

Vascular Surgery Research in the Coronavirus Disease 2019 Pandemic: A Sex-Based Bibliometric Analysis

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Abstract

Introduction: The COVID-19 pandemic has disrupted vascular surgery services globally and its impact on researchers has illustrated disproportionate barriers for female researchers. We assessed the pandemic's consequences on bibliometric trends in vascular surgery and vascular medicine throughout the pandemic.

Methods: A scoping review was performed using the PubMed/MEDLINE, Scopus, and EMBASE databases from January to December 2020 to identify articles related to COVID-19 and vascular surgery or vascular medicine. Articles only describing cardiac or neurovascular care were excluded. The scoping review was performed according to the PRISMA-ScR guidelines. Bibliometric data were extracted and analyzed.

Results: Four hundred and fourteen articles were identified, including 125 (30.2%) original articles, 42 (10.1%) review papers, 105 (25.4%) case reports, 27 (6.5%) editorials and commentaries, 94 (22.7%) letters and correspondences, and 21 (5.1%) conference abstracts. The 5 most common countries of study or discussion were all high-income countries. English was the predominant ($n = 393$, 94.9%) language. Funding was reported for 5.1% ($n = 21$) of articles. In the first 6 months, 17.6% ($n = 30$) of first authors and 10.6% ($n = 18$) of last authors were female, while the last 6 months saw an increase in representation to 30.6% ($n = 74$) and 15.6% ($n = 38$) for first and last author, respectively.

Conclusion: The pandemic caused a rapid surge in vascular publications related to COVID-19. Female authors remain underrepresented in vascular research and the share in female authorship has dropped early in the pandemic, but rose after the end of the first wave. High-income countries remain overrepresented in research productivity, alluding to important disparities in COVID-19-related literature.

Keywords

vascular surgery, coronavirus disease 2019, research, gender disparities

Introduction

The novel coronavirus disease 2019 (COVID-19) pandemic has disrupted health care delivery globally and already cost the lives of over 1.5 million patients worldwide.¹ The public health measures introduced by governments and the impact of COVID-19 on surgical (eg, patients) and non-surgical individuals (eg, health care professionals) led to a widespread delay of over thirty million elective surgical procedures early in the pandemic.² Moreover, the pandemic disproportionately affected researchers, further aggravating sex-based disparities in academic productivity in surgery and medicine.³ Female authorship in vascular surgery research

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has previously been shown to be underrepresented.^{4,5} Given the documented toll of supplemental responsibilities falling disproportionately on women during times of crisis,^{6,7} a global pandemic has the potential to become an additional barrier for publication. Similarly, researchers from low- and middle-income countries (LMICs), who already face financial and logistical significant barriers in publishing their work, are challenged by even fewer resources to engage in research as these move for the burden of COVID-19-positive patients.⁸

Here, we perform a scoping review and bibliometric analysis of publications related to vascular surgery and vascular medicine and COVID-19 during the first 12 months of the COVID-19 pandemic to better understand the impact of this recent health crisis on vascular literature.

Methods

Literature Search

A scoping review was performed using the PubMed/MEDLINE, Scopus, and EMBASE databases for articles on vascular surgery or vascular medicine and COVID-19 published from inception until December 2020 inclusively. Scoping reviews systematically search the literature, identifying key concepts, theories, and sources of evidence that ultimately address broader, complex, and exploratory research questions.⁹ Compared to systematic reviews, scoping reviews do not answer a specific study question but rather summarize existing topical knowledge while generating hypotheses and gaps in existing literature.⁹ The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for scoping reviews (PRISMA-ScR) were applied.¹⁰ All articles were screened in the abstract and full-text screening stages by two independent reviewers using the Covidence screening software (X.M., D.V.). Conflicts were resolved by a third independent reviewer (L.M.D.). Articles not related to vascular surgery, vascular medicine, or COVID-19 and articles only describing cardiac or neurovascular care were excluded. No exclusion was done based on language or article type.

Data Synthesis and Analysis

Bibliometric parameters (journal, article type, study's country of origin, first and last authors' sex and affiliations, article language, study funding, and study's main theme and main message) were obtained to identify trends in publications in the first 12 months of the pandemic. Only the first and last authorship positions were analyzed considering the traditional weight placed on these authorship positions in academia. Authors were considered

unique for every individual manuscript that was included and analyzed. For example, for a single-author manuscript, the author would be considered both the first and last author for that manuscript. In addition, duplicate authors (ie, published more than one manuscript as first or last author) were not removed from the analysis. First and last authors' sex was determined using publicly accessible biographies (eg, institutional pages) or, if unavailable, using the genderize.io Application Programming Interface (API) based on the author's first name and the country of their institutional affiliation.

