

# A Bibliometric Survey of Publications in Vascular Ultrasound

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## Abstract

Access to a body of published research is important to the development of research and to inform quality patient care. Measures of such activities are determined by bibliometric analysis of publication databases. This project aims to identify the scope of such publications in vascular ultrasound and its implications for the ultrasound professionals. Major databases were surveyed to identify the range of publications in “vascular ultrasound” from 2016 to 2018. The topics, sources, and relevance of the publications were noted along with recognized impact factors and other parameters. A list of target journals was created in radiology, ultrasound, and clinical vascular spheres. These journals were assessed for bibliometric parameters, total number of articles, and articles specific to vascular ultrasound. Web of Science was used over a 3-year period to identify 4136 articles (1421, 1384, and 1326 in each of 2016, 2017, and 2018, respectively). This search returned 414 pages; of these, 2-page analysis revealed 15% were relevant to vascular ultrasound practice. Of the 21 “highly cited” articles, one was related to carotid ultrasound and one was aortic practice guidelines. Of the 31 targeted journals (radiology, 5; ultrasound, 16; vascular surgery, 7; vascular medicine, 3), 3873 articles were published; 123 (3.2%) were relevant to vascular ultrasound. The maximum vascular ultrasound content in any one journal was 8%. The activities were guidelines, 11; cases, 7; and mixed other, 105. The topics were carotid, 30; arterial, 17; aorta, 7; venous, 16; education, 12; and other, 41. The impact factor was 0.36 to 16.8 (median = 2.1). None of the targeted journals nor the major databases have much content in vascular ultrasound. The choice of journal for publication should be determined by potential audience rather than the journal itself. As a tool for an environment scan of trends in vascular ultrasound, no journal serves well.

## Keywords

vascular ultrasound, journals, vascular imaging, bibliometrics, journal ranking, research, publications, radiology

## Introduction

Access to a body of published research is important to the development of ideas and to prompt further research to inform quality patient care.<sup>1</sup> For vascular ultrasound (VUS), the professional groups involved in research and patient care include vascular technologists who perform the studies, physicians from various different disciplines who interpret the results, and the vascular specialists, including physicians, surgeons, and interventionalists, who treat the patients. There are journals related to each of these specialty groups, as well as multidisciplinary journals and unrelated publications that contain VUS material. In addition, there is a body of literature related to physics and instrumentation and associated basic science. Such publications play a role in driving research that leads to innovation and changes in vascular management.

The Society for Vascular Ultrasound (SVU) represents many of the VUS professionals. The SVU has established the Quality Improvement and Research Committee (QIRC) to direct and facilitate quality improvement projects and research endeavors of its members. Quality Improvement and Research Committee

has identified that VUS publications are a foundation to the dissemination of scholarly initiatives of the Society.

The characteristic of published material in any given journal and the significance of a journal can be measured and determined by bibliometric analysis of publication databases.<sup>2</sup> Bibliometric study can help identify the nature of published material in general, the authors and institutions developing scholarly work, and an understanding of the content and characteristics of articles published in specific journals. Such study can be used to infer the ranking of journals. This information helps to guide submissions and allow timely publication of scientific articles and other scholarship in an

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**Table 1.** Radiology Journals.

	H-index	CiteScore	SNIP	SJR	Rank
<i>Radiology</i>	271	5.83	2.651	3.340	5/272
<i>Radiographics</i>	151	3.52	2.721	1.549	26/272
<i>Journal of Vascular Interventional Radiology</i>	120	1.66	1.295	0.921	122/272
<i>Radiology Clinics of North America</i>	76	1.65	0.964	0.583	114/272
<i>Radiography</i>	26	0.79	0.576	0.340	195/272

Note. H-index = Hirsch-index; SNIP = Source Normalized Impact per Paper; SJR = ScImago Journal Rank.

appropriate journal.<sup>3</sup> In addition, awareness of the status of specific journals may direct individual investigators to higher ranked journals to gain more academic benefit from the publication.<sup>4</sup> This project aims to identify the types of published material in VUS and the scope of publications that contain such material and document their relevance and the implications for the professions.

