

Reforming Scientific and Medical Publishing via the Internet

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I am optimistic that the ascendance of open access postings of articles to the internet will transform scientific and medical publishing; and that a number of profound problems – some particular to medical publishing -- will be assuaged as a result.

Currently, it can be impossible to gauge the true balance of risks and benefits of medical treatments from a reading of the literature. Frighteningly, this is true too for those doctors who ground their clinical decisions upon a reading of it. I will review some aspects of the problem; and then relay grounds for possible optimism.

First, as is probably true in all fields, bias occurs in favor of existing orthodoxy. This is arguably more troubling in medicine since the orthodoxy is in turn influenced, as has been learned, by the profusion of articles favorable to their products that are ghostwritten by the pharmaceutical industry, or by the for-profit MECCs (Medical Education and Communication Companies) that industry hires for this purpose. These companies in turn pay physicians and pharmacists – including favorably disposed “thought leaders” whom they seek to succor -- to be the listed authors, extinguishing any appearance of connection to industry for the favorable views propounded. This provides the appearance that many independent parties are in agreement in their favorable representations of the evidence. Crisply said, advertising is published as though it were science.

These problems are exacerbated by bias arising from direct conflict of interest. Conflict of interest is endemic in medical research; and articles about a class of drug have been shown to be dramatically more likely to be favorable when authored by persons with ties to industry than when authored by persons without such conflicts. Conflicts for *authors* thus appear to foster submission of industry-favorable articles. Conflicts for *reviewers* may also foster rejection of industry-unfavorable ones. (As elsewhere, reviewers are drawn from the pool of authors.) Moreover, reviewers are seldom tasked to disclose conflicts, and they remain anonymous, precluding repercussions for biased reviews.

These factors are aggravated, possibly dwarfed, by pharmaceutical company influence on medical publishing – further aligning medical publishing with medical advertising. Medical journals are not the independent arbiters of article quality one might wish. They are businesses and derive their revenue from pharmaceutical company advertising, and from sales to industry of glossy reprints of industry-favorable articles, at inflated prices. For some medical journals, profits reportedly number in the millions, providing high stakes. At least three former Editors in Chief of major US and British medical journals (the New England Journal of Medicine x2, and the BMJ) have penned books decrying the inimical impact of industry influence on medicine. One asserted that medical journals have devolved into information laundering operations for the pharmaceutical industry. Emphasis has perhaps focused on pressures for journals to accept for publication articles favorable to industry, to better line the coffers of the publisher (e.g. via reprint sales and lubrication of advertising revenue). But evidence has also come to light of articles

rejected -- despite laudatory reviews -- because they were unfavorable to industry, under pressure (read: veto of publication) from the marketing department for the journal. Moreover, in a well publicized case, a major journal lost an estimated \$1-1.5 million in advertising revenue after printing an article unfavorable to industry. This suggests that marketing wonks may be right to worry that their bottom line may suffer should they release articles critical of drug companies or their products. However one has to ask why, in medical journals, advertising is accepted (just because it is available for the taking); and whether the journal's bottom line is a proper consideration in dictating what is published, in settings where lives are on the line.

So, whence the optimism? One means to propel optimism is to suggest a tactic that might enable its fruition. Briefly, I suggest that papers be published on the internet, reviews be submitted by named reviewers; and that others rate (and review) the reviews. Both papers and reviewers receive ratings that are updated on an ongoing basis. While this won't protect against biased submissions, it will protect against biased rejections --and at least enable a voice for original or contrary perspectives.

It is probable that more bad science will be released. However the system provides a means for improving poor quality work; and avoiding having to view what remains substandard.

More importantly, more good science may be published -- and perhaps, more great science. As Nobelist Sydney Brenner (who famously authored an article entitled "Moron peer review") has observed, many of his co-Nobelists' prize winning work was initially rejected through the review process. Transformative work by its nature may defy conventional wisdom. One might be drawn to wonder: is there other work that would have revolutionized science and merited a Prize, that languishes unpublished? And that does so because authors at some point ceased to persevere in submission efforts after some number of rejections, or finally deemed the effort to publish futile? Hark back to the many great discoveries of which we *have* heard that were initially ridiculed: *H. pylori* as a contributor to ulcers; handwashing as a means to reduce puerperal fever; the sun as the center around which the earth revolves, to name a few. What might this imply for the possibility that major discoveries may be pilloried into nonpublication by peer review? There is no means to estimate the fraction of Nobel-caliber efforts that achieve publication, as the denominator remains unknowable.

Indeed, the benefits of this approach may be particularly great for the most important work: work that challenges existing orthodoxy; work that defines a new field and fits no existing journal; work that crosses boundaries to other disciplines -- with their own often arbitrary conventions and in-groups; or that demands knowledge from two or more disciplines; science that is ahead of its time, that entails many advances at once or that finds new work on an understanding of relevant material that others do not yet have. Or, too, work that runs counter to vested interest groups -- particularly but hardly exclusively in the arena of medicine, where the potent impact of industry influence on information has been the subject of increasing alarm -- and where disparities between literature and truth may cost patients' lives.

