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COMMENTARY

Weighing the impact (factor) of publishing in veterinary journals



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Abstract The journal in which you publish your research can have a major influence on the perceived value of your work and on your ability to reach certain audiences. The impact factor, a widely used metric of journal quality and prestige, has evolved into a benchmark of quality for institutions and graduate programs and, inappropriately, as a proxy for the quality of individual authors and articles, affecting tenure, promotion, and funding decisions. As a result, despite its many limitations, publishing decisions by authors often are based solely on a journal's impact factor. This can disadvantage journals in small disciplines, such as veterinary medicine, and limit the ability of authors to reach key audiences. In this article, factors that can influence the impact factor of a journal and its applicability, including precision, citation practices, article type, editorial policies, and size of the research community will be reviewed. The value and importance of veterinary journals such as the Journal of Veterinary Cardiology for reaching relevant audiences and for helping shape disciplinary specialties and influence clinical practice will also be discussed. Lastly, the efforts underway to develop alternative measures to assess the scientific quality of individual authors and articles, such as article-level metrics, as well as institutional measures of the economic and social impact of biomedical research will be considered. Judicious use of the impact factor and the implementation of new metrics for assessing the quality and societal relevance of veterinary research articles will benefit both authors and journals.

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Where you publish is important. Even as online publishing has shifted our focus from bound print issues to article PDFs, the prestige and importance of a journal—the package in which your article is wrapped—can have a big influence on the perceived value of your work and on your ability to reach certain audiences.

Today, the value of a journal is determined largely by its impact factor, a widely used metric of journal quality and prestige. An impact factor is a ratio of the number of citations a journal receives in a given year to articles published during the previous 2 years, relative to the total number of articles published over the same period.^{1,2} For example:

$$\text{2013 impact factor} = \frac{\text{number of citations received in 2012 to articles published in 2011 and 2010}}{\text{number of articles published in the journal in 2011 and 2010}}$$

Over the past 2 decades, the impact factor has evolved from a tool intended to aid librarians in purchasing journals for their collections, to the primary benchmark for discipline-based rankings and a proxy for the scientific quality of individual articles, authors, graduate programs, and universities.^{3,4} The linked valuation between impact factor and individual research articles has led us down a slippery slope to where this single number can make the difference in getting tenure, promotion, a job, or a grant. In China, authors receive cash rewards to publish in high impact factor journals⁵; in Greece, faculty hiring is based in part on a “total impact factor”, the sum of the impact factor of all the journals in which a person has published; in Brazil, the allocation of research resources and fellowships is linked to journal ranking and impact factor.⁶ This competitive race to attain “maximum impact” has altered the behavior of both authors and editors, with publishing decisions often based solely on impact factor. Sadly, the drive for impact comes at the expense of specialty journals and journals representing small research communities, including veterinary medicine and regional and local journals, making it more difficult for them to grow and improve.³

A look at the numbers

A journal’s impact factor is published annually by Thomson Reuters in *Journal Citation Reports*. In

2013, impact factors ranged from 0.000 to 162.500 for the 8474 science journals in the Thomson-Reuters Web of Science database.⁷ The distribution of impact factors is highly skewed: the median value was approximately 1.4 and only 2 journals (*CA: A Cancer Journal for Clinicians* and the *New England Journal of Medicine*) had an impact factor >50. Nearly 24% of journals had an impact factor of ≤ 1.0 while only about 7% had an impact factor ≥ 5 . For the 129 journals in the Veterinary Sciences category, impact factor ranged from 0.071 to 3.383 and 74/129 (57%) journals had an impact factor of ≤ 1.0 (Fig. 1).

While impact factor generally reflects the influence of a journal, it has limitations and should

not be taken at face value. First, journals get most of their citations (~80%) from a small proportion of articles (~20%), so citation data are highly skewed, affecting statistical validity.^{2,8} Further, reporting impact factor to 3 decimal places—intended to avoid overlap and facilitate ranking—implies a false sense of discrimination among journals.^{2,8} Instead of 124 unique rankings for 129 veterinary journals, there are only 28 rankings when impact factor is rounded to one decimal place and only 4 rankings when impact factor is rounded to a whole number (the actual precision of the impact factor measurement). Large changes in journal ranking can result from small changes in citations, article categories, or the number of papers published. In addition, the

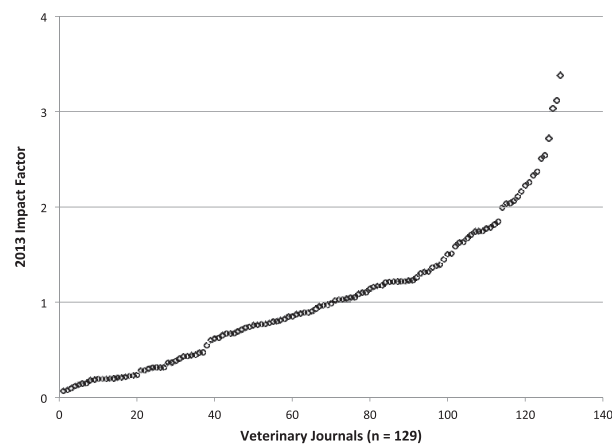


Figure 1 Impact factors (2013) for journals in the Veterinary Science category.

