

Review

# Open Access Publishing of Health Research: Does Open Access Publishing Facilitate the Translation of Research into Health Policy and Practice?

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Received: 2 November 2015; Accepted: 8 January 2016; Published: 21 January 2016

Academic Editor: Remedios Melero

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**Abstract:** Health practitioners and policy makers translate health research into practice and policy. However, these end users have limited access to full versions of peer-reviewed literature in subscription journals. Thus, the essential information bypasses the people it is designed to help and the health benefits of medical research are limited and delayed. Open access (OA) publishing is one strategy to facilitate the translation of research to improve health. This review explores the evidence that OA publishing is an effective strategy to facilitate the translation of research and improve health. The review examines citation benefit, knowledge translation, diffusion impact, self-archiving and regional responses, and found entrenched views about OA publishing but little empirical research. The many biases and flaws in published research lead to a high level of waste and limit the ability to find innovative solutions to the burgeoning health costs. Evidence is presented here that OA publishing would facilitate a reduction in these flaws and biases, reduce waste in research and facilitate innovation. Although there are positive signs of change, more action and more research are needed.

**Keywords:** open access; health; quality; citation benefit; knowledge translation; diffusion impact; archiving

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## 1. Introduction

Health research can benefit society by making better health possible. However, there is a gap between research findings (what is known) and health care practice (what is done). So, what is the point of health research unless it leads to better health? Evidence-based medicine stands on the shoulders of giants [1] and relies on peer-reviewed research [2]. Health practitioners, policy makers and consumers translate health research into practice and policy [3] but do not have full access to peer-reviewed literature in subscription journals. Thus, essential information bypasses the very people it is designed to help. The health benefits of medical research are limited and delayed [4] and knowledge translation remains slow and unreliable [5]. One strategy to facilitate the translation of research is open access (OA) publishing. The change to OA publishing was driven by journal prices rising four times faster than inflation [6] which led to the OA debate that overlooked the ability of end users to access research and focused on business models [1,7,8]. Little empirical research informed this debate revealing entrenched opinions, such as the view that “society as a whole is made worse off if access to scientific research results is restricted” [6] whilst others describe this view as “orthodoxy promoted with religious fervour without evidence or business models” [9].

There is evidence that OA published research can improve health by facilitating change. Greater access to peer-reviewed literature can empower consumers, inform end users, and improve communication with funders [10]. Using societal impact metrics rather than impact factor would

shape health outcomes [11]. OA can reduce social inequality by improving access to research for developing countries and for the smaller institutions in developed countries [6]. OA could address the sustainability of academic publishing [6]. Whilst these are all possible, it is necessary to evaluate the evidence to support these contentions.

The current model of subscription publishing may have contributed to the view that academic research is no longer relevant or even valid. This view comes from the highest academic source. Two editors-in-chief of the *Lancet* and founders of the *Cochrane Collaboration* state that “85% of biomedical funding is wasted on research as it is ill conceived, poorly executed, inappropriately analysed, inadequately reported, side-tracked by bias and stifled by red tape” [12] and that “much of the scientific literature, perhaps half, may simply be untrue” [13]. The driver has been the dependence of academic status, grants and advancement on the quantity not the quality of articles published in prestigious subscription journals. Thus, medical practitioners frequently do not follow guidelines based on academic research [14,15], and politicians and policy makers rely on opinion polls and focus groups rather than academic research [16]. Similarly consumers increasingly choose alternative health care [17,18]. Funding for conventional research is dwindling [19] and the role of traditional granting bodies [20] is being transferred to more innovative institutions [21]. Solutions are urgently needed that promote broader changes to the way research is performed and communicated that enables practitioners and policy makers to take better advantage of OA resources to inform their decisions.

This review will explore what evidence supports the hypothesis that OA publishing is an effective strategy to facilitate the translation of research into policy and practice, directly by communicating research findings to the end users and indirectly by ensuring research is less biased, more relevant to health outcomes and ultimately by facilitating innovation.

## **2. Is Open-Access Publishing an Effective Strategy to Facilitate the Translation of Research into Policy and Practice?**

The aim of this part of the review was to find what evidence exists that open access publishing facilitates the translation of health research into policy and practice. It was recognised that actual outcome studies may be limited and studies using surrogate measures would need to be included. The aim of this study was not to simply reiterate opinions but examine the evidence from quantitative research about the outcomes.

### *2.1. Methodology*

The source of the base chosen was a bibliography by Bailey [22]. This is extensive and includes 1100 articles on OA publishing. The process was firstly to examine the articles to generate themes using a critical interpretive synthesis approach. Searching was preplanned and iterative to seek all available themes until a theoretical saturation was achieved. After establishing the themes, the second part of the process was to extract quantitative data from these articles organised by themes.

