

# Surveying the evolving models of digital publishing: where does pharma fit?

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## OBJECTIVE

- Digital publishing platforms have the potential to facilitate efficient and transparent dissemination of medical research.<sup>1</sup> Our aim was to assess the suitability of these platforms for publishing studies funded by the pharmaceutical industry.

## RESEARCH DESIGN AND METHODS

- Digital platforms publishing medical research were identified through web searches (Google), interviews with publishing professionals and the authors' personal libraries (conducted between 1 August and 30 September 2016).
- Innovative English language digital platforms were selected; in order to showcase a range of new publishing models, some platforms which were similar to those featured were excluded.
- PubMed searches were used to gauge current usage of these platforms. We searched all articles in each of our chosen platforms indexed on PubMed for affiliations with the 15 largest pharmaceutical companies, by revenues, profits, assets and market value, in 2015.<sup>2</sup>
- Shortlisted platforms were assessed against 14 criteria, listed in Table 1, defined by author consensus to highlight emerging trends in digital publishing.
- Data were collected from platform websites, PubMed, the Directory of Open Access Journals, press releases and responses to email enquiries.



Table 1. Evaluation of digital publishing platforms against 14 criteria designed to highlight emerging trends in digital publishing.

Evaluation criteria		Cureus	eLife	Europe PMC	F1000 Research	Peerage of Science	PeerJ	PeerJ Preprints	ResearchGate	Royal Society Open Science	Science Matters	The Winnower
		Journal	Journal	Database	Journal	Peer review platform	Journal	Preprint server	Social network	Journal	Journal	Publishing platform
Background	PubMed indexed	✓	✓	–	✓ <sup>6</sup>	✗	✓	✗	✗	✓	✗	✗
	Launched after 2010	✓	✓	–	✓	✓	✓	✓	✗	✓	✓	✓
Peer review	Peer review	✓	✓	–	✓	✓	✓	✗	✗	✓	✓	✓
	Open peer review <sup>a</sup>	✗	✓	–	✓	–	✓ <sup>h</sup>	✗	✗	✓ <sup>i</sup>	✓	✓
	Pre-peer review publication	✗	✗	–	✓	–	✗	✓	✓	✗	✗	✓
	Commenting post-publication	✓	✓	✗	✓	–	✓	✓	✓	✓	✓	✓
Content specifications	No length restrictions	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	✓
	Non-traditional outputs <sup>b</sup>	✓	✗	✗	✓ <sup>l</sup>	–	✗	✓	✓	✗	✓	✓
Audience	Open access <sup>c</sup>	✓	✓	✓	✓	–	✓	✓	–	✓	✓	✓
	Content shared via social media	✓	✗	✗	✓	–	✓	✓	✓	✓	✗	✓
	More than 100 000 users <sup>d</sup>	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗	✗
	Provide article-level metrics	✓	✓	✓	✓	–	✓	✓	✓	✓	✗	✓
Publication	Publish within 4 weeks	✓	✗	–	✓	✗	✗	✓	✓	✗	✓ <sup>n</sup>	✓
	Publication fee < £200	✓	✗	✓	✓ <sup>n</sup>	✓ <sup>s</sup>	✓ <sup>i</sup>	✓	✓	✓	✓	✓

✓ Yes ✗ No □ Not applicable

<sup>a</sup>Open peer review was defined as publication of all peer-reviewer comments alongside the reviewed publication. <sup>b</sup>Non-traditional outputs included posters, slide sets and research notes. <sup>c</sup>Open access included 'gold' open access, whereby there is no embargo period before publication, and 'green' open access, whereby the authors may self-archive their work onto a public site. <sup>d</sup>Web traffic to the domain of each platform was calculated using www.similarweb.com. <sup>e</sup>Articles are made open access immediately but not PubMed indexed until they have passed peer review. <sup>f</sup>Non-traditional outputs are not peer reviewed. <sup>g</sup>Service is free but does not publish reviewed manuscripts. <sup>h</sup>Reviews are carried out privately, but reviewers may choose to sign their reviews, and authors may choose to share review history upon publication. <sup>i</sup>PeerJ Preprints shares a domain with PeerJ. <sup>j</sup>Membership fees to the journal can make the cost per published article lower than £200. <sup>k</sup>Article processing charge for non-members is £890. <sup>l</sup>Authors opt for either open or closed review. <sup>m</sup>Excerpts from the peer-review report are published. <sup>n</sup>Intention to publish within 2 weeks. <sup>o</sup>Articles up to 1000 words are \$150 (£120) per submission. Longer articles exceed this £200 threshold.

