

## Occasional essay

## Medical journals are dead. Long live medical journals

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The year is 2003. The world's leading medical journal has gone bankrupt. Three leading English-language cardiology journals are merging. Some general medical journals are thriving; others have begun to founder. Dr. Harold Varmus has received the Nobel Peace Prize.

The tidal wave that led to these events is PubMed Central, a central, entirely electronic repository of research papers in the biomedical sciences. Operated by the US National Institutes of Health, PubMed Central was launched in January 2000 "to make results from the world's life sciences research community freely available on the Internet."<sup>1</sup>

Some prestigious journals failed to make innovations in response to PubMed Central. They vigorously defended their ownership of articles by continuing to insist that authors assign copyright to them. Intent on protecting their subscriber-based advertising revenues, they continued to restrict access to their Web sites to paying subscribers. However, realizing that these policies limited the dissemination of their findings, authors no longer sent their best work to these journals. Subscriptions fell, advertisers defected, and some of the leading journals ran into financial trouble.

Journals that recognized that their business was not merely publishing articles but educating physicians and health care policy-makers embraced the spirit of PubMed Central and thrived. *BMJ*, which launched its free-access full-text Web site in 1998,<sup>2</sup> and *CMAJ*, which followed suit in 1999,<sup>3</sup> were among the first journals to sign on to PubMed Central. In 1999, *BMJ* launched Netprints, "an electronic archive where authors can post their research into clinical medicine and health before, during, or after peer review by other agencies."<sup>4</sup> By the end of the year 2000, both journals were asking authors to post their research papers directly on Netprints or another e-print server and to email the target journal requesting peer review.

In 2001 the key innovation was customization of information. The more progressive journals profiled their subscribers and hired content experts to monitor e-print servers, selecting and evaluating articles of high interest to specific groups of subscribers. Each subscriber received weekly email commentaries prepared by these experts on the most important developments in their field. These commentaries highlighted the strengths and weaknesses of

the articles, put the information in the context of related research and discussed the practical implications for physicians. The commentaries were linked to the original research article on Netprints or another e-print server, the journal's Web site, another journal's Web site, or PubMed Central.

By 2002, Netprints and other e-print servers had evolved into a free market in knowledge. Journals were scanning the posted articles, evaluating them, assessing "rapid responses" to the articles by colleagues, selecting articles for commentaries, and approaching authors to offer to publish their studies on their Web sites.

The economics of journal publishing changed. Competitive advantage no longer derived from the ownership of articles. In 2000, *BMJ* changed its editorial policy from holding copyright to holding an exclusive licence.<sup>5</sup> In 2001 some journals began to sign nonexclusive licenses. Journals in different countries began to cooperate in the copublication of articles, customizing them for their particular audiences and sharing the cost of editorial selection, copyediting and commentary. By 2002 a few of the leading general medical journals stopped printing their paper versions, which enabled them to reinvest 50% of their expenses — previously spent on paper and postage — in customization and editorial commentary.<sup>6</sup>

Competitive advantage came from the value added for subscribers through customization and editorial commentary. Subscribers gratefully paid \$200 per year for a journal, since the customized email commentaries saved them the time of sifting through information and helped them to apply new findings in their own practice. Pharmaceutical advertisers were also delighted, because they could target their advertisements to the physicians most likely to prescribe their products. The editorial commentaries carried advertisements targeted to particular groups of physicians, but advertisers did not influence editorial content. Journal "brand names" became less important and journal "impact factors" converged.<sup>7</sup>

A wave of mergers, acquisitions, and strategic alliances swept medical journals. Specialty journals realized they were competing for the same audiences and merged. Drawing on the expertise of their combined editorial staff, the merged journals were able to expend more of their resources on providing commentaries for readers. They also

formed strategic alliances with general medical journals to provide expert commentaries in those publications.

Readers were well served by these changes. Research information was now available on the Internet upon completion of a study (on an e-print server), following journal review (on the journal's Web site) and in an historical archive (on PubMed Central). Readers appreciated the customization of content and the informative commentaries provided by journals.

Authors were delighted. Their research results were available immediately upon submission to an e-print server, and they benefited from critical feedback from colleagues in the form of "rapid responses." Journals shaved the time they took to review papers down to an average of 4 weeks. At many journals the time from acceptance to electronic publication was reduced to 4 weeks.

University promotion and tenure committees were less enthusiastic about these changes. In the good old days they could rely on the "brand" of the journal in which an article was published to establish its merit. But some of the best "brand name" journals were running aground, and journal impact factors had converged. Therefore, tenure committees had to actually read articles and reflect on their worth. Of course, they were greatly aided in this task by the journals' detailed commentaries.

What became obvious by 2002 — and this was completely unexpected — was that a fresh wave of innovation was sweeping the medical literature. For instance, new qualitative studies published on e-print servers and in electronic journals provided a deeper understanding of clinical phenomena ranging from angina to end-of-life care. In retrospect, readers realized that some of the old journals with the greatest cachet had never published a single qualitative article. This meant that certain "why" questions had never been addressed in journals that, before PubMed Central, had the highest impact factor and visibility. More generally, new ideas emerged that didn't fall neatly into the editorial positions or interests of these journals. A leading sociologist of science published an article in *Netprints* entitled, "Medical publishing at the fin de siècle: suppression of innovation and the monopoly of knowledge."

In October 2003 the Nobel Committee awarded the Nobel Peace Prize to Harold Varmus, shared with the World Health Organization and the Bill and Melinda Gates Foundation. The Nobel citation read:

By initiating a revolution in medical and scientific publishing, Dr. Varmus equalized access to medical knowledge around the world. Building on PubMed Central, the World Health Organization launched its "Global Medical School" initiative, in partnership with the Gates Foundation, which developed and donated a "Global Doctor" Internet computer to every physician and medical student in middle- and low-income countries. These initiatives have improved the health of billions and brightened prospects for global justice and peace.

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