The inclusion criteria were articles that focused on or included an aspect of health science. The inclusion criterion for the types of studies included empirical studies, descriptive studies and case studies. The dates of publication were between 1 January 1999 and 1 August 2010. The studies in this bibliography were limited to English, were available on-line and not limited to peer reviewed journals but included self published articles, commentaries and blog sites.

Having established the scope of material available, it was searched for quantitative studies and a systematic review was made of quantitative studies where appropriate.

### *2.2. Results*

The themes found were citation, altmetrics, knowledge translation, diffusion impact, quality of research and motivation of researchers to promote their findings.

### 2.3. Citation

Citation of an article indicates that a fellow academic has read and values the work sufficiently to cite it in their journal article and that the article has the potential to influence other academics. The debate has been whether OA or non-OA journals are cited more often. The mean citation advantage of open access over subscription journal articles was 50% in one review [23], 93% in another with a range of 25%–250% across six disciplines [24] whilst another had a range of 36%–172% across 10 disciplines. The most recent review showed a range for OA citation advantage of 26%–64% with non-OA articles receiving 17%–33% fewer citations. However, some authors believe the OA advantage is negligible after accounting for confounding factors, selection bias and early view effects [25,26].

### 2.4. Altmetrics

Altmetrics emphasise social media as data sources [27] aggregating views, downloads, discussions, and recommendations about research outputs [28], with citations in academic and nonacademic communications such as policy documents, patent applications, and clinical guidelines [29]. Little research has been done to demonstrate the influence of OA publishing on policy makers. One article stands out on alcohol policy [30]. Although this was not cited for several months, it was tweeted frequently by influential public policy leaders in NGOs and the European parliament [31]. This implies that the research influenced opinion leaders and policy makers. Focusing on citations addresses the impact on academics, whilst altmetrics may indicate an influence on end users.

### 2.5. Knowledge Translation

Knowledge translation is an essential step for informing end users of the progress in health research which can lead to changes in health policy and practice. OA accelerates the uptake of information [32]. OA reaches more readers than subscription publishing with 23% more visitors, and 89% more full text and 42% more PDF downloads according to a bibliometric randomised controlled trial (RCT) of 1619 research articles [33]. OA articles are recognized more often than non-OA articles, as demonstrated in a cohort study of 1492 articles [34]. Furthermore, OA research directly influenced clinical practice in the fight against Ebola in Africa, as documented by Research4Life [35]. These studies support the hypothesis OA accelerates knowledge translation to more readers and beyond academia to health practitioners.

### 2.6. Diffusion Impact

The propagation of innovative ideas from OA publications to end users was examined in two articles. One study compared the diffusion impact of different levels of access to articles and found that twice as many mental health professionals read articles with free OA citations and five times as many demonstrated knowledge of the content than those given articles with less accessible types of citation [36].

Policy makers in Canada show increasing use of online research and mainly OA publications for reasons of access, credibility and use consultants just for interpretation [37], whereas in the past research acted only to reconceptualise issues not directly inform policy and consultants were the gatekeepers of knowledge [38].

### 2.7. Motivation of Researchers

Globally, the involvement of academics in OA publishing is low, unless encouraged by institutional directives [39–46]. Academics [47–51] and librarians [52] resist self-archiving and self-promotion of their research to inform end users and the health industry of their research via personal communication or by providing plain-English reader friendly explanations of their research directly to the media, on the web or through YouTube clips. This limits their ability to influence end users, find innovative solutions, collaborate with industry, or improve population health.

## 2.8. Quality of Information

End users are flooded with dubious medical information accessible on the net of limited relevance, poor quality, and using the wrong metrics [53] and are concerned about the quality of publications that are open access, including peer reviewed OA journals [54]. The most accessible web sites have no peer review and publish undiscerning inflated claims potentially biased by sponsorship [55], or slanted by pressure groups, politics or industry [56]. Furthermore, high quality evidence-based medicine is rarely discussed, whilst opinion pieces, surveys, laboratory studies and epidemiological studies are widely reported with notions of “miracle cures” based on inconsequential statistically significant associations. Extrapolating from this some authors contend OA peer reviewed journals are of a lower quality than subscription journals due to inadequate peer review. This has led to tests with fake papers that demonstrated deficiencies in the peer review of OA journals [57]. However, print journals have also been duped, such as the NEJM and Nature by the Duke University saga [58] and the Lancet by Wakefield’s paper on MMR and Autism [59]. Thus, both OA and non-OA journals have been victims of academic fraud. However, neither have responded appropriately, as revealed by low retraction rates (0.004%) and slow retraction times (three years) [60]; furthermore incomplete retraction databases allow high rates of post-retraction citation [61]. Considering this evidence neither OA nor subscription journals could claim to be of a higher standard.

