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REVIEW

Authorship problems in scholarly journals: considerations for authors, peer reviewers and editors

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Abstract Authorship problems in scholarly journals shake the foundations of research, diminish scientific quality of papers and devalue records of citation tracking services. The 'Publish or Perish' mantra is thought to drive some instances of unfair, honorary authorship, particularly in countries of emerging scientific power. Though causes of honorary, gift, guest and ghost authorship are still ill-defined, it is possible to avoid some of these instances by improving awareness of what constitutes authorship and by adhering to the editorial policies of learned associations. This paper overviews common cases of inappropriate authorship and suggests options to solve related problems by authors, reviewers and editors of scholarly journals.

Keywords Authorship · Editorial policies · Periodicals as topic · Research standards

Introduction

Over the past few decades, academics, researchers and science editors have witnessed major changes in the flow of scientific information and research studies globally. Scientific progress, development of sophisticated research techniques, internationalisation of academic and research groups supported by advanced communication have all emerged as the drivers of these changes [1]. In an attempt to respond to the changing scientific environment, publishers have improved functional capacities of traditional periodicals and launched a wide variety of more specialised media for communication. Meanwhile, journal editors and information scientists have encountered the emergence of brand new problems, jeopardising the integrity of scientific communication. Of these, authorship issues are the most troublesome, shaking the foundations of research and devaluing records of indexing and citation tracking services.

Problems with authorship in publications persisted throughout history. A classical example is the dispute over William Shakespeare's poetry claimed to be authored by other more educated and noble person(s) close to the Elizabethan court, who, for some reasons, could not disclose their identity to the public (a prototype of ghost-writing). Whoever the author(s) of these literature masterpieces are, they left a huge imprint in history and enriched culture. However, in most other cases, disputed authorship outcomes are not so innocuous. The most harmful are the consequences of inappropriate authorship in current biomedicine, where publications facilitate evidence-based clinical decision making and have yet another role—to drive the author's academic growth and prestige amongst specialists.

The sole authorship (one publication—one author) was an acceptable standard of scholarly publications until the twentieth century [2]. The sole author was usually self-sufficient in terms of doing research and fully responsible for the content of his/her scarce publications. It was also

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easy to assess the author's research output. In contrast, in these times of 'big science', research performance in most countries is becoming increasingly reliant on a complex of factors, such as publication and citation rates, the highly popular Journal Impact Factor (JIF), *h* index, degree of co-authorship and availability of research funding [3]. Research productivity is now strongly dependent on transnational cooperation, driving the unprecedented growth of papers authored by experts not just from different research institutions and departments but from different parts of the world [4, 5]. As a result, the all pervasive 'Publish or Perish' mantra is shaping current authorship patterns and unfairly increasing the number of authors per article in some cases [6]. Particularly, alarming is the state of inappropriate authorship in countries of emerging scientific power [7], which is distorting global science and research performance.

In top-tier journals such as *Cell*, *Science* and *Nature,* a strong correlation was found between the number of authors and citedness of articles with expanded scientific collaboration [8]. Undeniably, the expansion of cooperation within and between institutions is a positive trend, aiming to increase the quality and visibility of publications. Listing numerous experts as co-authors in papers on large clinical trials, cohort studies or systematic reviews is reasonable. However, multiauthorship in these and many other articles is not always fair, and it frequently complicates individual research performance, particularly measured by the widely applicable *h* index [9]. Incorrect interpretation of an author's publication record in online databases, his/her *h* index and other citation metrics displayed on Scopus, Web of Science and Google Scholar in the instances of multiple authorship causes undue crediting of authors, obtaining research funds, taking academic posts, abusing power and unethically co-authoring hundreds, if not thousands of new publications. Even worse, these 'authors' get unfair recognition from academia, publishers and journal editors, who invite them to act as reviewers and editors, unintentionally breaching the ethical standards of publishing.

Perceptions of inappropriate authorship

Several terms have been proposed to reflect unacceptable behaviour of authors. 'Honorary authorship' relates to the instances of listing a senior colleague or a chairperson, providing facilities and technical support without contributing creatively or playing an insignificant role in research and writing. Many junior and subordinate authors feel obliged or even pressurised to add names of heads of their departments or academic institutions in their papers. In some cases, names are added without prior knowledge of honorary authors. Slightly different is the phenomenon of gift authorship, when a senior or a junior colleague's name is added as a gesture of amicable relations, or in an attempt to boost his/her profile or to receive similar 'gift' in response. Finally, guest authorship is when a name of an individual, usually an influential scientist with numerous publications is added to the list of authors with a hope to increase publication chances and prestige of the publication.