## Methods

Major databases (Web of Science,<sup>9</sup> Google Scholar,<sup>10</sup> and Scopus<sup>5</sup>) were surveyed to identify the range of publications in “VUS” from 2016 to 2018. The topics, sources, and relevance of the publications were noted along with recognized impact factors, ranking, and other parameters. A list of target journals was created in radiology, ultrasound, and clinical vascular spheres. The journals selected were known to have VUS content or were considered to be in related fields likely to publish such material. These journals were assessed for total number of articles, types of articles specific to VUS, and domains of vascular interest covered. Article types included scientific research, case reports, guidelines and standards, descriptive articles, and other. Specific domains included physics and instrumentation, education, ethics, carotid, peripheral arterial, venous, aorta, and mesenteric/visceral arteries. The bibliometric parameters included citations, impact factor, rank, H-score, SJR (ScImago Journal Rank), and SNIP (Source Normalized Impact per Paper), where available. Detailed analysis was done for 2018. All results were collated in an Excel spreadsheet and analyzed.

## Results

A search of the Web of Science<sup>9</sup> database over a 3-year period identified 4136 articles (1421, 1384, and 1326 in 2016, 2017, and 2018, respectively) with possible VUS content or titles. This search returned 414 pages; of these, 2-page analysis revealed that 15% were relevant to VUS practice. Of the 21 “highly cited” articles over all topics, with 42 to 65 citations, 2 were VUS related; one was carotid ultrasound guidelines and one was aortic practice guidelines.

The search for journals considered to potentially have VUS content identified 31 targeted journals. These included journals in each of the following disciplines: radiology, 5 (Table 1); ultrasound, 16 (Table 2); vascular surgery, 7 (Table 3); and

vascular medicine, 3 (Table 3). The content of the *Journal for Vascular Ultrasound* (JVU) was excluded from the analysis. Overall, 3873 articles were published in the 30 remaining journals; 123 articles were relevant to VUS (3.1%). The maximum VUS content in any one journal, by percentage, was 8.6% in the *European Journal of Vascular and Endovascular Surgery*. The journal with the largest number of papers in VUS was the *Journal of Ultrasound in Medicine* with 26 out of 359 (7.3%). The types of articles published were guidelines, 11; cases, 7; and mixed other scientific articles, 105 (Table 4). The topics were carotid, 30; arterial, 17; aorta, 7; venous, 16; education, 12; and other, 41 (Table 4). Assessment of the 31 journals identified to potentially include VUS material, 29 had at least one article relevant to VUS, 22 had fewer than 10 articles, 4 had 11 to 20, and 2 had more than 21. The JVU had 71 articles.

Specific parameters selected for each journal included impact factor, H-score, SNIP, SJR, citations, and rank. Of the 5 radiology journals, only 2% of 171 articles related to VUS topics; the H-score ranged from 63 to 265 and SJR ranged from 0.55 to 3.46. Of the 31 ultrasound journals, 4% of 1190 articles related to VUS topics; the H-score ranged from 7 to 117 and SJR ranged from 0.13 to 1.76. Of the 6 vascular surgery journals, only 3% of 1251 related to VUS topics; the H-score ranged from 41 to 178 and SJR ranged from 0.407 to 1.757. Of the 5 vascular medicine journals, only 2% of 171 articles related to VUS topics; the H-score ranged from 63 to 265, SJR ranged from 0.55 to 3.46, and SNIP ranged from 0.108 to 3.588. The impact factor of the journals was 0.36 to 16.8 (median = 2.1). The ScImago<sup>6</sup> and Scopus<sup>7</sup> journal rankings ranged from 4 to 151 for radiology, 17 to 227 for vascular surgery and medicine, and 76 to 181 for ultrasound.