Results

Bibliometric Analysis

A total of 2,534 articles were identified from the search strings, with 2,073 remaining after removal of duplicates (Figure 1). After screening, 414 articles were included for final analysis. These included 125 (30.2%) original articles, 42 (10.1%) review papers, 105 (25.4%) case reports, 27 (6.5%) editorials and commentaries, 94 (22.7%) letters and correspondences, and 21 (5.1%) conference abstracts (Figure 2). The most frequent countries of study or discussion included the United States (n = 128, 30.9%), Italy (n = 54, 13.0%), United Kingdom (n = 27, 6.5%), Spain (n = 20, 4.8%), France (n = 19, 4.6%), and China (n = 15, 3.6%), whereas 34 (8.2%) articles were unrelated to a specific country of study or practice. The majority (n = 393, 94.9%) of articles were published in English, with others reporting in Portuguese (n = 7, 1.7%), German (n = 6, 1.4%), Spanish (n = 5, 1.2%), and Mandarin Chinese, French, or Czech (n = 1, .2%). Funding was reported for a minority (n = 21, 5.1%) of articles studied.

The *Journal of Vascular Surgery* (n = 70, 16.9%), *Annals of Vascular Surgery* (n = 30, 7.2%), *Journal of Vascular Surgery: Venous and Lymphatic Disorders* (n = 17, 4.1%), and *Blood* (n = 13, 3.1%) were the most common journals in which included articles were published. The topics of the articles were mostly clinical (n = 284, 68.6%), followed by professional affairs and practice in vascular surgery (n = 74, 17.9%), research (n = 37, 8.9%), and education (n = 19, 4.6%) (Figure 3).

Four hundred and ten articles did not include group authorship. Among these, 2,987 authors were identified, or an average of approximately 7.3 authors per publication. In terms of gender representation, the first 6 months of 2020 yielded 170 articles, where 17.6% (n = 30) of first authors and 10.6% (n = 18) of last authors were female (Figure 4). In the latter half of the same year, 244 articles were published, with female representation in first authors increasing to 30.6% (n = 74), while 15.6% (n = 38) last authors were women. Out of the 21 projects that were funded, only four (19.0%) had a female first author, two (9.5%) a female last author, and two (9.5%) both.