variance around impact factor can be wide, making it difficult to assess meaningful differences; citation rates for journals with impact factors as different as 2.7 and 5.4 were recently found to be indistinguishable statistically.⁶ The abundance of citation errors further affects the precision of the impact factor.² Lastly, Thomson Reuters limits access to its proprietary database, limiting the ability of the scientific community to evaluate or replicate impact factor calculations and test the assumptions behind them. Recently, *PLOS Medicine* editors were stymied in their effort to find out how “citable” articles in their journal were counted, a number that drastically affects the denominator of the ratio, and therefore the impact factor.⁴

Factors that influence a journal’s impact factor

The impact factor varies widely by discipline and reflects the citation practices, size, and interdisciplinary connections of the research community. Because of this it is important to use discipline-specific categories when comparing journals and impact factors (although the rationale for grouping certain journals is not always obvious). The discipline of General and Internal Medicine, for example, has about the same number of journals ($n = 150$) and median impact factor (1.333) as Veterinary Science ($n = 129$, 0.907), but encompasses a much wider range of impact factors (0.077–54.420 versus 0.029–3.426), reflecting the larger size of its research community. Rapidly moving fields like virology have higher impact factors than fields that change more slowly, like agriculture. Disciplines with a high rate of co-citations with adjacent disciplines, such as human health, receive more citations than fields that are relatively self-contained.⁹ Sometimes co-citations work mainly in one direction: an article published in a small animal journal, for example, may cite relevant articles from medical journals, but the small animal article may not be cited by medical researchers unless a defined animal model is involved.

Article type, length, study design, and language also affect citations and impact factor. Basic research is cited more often than clinical research; reviews and meta-analyses are cited more often than original research; and original research is cited more often than case reports.^{10,11} In an effort to boost impact factor, many journals have discontinued publication of case reports despite

their educational value for clinicians and trainees. Importantly, impact factor does not fully measure the influence of an article on clinical practice; veterinary practitioners who benefit from and apply clinical research often don’t do research or cite papers themselves. Further, English language articles are cited more often than non-English articles. This has not deterred veterinary journals in Europe, Asia, and Latin America from publishing in their national language to better communicate with veterinary practitioner communities.⁹

Impact factors also are affected by editorial practices and policies, such as limiting the number of references in articles or selecting articles based primarily on novelty or newsworthiness. Impact factor tends to correlate with a journal’s rejection rate, but journals accept papers for different reasons. Journals with broad scope have large research communities and hence more submissions, so are more selective for articles that not only are high quality but are likely to generate strong interest. *Nature*, for example, has an acceptance rate of only 8%, and an impact factor of 38. Other journals, such as *PLOS ONE*, accept papers based solely on scientific and technical validity; it has a relatively high acceptance rate (69%) and a 2013 impact factor of 3.5.¹² Specialty journals like *Veterinary Clinical Pathology* serve a small research community and have relatively low impact factors, but are committed to publishing a wide range of educational, diagnostic, policy, and research content in their specific fields.

Impact factors are easily manipulated, mainly by self-citation. Editorial staff at some journals encourage (and sometimes require) authors to add references to their manuscript that increase their journal’s citations and impact factor.¹³ Thomson Reuters reports impact factor both with and without self-citations, and monitors citation patterns to identify journals that appear to have inappropriately inflated their impact factor with self-citations. They recently suspended several Brazilian journals for “citation stacking”, a scheme devised by the editors to boost each others’ citations and impact factors; the plan grew out of frustration with Brazil’s policy of using impact factors to evaluate graduate programs.¹⁴

Impact factor does not correlate with the quality of individual articles or with readership

An impact factor reflects the citation rate and, by that measure, the general quality and prestige of a

journal; a journal's impact factor does not measure or correlate with the quality of individual articles or authors. The citations a journal receives are averaged across its articles and only a few articles get cited often; many other articles—in the same journal with the same impact factor—get few or no citations.² Similarly, journals with a low impact factor may contain high quality articles. Further, impact factor does not differentiate positive from negative citations. Was an article cited as an example of a biased or flawed study or because it was successfully replicated by the work of others? Impact factor can measure influence, but not quality. A recent study in the *Journal of Veterinary Internal Medicine* found that poor quality studies were cited just as often as high quality studies.¹⁵ Thus, other metrics and methods of assessment are needed to evaluate the quality and influence or “impact” of individual articles and authors.