The top-ranked radiology journal was *Radiology* at number 4 of 328 with H-score of 271, SJR 3.340, and SNIP 2.651; 2.8% of content related to VUS. The top-ranked ultrasound journal was *Ultrasonography* at 79 of 272 with an H-score of 44, SJR 0.847, and SNIP 1.572; 1.7% was VUS content. The top-ranked clinical vascular surgery or medicine journal was *Journal of Vascular Surgery* at number 17 of 425 with an H-score of 178, SJR 1.757, and SNIP 1.529; 2.4% was VUS content.

The JVU published 71 articles. Of these, 50% were case reports. All were VUS topics including venous 19, carotid 18, arterial 7, aorta 2, education 1, and unusual findings and other 10. The impact of JVU, by the H-score of 11 and SJR of 0.12, ranks the JVU in the lowest 10% of surveyed journals. Of the

**Table 2.** Ultrasound Journals.

	H-score	CiteScore	SNIP	SJR	Rank
<i>Ultrasound in Medicine and Biology</i>	122	2.62	1.033	0.932	63/129
<i>Journal of ASE</i>	121	5.18	3.588	2.952	11/322
<i>Journal of Ultrasound in Medicine</i>	78	1.57	0.868	0.595	123/272
<i>Journal of Clinical Ultrasound</i>	55	0.960	0.372	0.609	181/272
<i>Ultrasound Imaging</i>	44	2.34	1.156	0.792	66/272
<i>Seminars in Ultrasound</i>	41	1.170	0.617	0.352	165/272
<i>Cardiovascular Ultrasound</i>	37	2.09	1.07	0.766	92/322
<i>Ultrasound Quarterly</i>	33	0.78	0.402	0.336	198/272
<i>Journal of Ultrasound</i>	17	1.51	0.682	0.46	130/272
<i>Ultrasonography</i>	15	2.85	1.572	0.847	46/272
<i>Journal of Diagnostic Medical Sonography</i>	14	0.103	0.108	0.129	248/272
<i>Ultrasound</i>	12	0.910	0.595	0.376	184/272
<i>Journal of Medical Ultrasound</i>	12	0.31	0.256	0.130	238/272
<i>Journal for Vascular Ultrasound</i>	12	1.30	0.149	0.121	248/272
<i>Journal of Echocardiography</i>	8	0.71	0.408	0.275	207/272

Note. SNIP = Source Normalized Impact per Paper; SJR = Scimago Journal Rank.

**Table 3.** Vascular-Related Journals.

	H-score	CiteScore	SNIP	SJR	Rank
<i>Circulation</i>	570	9.17	5.200	8.613	1/322
<i>Journal of Vascular Surgery</i>	178	2.50	1.529	1.757	37/390
<i>European Journal of Vascular and EV Surgery</i>	107	2.33	1.922	1.539	48/390
<i>JACC: CV Imaging</i>	100	4.10	2.510	5.102	15/272
<i>Journal of EV Therapy</i>	93	2.360	1.395	1.571	76/322
<i>Vascular Medicine</i>	67	1.680	1.036	0.927	125/322
<i>Annals Vascular Surgery</i>	67	1.14	0.721	0.595	184/390
<i>Vascular</i>	51	1.05	0.671	0.478	200/390
<i>Vascular and EV Surgery</i>	41	0.91	0.518	0.407	223/390
<i>JVS—Venous and Lymphatic</i>	18	1.64	1.203	0.635	109/390

Note. SNIP = Source Normalized Impact per Paper; SJR = Scimago Journal Rank.

citable JVU articles, only 6% were cited in bibliometric analysis with citation counts of 1 to 3 for those articles that were cited.