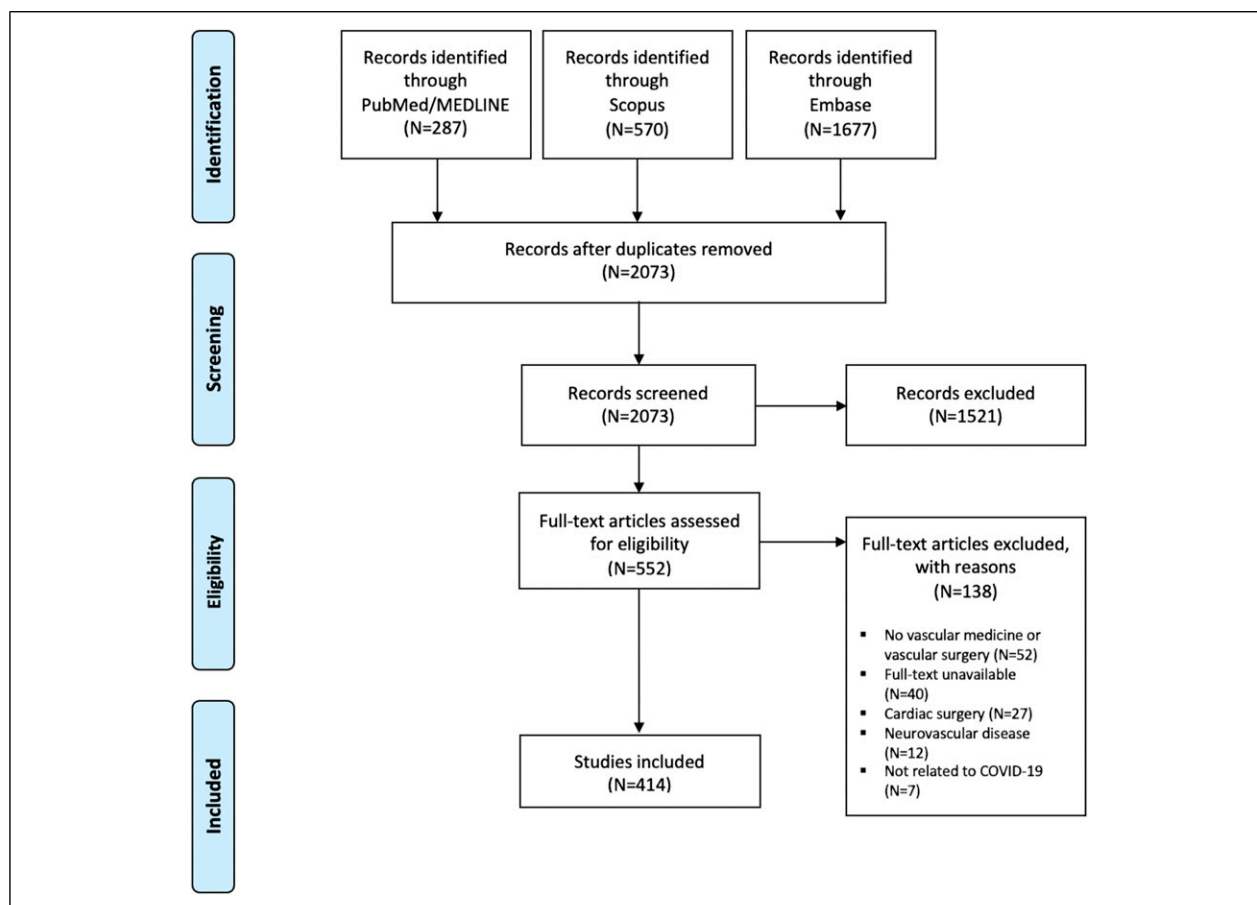


Figure 1. PRISMA flow diagram.

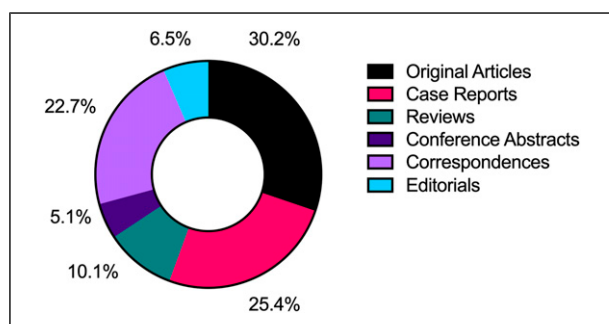


Figure 2. Distribution of article types among COVID-19-related vascular surgery and vascular medicine articles (January-December 2020).

Discussion

We live in an unprecedented pandemic overshadowed by a concurrent infodemic. In a matter of months, journals had published several thousands of articles related to COVID-19 as shown by PubMed/MEDLINE indexing. In times of uncertainty, rapid knowledge generation, experience sharing, and scholarly dissemination were needed to better guide ourselves, our colleagues, and our patients

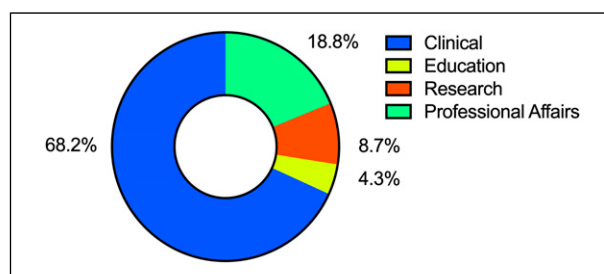


Figure 3. Distribution of themes of COVID-19-related vascular surgery and vascular medicine articles (January-December 2020).

through times of darkness.¹¹ In this analysis, we identified 414 articles related to vascular surgery or vascular medicine and COVID-19, of which a large share consisted of letters and correspondences (22.7%) and case reports (25.4%). The top 5 most common countries of study or discussion were exclusively in high-income countries (United States, Italy, United Kingdom, Spain, and France). A majority of articles (68.6%) described clinical outcomes of patients with COVID-19, highlighting trends towards increased rates of complications and death in

