



Open access medical journals: Benefits and challenges

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Abstract The world of medical science literature is ever increasingly accessible via the Internet. Open access online medical journals, in particular, offer access to a wide variety of useful information at no cost. In addition, they provide avenues for publishing that are available to health care providers of all levels of training and practice. Whereas costs are less with the publishing of online open access journals, fewer resources for funding and technical support also exist. A recent rise in predatory journals, which solicit authors but charge high fees per paper published and provide low oversight, pose other challenges to ensuring the credibility of accessible scientific literature. Recognizing the value and efforts of legitimate open access online medical journals can help the reader navigate the over 11,000 open access journals that are available to date.

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Introduction

A fantastic expansion in the number of online open access medical journals has occurred over the past 20 years. According to the Web of Science database, the percentage of open access papers of all published contributions increased from 9.5% to 24% from 1998 to 2018.¹ For the most part, these journals have been a wonderful source of information that can be accessed without cost and made available to a worldwide audience. Purely online journals are less expensive to publish, but there are still significant costs and fewer potential sources of revenue. The infrastructure necessary to host,

review, edit, and format issues is still quite substantial. Who bears the costs and who profits? The answers to these questions vary widely among open access journals; however, the mission of education, the real reason for existence of medical journals, should not be forgotten in the attempts to remain viable and thrive.

Open access journals

The first open access online medical journal, *Dermatology Online Journal*, published its first issue in 1995.² Currently, the number of open access journals includes nearly 11,780 that can be searched at the contribution level.³ By definition, these journals must make their full content available online, including text, images, and figures, without financial cost to readers. A worthy goal is to allow dissemination of important medical

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and scientific information to promote scientific advances and improvement in medical care. There are two main forms of open access (OA), plus a hybrid and platinum types:

1. In the green OA model, an author publishes in an established journal, but then may self-archive in an open access repository or open access website, usually after an embargo period of 6 to 12 months.⁴
2. In the gold OA model, the final version of the paper is made immediately available to readers without charge on the publishing site, but usually there is a substantial charge to the author to publish.⁴
3. There is a hybrid form in which a subscription journal will offer open access in the journal archive if the author pays a fee.⁵
4. Another category has been recently defined as platinum, in which a paper is peer-reviewed and OA, but no fee is charged to the author.⁶

The goal of OA should be to increase access to research and to allow more contribution opportunities for publishing by junior authors and developing countries. In fact, OA papers are associated with significantly higher citation rates compared with non-OA papers, ranging from 36% to 172% more.⁷ Selection bias may play a role, as authors may choose to publish OA contributions with the intent of disseminating their research to a broader audience. They may also seek out media-sharing platforms and actively engage in more self-promotion; however, one study found that the “OA advantage” in citations persisted regardless of whether contributions were made OA through author self-archives or through mandated institutional repositories, suggesting that self-selection bias played less of a role than overall ease of access.⁸ As a result, OA papers are likely to have more citations simply because they are more readily accessible. This is reflected in the higher rates of media coverage for OA papers compared with non-OA papers published by the same journals. For instance, OA contributions in *Nature Communications* were found to have 2.5 to 4.4 times more page views than their non-OA counterparts and were shared with twice as many unique tweeters.^{9–11}

Journal funding and access issues

Before online publishing existed, dissemination was cumbersome, through costly paper journals that could be accessed only in libraries or by personal subscription. Production costs were large, but still there were substantial profits fully realized only by the publishers. With the advent of online publishing, the publisher still retained the profits from these paywalled contributions, even though, in either case, much of the reported research was publicly funded.