## Discussion

The characteristic of published material in any given journal and the significance of a journal can be measured and determined by bibliometric analysis of publication databases.<sup>2,8-9</sup> Bibliometric analysis addresses quantitative approaches to the assessment of scientific journal publication using statistical parameters to characterize the material. Such analysis is based on large databases, such as Web of Science by Clarivate Analytics (formerly Thomson-Reuters),<sup>9</sup> Google Scholar by Google/Alphabet,<sup>10</sup> or Scopus by Elsevier Science.<sup>5</sup> Other sources and individual journals have published variations and advanced analytics, as well.<sup>7,8</sup>

Analysis may be used to identify productivity of individual authors, collaborating networks and institutions or countries of origin. Analysis of journals by the types of articles

published, the impact of individual authors, tracking author networks or direct indices, such as citation assessment, from the journals themselves, can further identify the impact of specific journals.<sup>1-8</sup> Various calculations have been defined, such as impact factor and citation count, citation score, and derived indices, to try to characterize journal impact. Unfortunately, time variables and the nature of different domains of science make direct comparisons unreliable. More complex analysis is provided by the Eigenfactor, SJR, and SNIP to try to standardize rankings within a discipline or across disciplines. The H-index (Hirsch-index) coordinates the number of publications (productivity) to citations (impact) over a time period; it is influenced by discipline and time period. Within a discipline, however, bibliometrics do allow for comparison and can inform decision-making regarding journals, institutions, or authors. This may guide researchers to sources for an environmental scan of their field. In addition, it can help to guide submissions and allow timely publication of scientific articles and other scholarship in an appropriate journal. In addition, awareness of the status of

**Table 4.** Types of Articles and Topics.

Types	
Guidelines—	11
Cases—	7
Scientific—	105
Topics	
Carotid—	30
Arterial—	17
Venous—	16
Aorta—	7
Education—	12
Other—	41

specific journals may direct individual investigators to higher ranked journals to gain more academic benefit from the publication.<sup>1-4,11,12</sup>

This project aims to identify the types and spheres of published material in VUS, the scope of publications that contain such material and assay the impact, relevance, and implications for professions addressing issues in VUS.

In general, few of 4136 articles identified over 2016 to 2018 in the Web of Science<sup>9</sup> database to potentially have relevance to VUS; only 15% were VUS topics. Of the top-cited articles overall, 2 of 21 were VUS related. Both were clinical practice guidelines in which VUS was a component of a larger work; as such, the citations were likely more related to the other content than to VUS.

The types of articles represented in the journals selected for this study included basic and clinical scientific reports, practice guidelines, case reports, and descriptive articles. Case reports were not published in some journals and represented 50% of material in the JVU. Practice guidelines were more frequently cited,<sup>5,13</sup> whereas case reports were seldom cited.<sup>2,3,11,12</sup>

All spheres of VUS material were represented across the surveyed journals. This included educational and clinical spheres. Clinical spheres included carotid, aortic, peripheral artery and veins, and mesenteric and renal studies. Of these, carotid was the most frequently reported and renal and mesenteric were rarely published areas. Education, quality improvement, and ergonomics were underrepresented.

Overall, of the journals surveyed in this study, the content of VUS material in any one journal was found to be quite low. None of the major groupings of radiology, ultrasound, or clinical medical and surgical vascular journals had more relevance to VUS than any other, and no specific journal, other than the JVU, had much VUS content. The journal with the largest number of papers in VUS was the *Journal of Ultrasound* in Medicine with 26 out of 359 (7.3%) and that with the greatest percentage of VUS material over the time frame of 2016 to 2018 was the *European Journal of Vascular and Endovascular Surgery* with 13 out of 151 (8.6%). The range overall was 0% to 8.6% in journals other than the JVU, which was 100% VUS.

Assessment of the 31 journals identified to potentially include VUS material, 29 had at least one article relevant to

VUS; 22 had fewer than 10 articles, 4 had 11 to 20, and 2 had more than 21. The JVU had 71 articles; 100% was VUS content. The relatively few publications in each journal related to VUS suggests that no one journal is good for an “environmental scan” or as a general update source. It is likely that researchers would use an online search approach on multiple databases to identify targeted material. In attempting to identify the best fit for an article, review of individual journals and their instructions for authors is required.<sup>1-4</sup> Of note, not all journals publish all types of material.