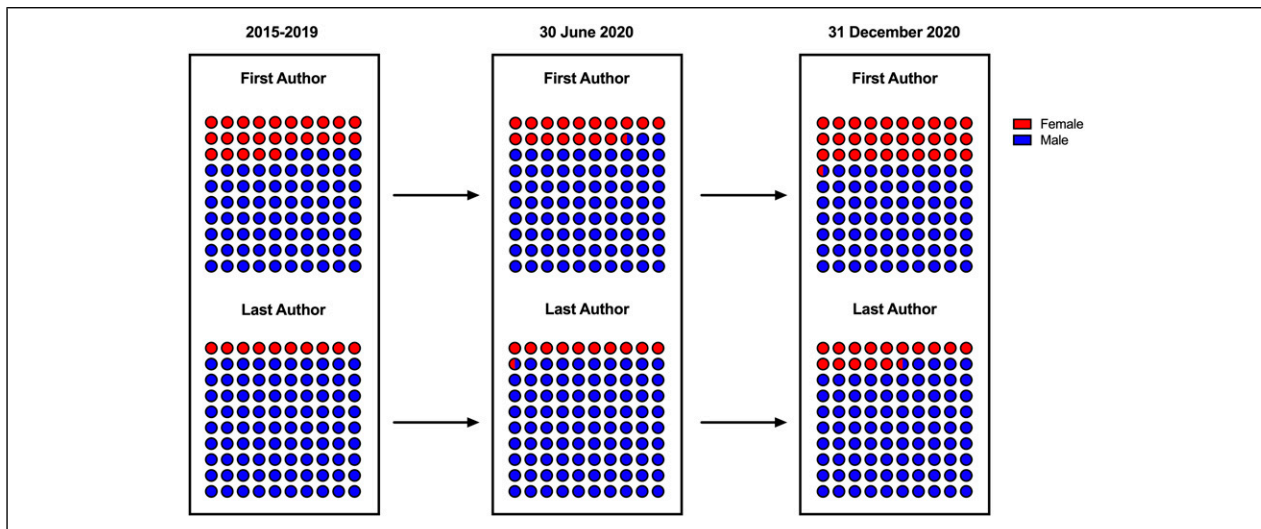


Figure 4. Sex-based distribution of first and last authors of articles related to COVID-19 and vascular medicine or surgery published in 2020.

vascular patients with COVID-19, although it must be noted that publication bias may be present.

Our bibliometric analysis in the field of vascular surgery corroborates with prior studies suggesting that the publication rate of women dropped relative to that of men during the COVID-19 pandemic.¹² Between 2008 and 2018, 21.0% of authors in the *Journal of Vascular Surgery* were female, including 22.6% of first authors and 12.4% of last authors.⁴ A larger analysis of the *Journal of Vascular Surgery*, *European Journal of Vascular and Endovascular Surgery*, and *Annals of Vascular Surgery* between 2015 and 2019 found that 25.0% of first authors and 9.9% of last authors were female.⁵ Our findings, although across the entire specialty and its journals, suggest a notable drop in female authorship 6 months into the pandemic but recuperation during the following 6 months. The early drop in female representation has been similarly observed in other specialties, including general medicine publications and early COVID-19 publications.^{13,14} In particular, first authorship female representation substantially dropped, which may suggest a greater burden placed on female trainees and junior surgeons and researchers during acute, uncertain times. Before the pandemic, sex-based disparities were prevalent in vascular surgery and most other surgical subspecialties. Female vascular surgeons, while receiving more grants, received less in industry payments, held fewer leadership positions, published less frequently, and were cited less regularly compared to their male counterparts.¹⁵ A recently retracted publication studying vascular surgeons' social media highlighted these pervasive systemic barriers, requiring affirmative action by the vascular surgery community.¹⁶ Nevertheless, for the last 6 months of 2020, assuming that most first authors are trainees or junior

faculty while last authors are senior surgeons, female authorship approached levels that resemble the proportion of female vascular trainees and surgeons in the United States, namely, 33.8% (30.6% of first authors in our study) and 14.6% (15.6% of last authors in our study), respectively.^{17,18} It must also be recognized that there is a risk of confounding in our analysis. During the first 6 months of the pandemic, surgical journals increasingly recognized the importance of diversity, equity, and inclusion. For example, in June 2020, 52 publishing companies, representing more than 15,000 journals, issued the "Joint commitment for action on inclusion and diversity in publishing."¹⁹ Similarly, in August 2020, JAMA Surgery issued a call to action for all surgical journals to improve diversity, equity, and inclusion in the editorial and peer-review process.²⁰

Moreover, the observed linguistic predominance of English despite a broad search strategy and no language exclusion illustrates the sustained anglophone nature of academic literature in the COVID-19 pandemic. These results corroborate previous observations, which pose important barriers for researchers and clinicians less comfortable with academic English to stay on top of the latest literature or share local experiences and knowledge during times of uncertainty.²¹