An instance from mathematics supports the premise that current convention, requiring articles to be published in peer-reviewed journal venues, may inhibit promulgation of at least some of the very most important work. The Poincaré conjecture – a holy grail in mathematics -- was recently proved by a Russian mathematician who posted his work on the internet but refused the bother of submitting his work to a journal. Other cases can be adduced favoring the proposition that some among persons capable of propelling major advances – which often entails rejecting conventions in science – are also constitutionally inclined to reject the conventions, petty obstacles and distractions that attend the current model of scientific publishing. And perhaps they do so with justifiable contempt.

Surely many will defend the current system – not least those who fare well within it, and who benefit disproportionately from it. And surely there will be problems to overcome in the new system. Orthodoxy, in-groups, and interest groups will continue to influence the literature. Those who serve these masters will likely submit negative reviews of articles (and of reviewers) who do not toe the respective party lines. But at least now the contrarian positions will achieve release, reviewers can be held accountable for biased reviews, and unacknowledged conflicts can be exposed in instances when others know of them.

In short, I am optimistic that online publishing, with a review-the-reviewer system akin to that proposed here, will provide more voice and venue for science that may now have the highest need -- and the lowest prospect -- of being aired.

Here is the suggestion in somewhat more detail.

1. Articles are published/ posted on the internet.

Benefits:

- A submission date/time tag mitigates problems of precedence – the determinant of who got the work out first need no longer rest on such factors as whether one has friends at a journal.
- Interested parties have access to the work immediately, which may speed the utilization of new discoveries to accelerate the advance of science.
- The quality of published science may be enhanced by allowing the science to dictate the content and format of an article rather than seeking a procrustean fit to a particular journal. Thus, for instance, key methodological details, controls, and citations need not be omitted to conform to a journal's word length or reference length restrictions.

2. Readers with relevant competence may submit peer review comments and ratings:

All reviewers (like all authors) must provide their names, affiliations, and any potential conflicts of interest.

Benefits:

- Openly publishing reviews – and naming the reviewers -- allow reviewers a means of securing credit for their contributions, which they now lack, and provides an incentive for them to aid the system through peer review.

3. Others review the reviewers – on such factors as the methodological quality, usefulness of suggestions, and balance/ lack of bias. (The details of these factors may be worked out, and will likely evolve.)

Benefits:

- By having a public reputation to uphold in submitting a review, and being held accountable for the content and fairness of reviews, a higher quality of review is likely to surface.
- Readers can choose to read only those articles with high ratings by highly rated reviewers; or they can choose to access at a lower threshold, or even retrieve all literature in their area, performing their own filtering.
- When reviewers fail to state a conflict of interest, others may “out” them, in the review-the-reviewer process.
- The estimated quality of a person's reviews can be considered in their academic file, providing additional disincentive to low quality or biased reviews.

4. Articles can be submitted initially as drafts, and revised after review. Original versions and reviews will still be available for interested parties, but most will prefer to read the revised version.

Benefits:

- This will enable improvements to article quality that can arise from the current review system – indeed, more so since good suggestions may hail from a number of reviewers rather than two or three, and since the quality of each review may be higher, given knowledge of open scrutiny.

Bells and whistles could be added: for instance, when widely divergent ratings arise, methodologically expert “judges” – with no conflict – could assess the source. If it

derives from persons who have conflicts, or particularly from those who fail to disclose conflicts of interest or who engage in dishonest reviewing, these could be barred from the reviewer pool or receive a mark that enables tallying of review scores without their inclusion.

Many benefits of this approach inhere – some alluded to above. The approach may:

1. *Speed science*: The pace of scientific advance may be accelerated by hastening publication of key articles; and by freeing talented investigators to do the next groundbreaking science rather than expending undue efforts publishing the last.
2. *Facilitate cross-disciplinary work*: Advances often arise from people bringing new ideas into a field, or applying techniques or concepts from one field to another. However, obstacles inhibit talented investigators from publishing in new fields: lack of familiarity with available journals; lack of personal connections with editors or prospective reviewers; and discipline-specific conventions that are often quite arbitrary. These will not be obstacles in the proposed model.
3. *Reduce waste of talent and training*: This approach may lessen the colossal waste of talented investigators' time (and training dollars) currently squandered on retooling articles to meet idiosyncratic requirements for each of a series of journals in their effort to find the right "home" for their work.
4. *Improved balance*: This may attenuate bias, for instance in meta-analyses of studies, since negative findings need no longer remain unpublished due to difficulties finding a venue. (Aggregating a biased sample of studies in meta-analysis just narrows the confidence interval around the flawed estimate of effect.)
5. *Improve quality*: Access to a larger number of reviews from persons with a broader range of expertise, coupled with incentive to provide higher quality reviews may improve quality of published science. Additionally, the process of receiving feedback for one's reviews (not just one's science) may help to hone the methodological aptitude of scientists, a benefit that may extend not only to their future reviews but to their future science.
6. *Aid cost efficiency for funders*: By enabling publication of important work that might otherwise remain unreleased, it may improve cost efficiency and dollar impact for funding agencies and taxpayers.
7. *Qualitatively transform what is published*: In addition to speeding publication of what would have been published (but later, after variable delays); and improving balance in areas that people are already investigating, this approach may provide a forum for airing science that might not readily find a home among existing journals – including some of the most important science (as detailed below).