## Case studies

F1000 Research	Peerage of Science	PeerJ Preprints	ResearchGate	Europe PMC
Publishes the data on which the article is based and the identity of reviewers and their comments along with each article. <i>Wellcome Open Research</i> , launched in October 2016, also uses this model.	A free peer review service. Articles are uploaded to the site and approved reviewers select articles they wish to review. Following review, journals can make direct publication offers, or authors may export the review to a journal of their choosing.	A preprint service for biomedical sciences that allows authors to host drafts or final versions of abstracts, posters or articles ahead of formal peer review. These are critiqued by the community and feedback is incorporated into subsequent drafts.	An open-access social media platform on which authors can host their own scientific outputs, pre- or post-review, for distribution to the authors' followers. The followers can then post comments on the article.	An online database which hosts millions of full-text articles published by biomedical and life-science journals.

## RESULTS

### Evaluation of digital publishing platforms

- Eleven innovative digital platforms in the life sciences were evaluated: 6 journals (*Cureus*, *eLife*, *F1000 Research*, *Science Matters*, *PeerJ*, *Royal Society Open Science*), a social network (*ResearchGate*), a publishing platform (*The Winnower*), a database for articles published in journals (*Europe PMC*), a preprint platform (*PeerJ Preprints*) and a peer review service (*Peerage of Science*) (Table 1).
- Of the 11 platforms assessed, 5 are indexed in PubMed. *Europe PMC* exclusively contains articles indexed on PubMed.
- Overall, the platforms assessed met 3–13 of our 14 criteria.

### Peer review

- Peer review is integral in 8 of the 11 platforms.
  - There is no peer review prior to publication in *PeerJ Preprints* and *ResearchGate*; they enable commenting on articles following publication.
- The peer review comments are open access on 6 of the 8 peer-reviewed platforms and pre-peer-review publication is available on 4 of these 8.