The fact that most of the publication profit relating to publicly funded research was enriching publishing companies was recognized as a problem in need of a solution. Libraries

and other publicly funded institutions were being financially crippled by subscription costs. In December 2007, President George W. Bush signed a spending bill including a mandate that peer-reviewed publications of research funded by the National Institutes of Health be made available through the open access repository PubMed Central. The open access was to occur after an embargo of not more than 12 months.¹²

A similar mandatory policy was also adopted by the Howard Hughes Medical Institute and the Wellcome Trust, based in the United Kingdom, at about the same time. An earlier voluntary attempt by the National Institutes of Health in 2005 had resulted in only 4% compliance.¹²

The movement toward open access has advanced further in several European countries. Libraries and university consortia have been in active negotiations with major publishers (Elsevier, Springer Nature, and Wiley) for years, particularly after dissemination of the Berlin Declaration in 2003.^{13,14} In 2014, a consortium of institutes in the Netherlands was able to negotiate a subscription deal that allowed academic authors to openly publish their work; many other national consortia are working to follow suit.¹⁵ The DEAL project in Germany was set up in 2014.¹⁶ The DEAL project aims to promote:

- immediate open access upon publication of all publications from designated institutions
- full access to publisher-controlled electronic journals
- negotiated fair publication fees to cover costs of publication¹⁴

The architects of DEAL also advocate that open access cannot be limited by country but must be global. The overall slow progress of this movement has resulted in a recent agreement in May 2018 by many European consortia to share their negotiation approaches with one another to facilitate the contracting process with publishers.¹⁵

Contribution-processing charge

The negotiation of fair publication fees to cover the cost of publication is a tenet of the DEAL project. In general, to shift from expensive subscription fees for libraries and other public institutions another source of revenue is required, and open access has been associated with the advent of the article-processing charge (APC). This fee is paid by the authors/submitters themselves. Although some open access only journals charge no fee, it is much more common to charge authors a fee; these costs vary widely. Currently PLOS One charges \$1595 per published paper. Many are higher than this (above \$4000), although estimations of actual costs of publication are likely to be much lower than this, perhaps under \$900 per submission.¹⁷ In addition, the practice of tying acceptance to fee acquisition further leads to the temptation to lower standards and publish more papers, resulting in acceptance rates exceeding 50% in some cases.¹⁷ In addition, the large APCs

preclude the publication of manuscripts by authors from poorly funded departments and institutions. Although there are many benefits to the early introduction of medical students and young scientists to research and publication,⁶ they are certainly at a disadvantage when APCs are high. A listing of author fees may be found on the Eigenfactor site (www.eigenfactor.org). In addition, an Eigenfactor index of open access fees, a ratio of an estimate of article influence related to author fee, can be viewed on this site, along with a list of OA journals with APC and OA no-cost journals.¹⁸

Predatory journals

A negative result of OA support by APC is the advent and proliferation of the predatory journal, sometimes defined as a journal with little oversight, high acceptance rate, and high APC. Pressure on academic authors to publish and the need to be able to disseminate work in a timely fashion has fed this predatory expansion, such that a list of such predatory publishers will have reached over 1200 by the end of 2018.¹⁹ There have been criticisms of this list relating to objectivity and a bias against new journals and OA, in general. This blog was removed in 2017,⁵ but an updated list is archived.¹⁹ In an attempt to aid authors in identifying predatory journals, other authors have developed guidelines for authors. One contribution²⁰ in *Clinics in Dermatology* has outlined clues to aid in the recognition of predatory journals. These include the adoption of similar titles and layouts to known, established journals, known as hijacking; the presence of several webpage versions for the same title; and the use of false or altered names of editors and board members. Generally, these journal names cannot be found in established scientific databases.

Predatory publishers have even been known to acquire legitimate indexed publications so that the former can mask aggressive profit-driven business strategies behind a seemingly reputable brand. This was highlighted in the case in which the once-respected *Experimental and Clinical Cardiology* was bought by publishers in 2013, who began accepting plagiarized papers and blatantly phony submissions²¹; furthermore, predatory publishers often advertise an unsubstantiated assessment of influence that is similar in name to the impact factor (IF) (Journal Citation Reports), such as “unofficial IF” or “prognostic IF.”²⁰

These journals may also actively solicit papers via e-mail from academic authors in addition to their practice of soliciting agreements to list academic authors as editors, board members, and reviewers.²⁰ A recent paper, looking at publications of surgery department faculty, found that many senior surgery faculty members publish in solicitant journals despite low or no impact factors, lack of PubMed indexing, and a mean contribution cost of \$1302.²² In addition, nearly two-thirds of the 113 solicitant journals assessed were only launched very recently in 2016. Upon survey of the senior academic authors, the top reported reasons for submission included waived publication fees, invitation, and difficulty publishing elsewhere.