While the body of knowledge regarding COVID-19 has rapidly and vastly expanded in a short time, many questions remain unanswered, especially on an individual subspecialty basis. For vascular surgery, academic practice (eg, randomized controlled trials) has to be adapted to the new reality, requiring careful consideration and adaptation by all layers of the scientific process.²² Important multicentric and international collaboratives have been started to expand our knowledge regarding vascular

surgery during the pandemic. The Vascular Surgery COVID-19 Collaborative (VASCC), for example, was launched off of a WhatsApp group among vascular surgeons with a goal to better inform vascular practice in COVID-19 patients and assess the impact of widespread procedural cancellations and delays on patient outcomes.²³ Additionally, we identified a large number of editorials, commentaries, and letters to the editor that did not present with original data, a pattern which has been nicknamed the “covidisation” of research: a need for novel data and journals’ willingness to publish the latest on COVID-19, but not being strict enough to draw the line for what content to publish vs to pass.²⁴

This review presents some limitations. *First*, this study represents a snapshot of research and clinical knowledge regarding the interface between vascular surgery and COVID-19 in the year 2020. Professional societies, such as the Society for Vascular Surgery, have been proactive in disseminating information through their membership and through online webinars and conferences. These platforms have been important to ensure rapid dissemination of scholarly information and clinical experience, in a time where delays associated with the publishing process are costly.¹¹ *Second*, although there is a trend towards research “covidisation” and a vast need for knowledge generation exists during this pandemic, there is a clear skewing of “high-output” countries. For example, countries and institutions where services have been halted without requiring staff to support other departments, as was observed in some hard-hit regions, or where a culture of rapid research generation has not been present are disadvantaged or overseen. This self-selection practice builds on previous academic trends, and thus partially limits the generalizability of results to other countries and settings. *Third*, it may be that differential turnaround (ie, peer review and publishing) times among journals contribute to our findings. However, early in the pandemic, most journals and publishers expedited peer review and publication of COVID-19-related research. In addition, one would not expect female authors to be more likely to submit to or publish in late-turnaround journals, as turnaround time is poorly reflective of journals’ reputation, circulation, or impact factor. *Last*, the genderize.io API was used to determine the sex of first or last authors when institutional biographies and pronouns were unavailable. To improve the accuracy of the API’s output by accounting for geographical differences in first-name usage, first names were combined with authors’ country of affiliation. However, some first names remain nearly equally prevalent among male and female authors. In addition, in the absence of personal pronouns, it was not possible to determine gender identity for all authors. Nevertheless, this review is the first overview of the bibliometric changes in vascular surgery publications during the early COVID-19 pandemic period.

Conclusion

The number of publications related to COVID-19 and vascular surgery practice has been growing steadily since the early months of the pandemic. Letters, correspondences, and case reports make up the majority of vascular COVID-19 research, requiring a shift from anecdotal reports to more data-driven case series, cohorts, and clinical trials. The share of female authorship dropped in the first months of the pandemic but recovered after the first global wave. Opportunities arise to minimize the “covidisation” of vascular surgery research, whilst recognizing which questions remain unanswered and which academic gaps and inequities are created in vascular surgery as a result of the COVID-19 pandemic.

Authors Contribution

X.M. and D.V. elaborated the question and designed the study. X.M., D.V., and M.S.B. contributed to data extraction and analysis. L.M.D and J.G.L supervised the process.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Data Availability Statement

Data can be made available upon request.

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References

1. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. *Lancet Infect Dis*. 2020;20:533-534
2. COVIDSurg Collaborative. *Elective Surgery Cancellations Due to the COVID-19 Pandemic: Global Predictive Modelling to Inform Surgical Recovery Plans* Br J Surg; 2020. [Internet]. doi: [10.1002/bjs.11746](https://doi.org/10.1002/bjs.11746)
3. Kibbe MR. Consequences of the COVID-19 pandemic on manuscript submissions by women. *JAMA Surg*. 2020;155: 803-804
4. Hart KL, Boitano LT, Tanious A, et al. *Trends in Female Authorship in High Impact Surgical Journals between 2008 and 2018*; 2020. *Ann Surg* [Internet]. doi: [10.1097/SLA.0000000000004057](https://doi.org/10.1097/SLA.0000000000004057)
5. Buda AM, Pendleton AA, El-Gabri D, et al. *The Sticky Surgical Floor: An Analysis of Female Authorship Trends in*