### Content

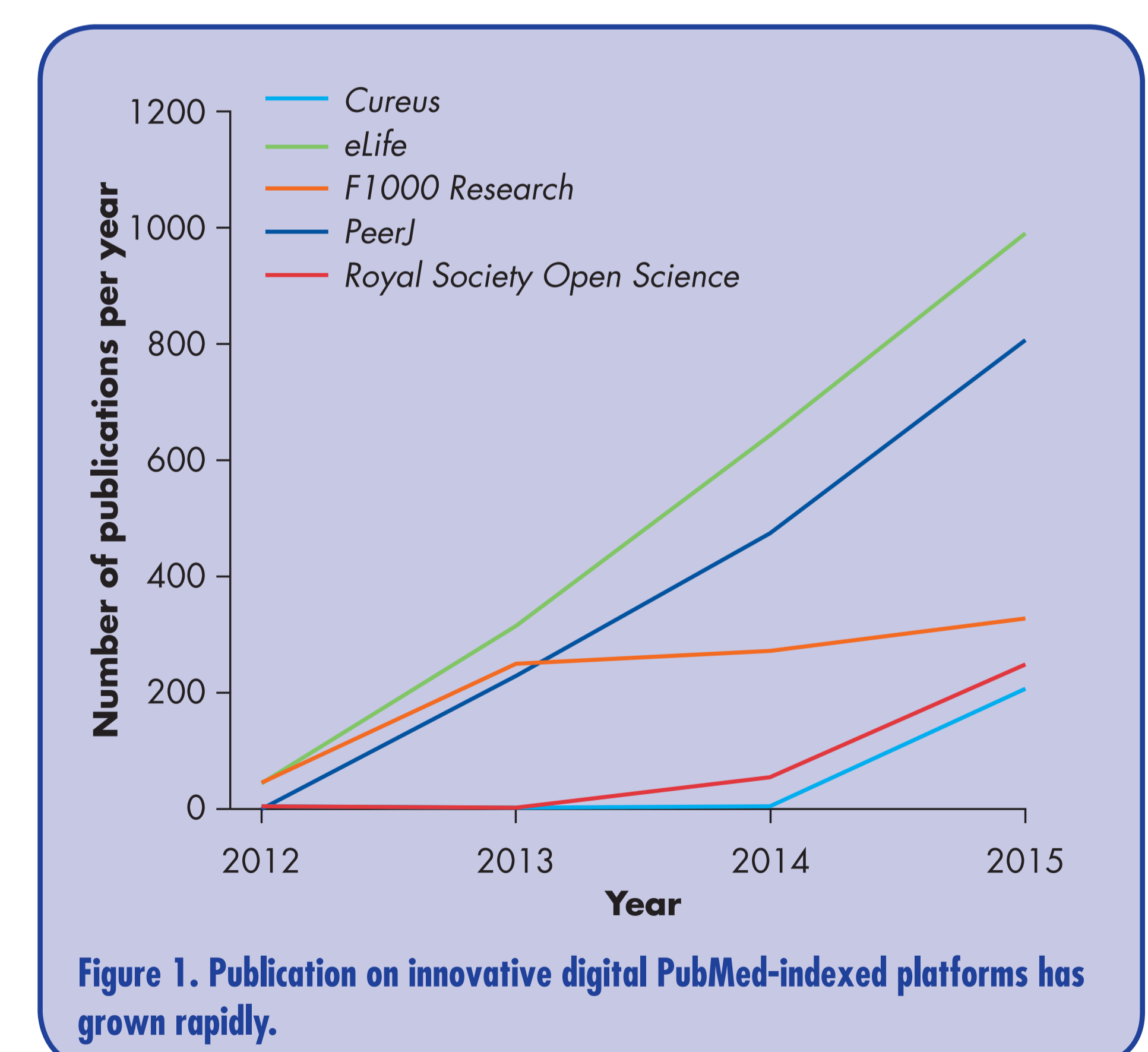
- There are no length restrictions for articles on 10 of the 11 platforms.
- Six platforms are willing to publish non-traditional outputs not associated with a traditional article, such as posters, data notes and slide sets.

### Audience

- Of the 11 platforms assessed, 9 are open access; *Peerage of Science* does not host manuscripts.
- Six platforms had a cumulative total of more than 100 000 users between 1 April 2016 and 30 August 2016.
  - ResearchGate* had 60.3 million users during this period.
- All platforms have social media accounts; 7 of the platforms enable article sharing via 3 or more social media sites.
- Article-level metrics are available on 9 of the 11 platforms.

### Growth in publication on innovative digital platforms

- Many of these platforms have been established relatively recently, with 10 of the 11 having been set up since 2010. *ResearchGate* was launched in May 2008.
- The rate of publication on the platforms assessed has grown rapidly.
  - The total number of articles published on those platforms indexed on PubMed increased from 98 in 2012 to 2579 in 2015 (Figure 1).
- During December 2014–August 2016, articles from the top grossing 15 pharmaceutical companies accounted for only 0.5% of articles published on the digital platforms we assessed.



## CONCLUSIONS

The volume of medical research published on the digital platforms studied has risen sharply since 2010. These platforms provide various means of improving the exchange of scientific knowledge. The pharmaceutical industry is an important contributor to medical research, but has been reluctant to follow non-industry researchers in publishing outside traditional journals. Collaboration between digital publishers and pharmaceutical companies has the potential to improve the dissemination of medical research in general, and to promote these innovative methods of information sharing.

## Disclosures

A Williams, C Winchester, L Robinson and T Koder are employees of Oxford PharmaGenesis, Oxford, UK. C Winchester owns shares in Oxford PharmaGenesis Holdings Ltd and AstraZeneca Ltd. C Rains is an employee and shareholder of Shire, Lexington, MA, USA. R Smith is a consultant to *F1000 Research*.

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