Ghost authorship is another ethically unacceptable practice, research misconduct related to the omission of a substantive contributor's name from the authors' byline, despite his/her major involvement in the study design, data collection, interpretation and article writing. The phenomenon may have dramatic consequences in pharmacy practice and health care. Ghost-writing is frequent in instances of promoting a drug or medical technology, when a company with a strong interest in the product hires an individual to write a positive article but attributes authorship to guest experts. Attributing sole authorship to guest experts is aimed to add more weight in and make it more convincing for readers—users of the product. To easily sell messages of the article to the readers, authors usually target high-impact journals. By obscuring relations to the company and concealing competing interests, guest authors further exaggerate research misconduct. In fact, ghost-writing and guest authorship are interrelated and frequently occur simultaneously [10]. A classic example is the case of rofecoxib, which was heavily promoted in numerous pharma-sponsored papers prepared by sponsored employees and authored by guest experts [11]. The drug was withdrawn from the pharmaceutical market because of adverse cardiovascular effects and thrombotic risk, which surfaced in only two publications in *The New England Journal of Medicine* in 2000 and 2005 [12].

The denial to acknowledge authorship of real contributors may take another form of ghost-writing, which came to our knowledge with the expansion of professional writers' services. The writers support narrow specialised experts lacking time or skills for proper writing. By correcting language, changing meaning of separate sentences and paragraphs or graphics, the writers add new value and may even change genuine ideas, worthy of an acknowledgement. Therefore, the acknowledgement of professional writers' support in the footnotes or even in the authors' bylines is justifiable for narrative reviews, expert opinion pieces or recommendations with textual messages, but not so for original research papers.

The denial to put names of real contributors on papers is an unethical conduct, further aggravated when it coincides with additional research misconduct. A relevant example is the case of the plagiarised review published in the *Iranian Journal of Allergy, Asthma and Immunology* in 2006 and

retracted 2 years later, when patchy writing was reported by experienced in the field readers. The published item had only one author, an eminent immunologist who, nonetheless, admitted that there was also a student contributing to the writing [13].

Importantly, unacknowledged intellectual contribution of peer reviewers may also take the form of ghost-writing, particularly when referees suggest major changes, new tests or an emphasis on a certain drug therapy and do not get even an acknowledgement due to the closed model of peer review. Though reviewers' tasks are distinct from those of authors' [14], it is widely known that most manuscripts on the verge of rejection may eventually get published after revisions thanks to the reviewers' input and fresh ideas. Also, reviewers bear their share of responsibility for publications with redundant, incorrect or plagiarised parts. Adopting an open peer review model and acknowledging reviewers for each commented article may prevent instances of ghost authorship by reviewers and ensure more responsible publishing [15].

Prevalence of inappropriate authorship

Rampant examples of unethical authorship are common globally, particularly in small, nonmainstream science journals and in journals representing highly productive scientific fields. Addition of authors lacking authorship credentials is the most frequently detected and reported. An early study on authorship patterns in the *Croatian Medical Journal* proved that a large proportion of authors (60 %), particularly those not listed first in the authors' bylines, do not meet authorship criteria [16]. In line with this, honorary authors are reportedly present in as high as in 89 % of papers in Iranian medical journals, mostly in basic science papers [7].

Evidence from pharmacy and pharmacotherapy, a rapidly developing and highly impacting field of science, suggests that the prevalence of honorary authorship is 14.3 %, reaching 29.4 % in articles with five or more authors [17]. A recent survey of 490 corresponding authors of the *American Journal of Roentgenology*, aware of the accepted authorship criteria, reported the presence of honorary authors in 353 research articles (72 %) [18]. Furthermore, it appeared that even most influential journals, adherent to the principles of research integrity, are not spared from such authorship problems. A survey of 630 corresponding authors of research papers, reviews and editorials published in the *Annals of Internal Medicine*, *JAMA*, *The Lancet*, *Nature Medicine*, *The New England Journal of Medicine and PLoS Medicine* estimated the prevalence of both honorary and ghost authorship to be 21 % [19]. Honorary authorship was more prevalent in research papers (25 %) than in reviews (15 %) and editorials (11 %).

Order of listing authors

Authors' position in the article bylines determines the success of research grant applications and academic promotions globally. It may reflect the authors' social status, scientific prestige and a role in research studies. Based on the position, one can have an impression of his/her contribution, research responsibility as well as involvement in writing and coordinating the work. There are no universally accepted rules. A systematic review distinguished the amount of contribution as the main determinant of the authors' order across scientific disciplines [20]. The first and last positions have special meaning in most research publications [21]. In most countries, first author is usually a junior fellow with the greatest contribution to the research and writing, whereas last author is a senior scientist, principal investigator or research professor. A survey of 1,038 Spanish authors with articles listed in the Web of Science suggests that the authors' position in articles may vary between different scientific disciplines, depending on their age, professional rank and research performance [22]. In biology and biomedicine, for example, research professors older than 55 years tend to occupy the last position.

