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The history of open access medical publishing: a comprehensive review

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## Review

### The history of open access medical publishing: a comprehensive review

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## Abstract

Dermatology Online Journal became the first medical open access journal in the early 1990's. Today, thousands of open access medical journals are available on the Internet. Despite criticisms surrounding open access, these journals have allowed research to be rapidly available to the public. In addition, open access journal policies allow public health research to reach developing countries where this research has the potential to make a substantial impact. In the future, open access medical journals will likely continue to evolve with technology, changing how medical research is accessed and presented.

## Introduction

According to the Directory of Open Access Journals, there are approximately 2,000 open access medical journals in existence today. Since their inception in the 1990's, open access journals now cover a multitude of medical subjects from malaria to health research and development.

Although many versions of online medical journals exist, open access medical journals are those whose content is accessible to readers online. Content includes text, images, figures and data. Truly open access means there are no barriers, either financial or technical, to readers. In some instances, fees are transferred to the authors who provide payment for publication. There are immediate (gold) and delayed (green) access policies relating to when articles become openly accessible. Articles becoming immediately accessible usually require a fee. Delayed open access policies usually make articles available 6 to 12 months after publication.

The Howard Hughes Medical Institute (HHMI) and National Institutes of Health (NIH) mandated open access policies as early as 2007 and 2008, respectively [1, 2]. These institutes now require peer-reviewed articles to be available through PubMed Central within 12 months of publication.

The advantages of open access journals are many. Most importantly, information is quickly and easily accessible, which is important in a field with rapidly expanding knowledge. In addition to accelerating dispersal of discoveries, open access is an asset to the general public and it is of utmost importance for developing countries. Due to limited resources, developing countries greatly benefit from open access journals, especially for public health research. In response to this need Research4Life partnered

with the World Health Organization (WHO), United Nations Environment Programme (UNEP), Food and Agriculture Organization of the United Nations (FAO) and others to create four programs aimed at increasing developing countries' access to peer-reviewed research. These programs encompass medicine, agriculture, environment, and applied science and technology. Medical research is published through the Health Internetwork Access to Research Initiative (HINARI). Contributing journals include the Journal of the American Medical Association (JAMA) and British Medical Journal (BMJ).

Evolving in parallel with open access was the emergence of online publishing. General advantages of online publishing include access to supplemental material, and increased author and reader interaction. Text now can include links to resources like relevant papers, videos or other materials such as computer rendered molecular structures. Also, because online publishing circumvents the use of resources like paper and ink, there is less restriction on word count and images. Lastly, there are numerous benefits for authors. Online publishing greatly improves tracking of article performance. Now a variety of novel metrics (e.g. altmetrics, PlumX) are available to assess an article's immediate impact. Thus, online publishing allows greater interaction between researchers and the scientific community at large.

Despite the many advantages of open access journals, disadvantages exist. A major criticism of open access journals is lack of stringent peer-review processes, allowing a deluge of low quality research to be published. Science journalist John Bohannon aimed to reveal high publication rates of low quality papers by submitting a fake manuscript to multiple open access journals. Despite obvious flaws in study design and analysis, the manuscript was accepted by 70% of journals to which it was submitted [3]. With costly publication fees up to \$5,000, open access journals have posed as a guise for lucrative businesses. Well-known open access journals like The Public Library of Science (PLOS) have faced similar criticisms with bloggers calling PLOS the "Public Library of Sloppiness" [4]. According to Peter Binfield who ran PLOS, the rejection rate was approximately 30% for submissions and manuscripts are reviewed by approximately 1.8 reviewers plus an editor [4].

Another criticism of PLOS is their data sharing policy. In 2013, PLOS journals required that authors submit all datasets used to create the figures and conclusions in submitted manuscripts [5]. This policy is intended to increase transparency, allowing for "replication, reanalysis, new analysis, interpretation or inclusion into meta-analyses" [5]. PLOS has received pushback for this policy as it puts certain authors at a disadvantage. Publishing datasets can jeopardize their use in future publications, and may reveal the novel approaches of small laboratories struggling to compete with larger, well-funded laboratories.