**Conclusion**-The evidence that open-access publishing is an effective strategy to facilitate the translation of research into policy and practice is largely anecdotal or inferred from intermediate outcomes. Empirical research provides evidence OA assists innovative ideas to propagate academic research to end users; however, academics appear to lack the motivation to personally promote their own research. End users are concerned about the flood of dubious information about health on line and some are concerned about using open access peer review journals as the quality of these publications may be lower than non-OA journals. There is no consistent evidence that quality, peer review and ethics in publishing are substantially higher in non-OA journals as compared to OA journals.

## 3. What Other Changes Are Needed to Ensure OA Is Effective?

Considering the view that 85% of biomedical funding is wasted on research as it is ill conceived, poorly executed, inappropriately analysed, inadequately reported, side-tracked by bias and stifled by red tape, the aim of this part of the review was to examine whether open access publishing has a role in reducing bias and red tape, improving methodology and ensuring research is relevant to health outcomes.

Many studies are published giving only limited information. This leads to waste in the form of unnecessary research being required, poor patient care and billions of dollars of investment in research being wasted [62]. Systemic changes are required that support study registration and open access to journal reports, full study reports, and participant-level datasets. These need to be endorsed and enforced by investigators, journals, funders, sponsors, research ethics committees, regulators, and legislators. To ensure free access, OA institutional repositories are needed. Many countries have realised the importance of this and are providing varying levels of support. The UK promotes OA by providing grants to Universities to fund OA research archiving and similarly *Europe PubMed Central* provides free online digital archiving of full-text, peer-reviewed research publications [63]. Whilst the US and Australia endorse the concept of OA access institutional repositories for publically funded research, they do not provide funding for repositories [64].

Much research is funded by industry grants, there is an increased risk of publication and funding bias [65] leading to credible claims that recommendations are misleading or demonstrably false [66]. As industry funding is associated with increased bias, progress in health care will be limited unless public institutions not only fund research but also ensure that published research and participant level data are shared. Thus, open access publication of research would reduce publication bias, and free open access to participant level data would reduce funding bias.

Much research appears to be performed in a clinical and methodological vacuum [67] making inferences from in vitro studies and animal models that bear little relation to medical reality [68]. Furthermore research rarely focuses on diseases with the greatest burden to the population: obesity and lifestyle related disease [69].

Innovative solutions are required to address the health crisis of increasing cost of chronic disease care in ageing populations [70,71]. New policies are required to ensure research translates into innovative practice and policy transforming health care from the current disease-orientated service-provision model to a health maintenance model [72]. Studies in the UK have demonstrated that early adoption of innovative ideas in health is facilitated by the ability of practitioners and policy advisors to access full copies of the most up to date information [73]. Thus, open access publications can help to address the current health crisis.

#### 4. Conclusions

The potential health benefits of research are limited and delayed as practitioners and policy makers rarely have full access to peer-reviewed literature. Timely OA publishing of research is one strategy to facilitate the translation of research to end users. This review was undertaken to explore what evidence supports the hypothesis that OA publishing is an effective strategy to facilitate the translation of research into policy and practice by communicating research findings to end users and by ensuring research is less biased and more relevant to health outcomes.

Entrenched views about OA publishing were found in opinion pieces and there was little empirical research.

Bibliometric studies identified a strong citation advantage for OA and altmetrics confirm more views and knowledge translation occur with OA than print journals. This only addresses the impact on researchers. Only two empirical studies of health practitioners and policy makers were found. These demonstrate the propagation of innovative ideas when free OA sources are cited are available.

Whilst the quality of OA publications has been questioned, there is no evidence of a substantial difference between OA and print journals. The greater issue for end users is being flooded with unreliable information of limited relevance, poor quality, tainted by sponsorship, and using inappropriate metrics for health care. This is intensified by the media that rarely discuss research that is likely to lead to improved health care. However, researchers show little motivation to promote their research online using plain English explanations, interviews, social media and YouTube clips. Whilst OA is necessary for translation and innovation, it is not sufficient as there are biases and flaws in much research leading to the opinion that 85% of biomedical funding is wasted and 50% of research is simple untrue. These opinions are confronting in their audacity and magnitude and might be disregarded if they were not proposed by peerless exponents of evidence-based medicine, including two editors-in-chief of the Lancet and founders of the Cochrane Collaboration. To address this waste of funding, concerted action is required and OA publishing can play a significant role by allowing full access to the results of research and data sharing through institutional repositories. This greater transparency would help to reduce publication and funding bias in published research and guidelines. Furthermore, this improved transparency through OA publishing may also allow more feedback to researchers so that end users have a role in guiding the research agenda to focus on areas of importance to health practitioners, policy makers and consumer and ultimately to the health of the population.

There are now signs of progress. Academics, professional societies and librarians are starting to recognise the value of free OA publications. Funding bodies are promoting and even funding free OA repositories. Whilst researchers respond slowly to pressure from universities or funders to promote their research, health professionals and policy makers are becoming more aware of and reliant on research through free OA. Although there are positive signs of change, more action and more research are needed.

**Conflicts of Interest:** The author declares no conflict of interest.

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