The Directory of Open Access Journals was created to list OA journals that conform to criteria related to quality, oversight, and sustainability.³ It is also a requirement for listing that the author retain unrestricted copyright⁵; however, there is currently no fully comprehensive listing of legitimate journals, and there are a number of organizations currently aiding in developing criteria and guidelines for these, such as the Open Access Scholarly Publications Association.^{23,24}

Additional funding sources

There is a third avenue of potential funding besides subscription and APC. This funding would come from universities, public institutions, and scientific societies. Public funding through universities and public institutions supports the research, teaching, and salaries of academic authors. It stands to reason that these institutions should maintain at least some control of the publication and dissemination of the work. The California Digital Library arm of the University of California (<https://escholarship.org>) is one example of such an OA endeavor by a university system.²⁵ This site publishes over 70 academic journals, including the *Dermatology Online Journal*, which is managed by the University of California, Davis School of Medicine Department of Dermatology. All of the journals hosted by the California Digital Library offer free access and zero APC. Other universities and institutions with similar models include Cleveland Clinic, Massachusetts Institute of Technology, George Washington University, Princeton University, and the National Institutes of Health, among many. These institutions offer journals in a wide variety of fields, including mathematics, medicine, and law. Device and pharmaceutical companies may also aid in support of some journals or issues with particular topics. This is very limited for university-sponsored journals because of the imposition of stringent restrictions on inclusion of logos or sponsorship acknowledgments by many universities.

Scholarly societies also play a key role in supporting journals that disseminate peer-reviewed articles relating to their societies. There are various models for this, one of which is the *Journal of Neurochemistry*, supported and owned by the International Society of Neurochemistry.²⁶ This society subcontracts with a publisher, and they share profits. It is a hybrid journal; the author can pay a reduced fee for immediate OA. Society members can publish contributions at a reduced rate, although this is still currently a \$1000 charge. Other societies that support such journals include the American Academy of Family Physicians, Canadian Diabetes Association, Max Planck Society, and the American Economic Association; all of these societies have no author APC.

Ensuring permanence

Concerns have also been voiced about adequate preservation of the expanding body of OA material.²⁷ Whereas printed

books and journals have traditionally been housed in libraries, albeit with variable safety, the permanence of new online journal material has often been dependent on locally housed servers. The development of repositories, many of which are open access and supported by private and public institutions, is addressing the issue of permanence. Active open access repositories may be viewed in the Registry of Open Access Repositories.²⁸ Maintaining permanence of digital information on such archives requires various safeguards, such as data loss prevention (backing up data, using stable web addresses, utilizing secure web APIs) and ongoing collaboration with international repositories, as well as periodic self-inspection by the authors to ensure that their work is being preserved appropriately.^{29–32} A condition of MEDLINE/PubMed indexing requires journals to participate in a certified repository. Currently, acceptable certified repositories include PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/>), Portico (<https://www.portico.org>), and CLOCKSS (<https://clockss.org>). The assurance of long-term open access and preservation is essential to continued growth and expansion in research and other academic activity.

Conclusions

Open access medical journals provide many valuable benefits for the entire international scientific community. The challenge of maintaining such journals is a result of the delicate balance between providing and preserving valuable information without compromising principles, while also facing the financial and technical burdens involved in running a publication. Larger well-funded, for-profit journals are less likely to face these issues; nevertheless, the opportunity for medical students, academic physicians, community physicians, and international authors to contribute to and learn from the vast resources provided by OA online journals is priceless.

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