Despite these criticisms, medical open access journals are the evolutionary extension of paper journals, catering to the need for quickly accessible information. Though the importance of online access is obvious today, the usability of the Internet was questionable at a time when these journals came to fruition. One of the pioneers of medical Internet publishing was Dr. Arthur Huntley of the University of California, Davis. His first attempts resulted in an online medical atlas published in 1993 aimed at training medical students in dermatology. In 1994 he began coding the first medical open access journal, Dermatology Online Journal (DOJ) which published its first issue in 1995 [6]. Shortly thereafter it became the first open access journal to be indexed in PubMed. According to Dr. Huntley, DOJ was created as "a virtual laboratory for the exploration of the WWW medium for continuing education in the field of dermatology" [7]. Today, the DOJ continues to provide open access for peer-reviewed articles with over 600 articles published to date.

Publishers of major journals followed. The New England Journal of Medicine (NEJM) began delayed open access in 1996 with articles released 6 months after publication. In addition, NEJM now indexes past articles dating back to 1812. PLOS launched its first journal, PLOS Biology, in 2003, which was quickly followed by other journals including PLOS ONE, PLOS Medicine, PLOS Computational Biology and PLOS Genetics. JAMA followed suit one year later, allowing delayed open access for articles published in 2004.

Publishers of other major impact journals including Cell, The Lancet and Chemical Reviews, and Nature have created open access journals more recently. Cell Reports, the open access version of Cell, began in 2012 with the goal to publish high quality research covering all of biology. The Lancet Global Health was The Lancet's first open access journal, opening in 2013 in response to RCUK policies to expand research access to developing countries. The publishers of Chemical Reviews, American Chemical Society (ACS), began their open access journal in 2014 called ACS Central Science. One article is released daily and there are no publication charges to authors. Even more open access journals were created in 2014 and include Science Advances from the publishers of the prestigious journal, Science. A timeline of the major developments in open access publishing can be seen in Figure 1.

Figure 1. Timeline of Open Access Medical Journals

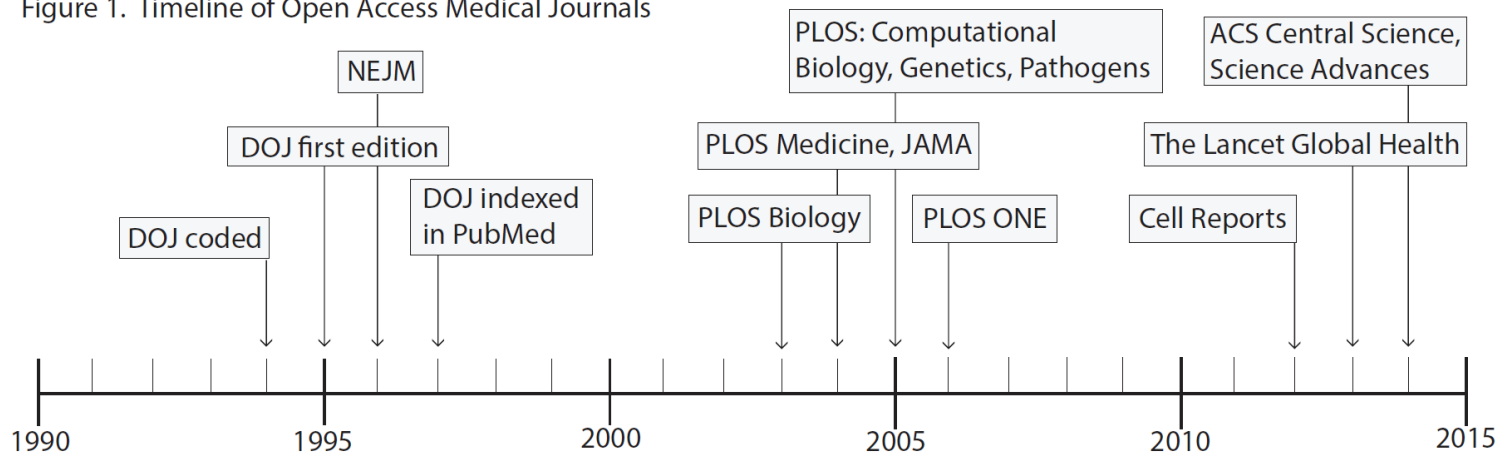


Figure 1. Timeline of Open Access Medical Journals.

## Conclusion

Though open access medical journals are a recent development, they have changed the field of medical research, perhaps for better and worse. On one hand, open access medical journals have increased the rapidity of publishing, pushing medical discoveries forward. On the other hand, they have allowed lower impact and lower quality research into the viewing arena. In the future, this pace is unlikely to slow; therefore the challenge will not be scarcity of information, but successfully navigating an inundation of research.

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Figure Legend

Figure 1. Timeline of Open Access Medical Journals.