- Vascular Surgery*, *J Vasc Surg*; 2021. doi: [10.1016/j.jvs.2021.07.228](https://doi.org/10.1016/j.jvs.2021.07.228)
6. Sarker MR. *Labor Market and Unpaid Works Implications of COVID-19 for Bangladeshi Women*; 2020. Gend Work Organ. doi: [10.1111/gwao.12587](https://doi.org/10.1111/gwao.12587)
 7. Parry BR, Gordon E. *The Shadow Pandemic: Inequitable Gendered Impacts of COVID-19 in South Africa*; 2020. Gend Work Organ. doi: [10.1111/gwao.12565](https://doi.org/10.1111/gwao.12565)
 8. Mahendradhata Y, Kalbarczyk A. Prioritizing knowledge translation in low- and middle-income countries to support pandemic response and preparedness. *Health Res Pol Syst*. 2021;19:5
 9. The Cochrane Collaboration. *Scoping Reviews: What They Are and How You Can Do Them*, 2021 Available from: <https://training.cochrane.org/resource/scoping-reviews-what-they-are-and-how-you-can-do-them>.
 10. PRISMA for Scoping Reviews [Internet], 2021 Available from: <http://www.prisma-statement.org/Extensions/ScopingReviews>.
 11. Vervoort D, Ma X, Luc JGY, et al. *Rapid Scholarly Dissemination and Cardiovascular Community Engagement to Combat the Infodemic of the COVID-19 Pandemic*; 2020. *Can J Cardiol* [Internet]. doi: [10.1016/j.cjca.2020.03.042](https://doi.org/10.1016/j.cjca.2020.03.042)
 12. Viglione G. Are women publishing less during the pandemic? Here's what the data say. *Nature*. 2020;581:365-366
 13. Pinho-Gomes AC, Peters S, Thompson K, et al. Where are the women? Gender inequalities in COVID-19 research authorship. *BMJ Glob Health*. 2020;5:5. doi: [10.1136/bmjgh-2020-002922](https://doi.org/10.1136/bmjgh-2020-002922)
 14. Andersen JP, Nielsen MW, Simone NL, et al. *COVID-19 Medical Papers Have Fewer Women First Authors Than Expected*, 9; 2020. *Elife* [Internet]. doi: [10.7554/eLife.58807](https://doi.org/10.7554/eLife.58807)
 15. Carnevale M, Phair J, Batarseh P, LaFontaine S, Koelling E, Koleilat I. Gender disparities in academic vascular surgeons. *J Vasc Surg*. 2020;72:1445-1450
 16. DiLosa K, Drudi L, M, Vascular Surgery Trainees. Changing tides: A vascular surgery trainee perspective on the #Med-Bikini Campaign and a call for action. *J Vasc Surg*. 2020;72:1819-1820
 17. *ACGME Residents and Fellows by Sex and Specialty*, 2015 Available from: <https://www.aamc.org/data-reports/workforce/interactive-data/acgme-residents-and-fellows-sex-and-specialty-2015>
 18. Cui CL, Khan MA, Janssen CB, Marmor RA, Freischlag JA, Malas MB. Women representation in academic vascular surgery: Leadership, education, and research. *J Vasc Surg*. 2021;74:e75-e76
 19. KingsburyB@rsc.org. *Joint Commitment for Action on Inclusion and Diversity in Publishing*. 2020 Available from: <https://www.rsc.org/new-perspectives/talent/joint-commitment-for-action-inclusion-and-diversity-in-publishing/>
 20. Kibbe MR, Freischlag J. Call to action to all surgery journal editors for diversity in the editorial and peer review process. *JAMA Surg*. 2020;155:1015-1016
 21. Ma X, Miranda E, Vervoort D. Placing equity at the core of vascular surgery research. *J Vasc Surg*. 2020;72:2220-2221
 22. Ma X, Luc JGY, Vervoort D. Moving Forward: Ensuring Quality Research in Vascular Surgery during COVID-19; 2020. *J Vasc Surg* [Internet]. doi: [10.1016/j.jvs.2020.07.048](https://doi.org/10.1016/j.jvs.2020.07.048)
 23. Mouawad NJ, Cuff RF, Hultgren R, Chuen J, Galeazzi E, Wohlauer M. The vascular surgery COVID-19 collaborative (VASCC). *J Vasc Surg*. 2020;72:379-380
 24. Pai M. Covidisation of academic research: Opportunities and risks. *Nature Research Communities: Microbiology*. 2020