Rankings of individual journals can be developed from author and institution performance on individual articles and over time, as well as by analysis of citations and citation-derived indices. Comparison of rankings across disciplines, however, can be misleading, in that different disciplines may have different frequency of citations, self-citation, and institutional cross-citations. The timeline selected may have differing citation frequency if new material or trends skew the results or recent publications have not yet developed a citation history.<sup>7</sup> Various bibliometric scales and indices have been developed to try to address these and other issues.<sup>7,8</sup> Hence, using different databases and indices gives different rankings.

Of the journals studied, the H-score ranged from 63 to 265 and SJR ranged from 0.55 to 3.46 for the radiology journals, from 7 to 117 and 0.13 to 1.76 for the 31 ultrasound journals, from 41 to 178 and 0.407 to 1.757 for the vascular surgery journals, and from 63 to 265 and 0.55 to 3.46 for the vascular medicine journals. Overall, SNIP ranged from 0.108 to 3.588. The impact factor of the journals was 0.36 to 16.8 (median = 2.1). The ScImago<sup>6</sup> and Scopus<sup>7</sup> journal rankings ranged from 4 to 151 for radiology, 17 to 227 for vascular surgery and medicine, and 76 to 181 for ultrasound. The broad range of parameters does not identify any specific grouping of journals to identify as a target journal; the content per journal is low overall. Although higher ranking journals can be identified, this does not channel publication targets for VUS material. The top-ranked radiology journal was *Radiology* at number 4 of 328 with H-score of 271, SJR 3.340, and SNIP 2.651; 2.8% of content related to VUS. The top-ranked ultrasound journal was *Ultrasonography* at 79 of 272 with an H-score of 44, SJR 0.847, and SNIP 1.572; 1.7% was VUS content. The top-ranked clinical vascular surgery or medicine journal was *Journal of Vascular Surgery* at number 17 of 425 with an H-score of 178, SJR 1.757, and SNIP 1.529; 2.4% was VUS content. Although ranking may be used to select higher impact journals, the low volume of VUS content limits publication possibilities. Although it may be of academic value to publish in one of these, it may not be relevant to the VUS community. Apart from the JVU, none of the targeted journals nor the major databases are specific to or have very much content in VUS. Choice of journal for publication should be determined by potential audience rather than the journal itself.

Access to a body of published research is important to the development of ideas and to prompt further research to inform

quality patient care.<sup>1,4,11</sup> For VUS, the professional groups involved in research and patient care include vascular technologists who perform the studies, physicians from various different disciplines who interpret the results, and the vascular specialists, including physicians, surgeons, and interventionalists, who treat the patients. There are journals related to each of these specialty groups, as well as multidisciplinary journals and unrelated publications that contain VUS material. As a tool for an environment scan of trends in VUS, no journal serves well.

The SVU represents many of the VUS professionals. The SVU has established the QIRC to direct and facilitate quality improvement projects and research endeavors of its members. Quality Improvement and Research Committee has identified that VUS publications are a foundation to the dissemination of scholarly initiatives of the Society. Whereas publication is encouraged to inform practice and drive research, the domain of VUS presents challenges, in that the publications are spread over numerous journals each with limited VUS content by numbers or by percentage. Some journals limit certain types of publication, such as case reports. Although the JVU is a primary target for publication by its adherence to a VUS mandate,<sup>14</sup> it ranks low by bibliometric indices and in journal ranking status. This represents a challenge and an opportunity to the journal and to submitting authors.

## Conclusions

This project identifies the types of published material in VUS (including the specific type and topic of each article) and the scope of publications that contain such material. Their overall relevance and their implications for the professions involved in VUS are documented.

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