented at the CIRSE and SIR meetings. A systematic review that outlined various interventions targeted to increase publication rate of academic research groups found that the most successful tools were implementing scientific writing courses or writing coaches (20). This may also be of value for SIR and CIRSE to consider implementing at its annual meeting. There may also be value in SIR and CIRSE providing online resources for researchers to facilitate improved scientific writing.

However, this demands further discussion into what the annual interventional radiology research conferences are intended for. Interventional radiology researchers presumably attend CIRSE and SIR to gain insight and feedback on active research projects regardless of potential for publication. Many see these meetings as a platform to communicate with other physicians to find areas for improvement or collaboration. If this is the emphasis at CIRSE and SIR conferences, the overall publication rate may then just serve as a soft measure of quality assurance over time (21). In this case, increasing the threshold for acceptance of abstracts at SIR and CIRSE would likely decrease the total number of abstracts presented and may be counterproductive.

Ultimately, there is a balance that must be achieved by scientific and medical conferences when addressing the publication rate. This includes a focus on accepting quality research while also providing an avenue for interesting research projects with a low-likelihood of publication to benefit from community feedback. However, with over 50% of abstracts not going on to subsequent publication, it may be worthwhile for SIR and CIRSE to review their evaluation and acceptance process for submitted research. Accepting fewer overall abstracts of higher quality will indirectly improve the publication rate, while also allowing physicians attending the conferences to spend more time learning about and contributing to research with greater potential for pub-

lication. This will likely allow the SIR and CIRSE conferences to continually improve the quality and standard of radiology innovation presented at these meetings.

Limitations that may have impacted the results of this study include the possibility of published manuscripts being missed by the search strategy. These may have been due to major changes in overall authorship and title of study, or that these studies were not available on the identified databases. Furthermore, the search occurred 3 years from the abstract presentation date. It is possible that certain projects are still ongoing and will be submitted for publication at a later time (particularly larger, multicenter trials). This study did not identify the number of abstracts actually submitted to journals, but rather those that were accepted and published. It is possible that the end point of certain research projects was a conference presentation and not subsequent publication. Finally, although regression analysis did not reveal any factors that were predictive of publication, this study did not evaluate all possible abstract variables. It is possible that other factors related to the presented abstracts that were not assessed in this study could be predictive of future publication.

In conclusion, the percentage of presentation abstracts that went on to subsequent publication for the 2012 international CIRSE and SIR conferences were 46.8% and 44.1%, respectively. The combined publication rate between both conferences was 44.9%. These values are consistent with the reported publication rates in other international medical conferences. There were no variables evaluated in this study that were predictive of future publication.

Conflict of interest disclosure

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