Where you publish is a key factor in your ability to reach certain audiences.¹⁶ Submitting your article to a journal based primarily on impact factor does not ensure your research will be read by others in your field unless they specifically look for and find your article in a database. Submitting your manuscript to a specialty journal or one aimed at a veterinary audience makes it more likely relevant experts and end-users will browse and read it. Because the editorial board of specialty journals like the *Journal of Veterinary Cardiology* includes some of the top experts in the field it can also mean a more rigorous peer review process; but what better measure of scientific quality than to be evaluated by your peers?

A colleague once advised: “To be successful, never publish in a journal with ‘veterinary’ in its title”. This advice reflects in part the value placed on high-impact journals. Submitting your research to a journal based *solely* on impact factor will pretty much guarantee that veterinary journals never have the opportunity to publish the best papers in the field. Because impact factor is used so pervasively in the assessment of individuals and their research, investigators have little incentive to publish in low-impact journals, regardless of how well the scope and audience fit.

Looking to the future: shifting the focus in academic evaluation

Efforts are underway to shift the focus of academic evaluation away from using a journal's

impact factor to assess the scientific quality of individual articles and authors. In 2012, a group of editors and publishers established the *San Francisco Declaration on Research Assessment: Putting Science into the Assessment of Research*. Among the recommendations was “the need to eliminate the use of journal-based metrics, such as the Journal Impact Factors, in funding, appointment, and promotion considerations.”¹⁷ The International Association of Veterinary Editors is one of 484 organizations and nearly 11,000 individuals that have signed the San Francisco Declaration. Thomson Reuters also has acknowledged the inappropriate use of impact factors in evaluating the quality of individual articles.¹⁸

If not a journal's impact factor, what measures can be used to evaluate the quality of an author's research article? As of yet, a single alternative widely accepted metric remains elusive. Rather, a wide range of publication metrics, as described in an excellent recent review, is likely to be most effective for highlighting academic productivity and research impact.¹⁹ The *h*-index is an author-specific metric that uses citations to measure the impact and productivity of scientists working in the same discipline. Thomson-Reuters is unveiling a new set of metrics (InCites) that link impact factor with article-level data.²⁰ Article-level metrics, including the number of times an article is viewed, cited, saved, downloaded, discussed, and recommended are calculated by many open access and online publishers and citation indexes.^{19,21} *Frontiers* journals allow readers to score the academic excellence and social relevance of its articles. These and other alternative metrics or “altmetrics” based on social media and other web-based environments are growing rapidly as new benchmarking tools of research quality for academic assessment. However, all of these metrics have different strengths and limitations that must be weighed accordingly within a particular context or discipline. Importantly, the quality of a scientific article—and its impact—cannot be summarized in a single number. On a broader scale, national initiatives are underway, such as the Research Excellence Framework in the United Kingdom, to define criteria—both quantitative and qualitative—that measure the economic and social impact of medical research.²² Concerted efforts such as this one are contributing to new definitions and parameters of research quality for assessing programs, universities, and healthcare services that could limit reliance on the journal impact factor

and keep this controversial metric in its appropriate place.

The Journal of Veterinary Cardiology

The *Journal of Veterinary Cardiology* will soon receive its first impact factor. What can you do to keep the impact factor in perspective while supporting your journal as an important publication for cardiovascular research in animals and animal models?

- Use the impact factor as only one of many indicators of journal quality; do not use the impact factor as a measure of the quality of individual articles or authors.
- Consider the reputation of the *Journal of Veterinary Cardiology*, whose editorial and review boards include many of the top experts in veterinary cardiology.
- Focus on readership: what audience do you want to reach most directly? Which clinicians and investigators are likely to follow and read your target journal most closely?
- Remember the other ways a journal can influence its field: does it publish guidelines that set the standard of practice? Does it publish educational articles for trainees and practicing veterinarians? Does it publish work by under-represented groups?
- Make sure your institution subscribes to the *Journal of Veterinary Cardiology* so its articles are widely available locally.
- Encourage efforts to enhance the accessibility of articles in the *Journal of Veterinary Cardiology* and to explore new metrics of article quality, relevance, and influence on policy and clinical practice.
- Work with your institution to promote appropriate measures of academic evaluation for decisions on hiring, promotion, and funding.

Conflict of interest statement

Dr. Christopher is the coordinator of the International Association of Veterinary Editors, which receives sponsorship from Wiley and Elsevier. She co-authored *Writing for Publication in Veterinary Medicine*, which is published by Wiley. Dr. Christopher was Editor-in-Chief of *Veterinary Clinical Pathology* for 12 years and currently is Field Chief

Editor for a new open-access journal, *Frontiers in Veterinary Science*. She is a former member and chair of the NIH National Library of Medicine Literature Selection Technical Review Committee for MEDLINE.

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