The last author is usually a corresponding author, who coordinates communication between co-authors and takes full responsibility for the integrity and correctness of the data and the statement on the authors' contribution at submission and throughout revisions. She/he is supposed to be an academic or research staff member with permanent contact details, an active institutional email account and available for timely responding to editors' and reviewers' queries. Unfortunately, the last position in the bylines is frequently taken by gift or honorary authors. Such practice in some Asian countries is particularly notable [23].

Over the past decade, an increasing trend of assigning equal credits to first and second authors of original papers has surfaced [20, 24–26]. Equal authorship has also applied to other positions in the byline, for example, in top journals, such as *The New England Journal of Medicine* and *JAMA*. Nonetheless, there is no specific guidance on measuring equal contribution and extrapolating it to academic promotion [27].

Authorship versus contributorship

Given the complexities of defining authorship and distinguishing it from nonauthorship in the current scientific environment, the concept of contributorship was proposed

in 1997 by the former deputy editor of *JAMA*, Drummond Rennie [28]. The concept was meant to replace the traditional authorship system with a model of listing all contributors and guarantors of original research papers. It was well accepted by some leading biomedical editors, particularly by Richard Smith, the former editor of *BMJ*, who predicted the gradual shift to contributorship without completely abandoning traditional authorship [29]. If widely accepted, the model of contributorship may help to fairly crediting all contributors, including those who frequently do not satisfy traditional authorship criteria (e.g. statisticians, laboratory technicians, professional writers). Denial of authorship, gift, ghost, guest authorship and disputes over the author's order can be avoided, while accountability for all parts of papers can be ensured [30].

Despite the strong argument in favour and the interim application of the model by editors of the *BMJ* in the past 15 years, it is still not well-validated. Besides, it appeared to have some inherent limitations; the uncertainty over the line between substantive intellectual contribution and noncontribution is the main one. It is not clear how and where exactly all contributors should be listed. Listing all of them in the authors' bylines devalues the basic principles of academic authorship [31], while following the crediting model of feature films [32] looks odd and not suitable for science. Lastly, the new concept further complicates the whole system of academic promotions and grant allocations to individuals with multiauthored publications.

How to avoid inappropriate authorship

It seems that merely shifting the paradigm of authorship cannot prevent inappropriate and unethical behaviour of some authors and related conflicts. All those involved in research, science writing, editing and publishing should understand the importance and implications of fair crediting originators of ideas and contributors to study design, data collection and writing. Complex measures are warranted to ensure fair authorship (Table 1).

Research institutions with interest in high-quality and honest publications should, first and foremost, arrange educational courses in accordance with the updated authorship policy and guidelines [33]. The adoption of relevant policy and the discouragement of dishonest attainment of authors' credits by its employees may prevent misconduct at the early stages of research as well as throughout the writing and revising scientific articles.

In the context of scholarly journals, unified perception of authorship by authors, reviewers, editors and publishers can serve as a key to resolving authorship disputes [34]. It is widely accepted that authors themselves are primarily responsible for listing names in the authors' bylines and in the acknowledgement notes. No one knows details of collaboration, research execution, data collection, article writing and reasonable limits of authorship better than the authors themselves. They should adhere to the acceptable authorship by self-regulation and follow policies of their research institutions. The same authors may also serve as reviewers and take up editorial posts.

Table 1 Options to ensure fair and appropriate authorship

Responsible persons/bodies	Measures
Research institutions	Implement relevant educational courses, set a policy and discourage inappropriate authorship
Authors	Familiarise with available authorship guidelines and journal instructions for authors; agree on the responsibilities, order and place of listing co-authors early at the start of research. Avoid misconduct and unfair authorship by self-regulation
Reviewers	Familiarise with available guidelines, report suspected authorship to editors
Editors	Stick to authorship criteria and journal instructions, obtain author contributions statements, resolve disputes by cooperating with authors or research institutions
Publishers	Ensure proper guidance and interpretation of authorship in instructions for authors; adopt field-specific recommendations of learned associations
Learned associations	Develop and update policy statements and authorship criteria

The reviewers are in a good position to spot inappropriate authorship, as they do with the issues of study design and research ethics, and report to the editors. Asking reviewers to comment on authorship in the space designated for editors' attention may be helpful, at the very least for proper reporting in the manuscripts on small, short-term studies or single case reports with a long list of authors and vice versa. Examples of the former [35, 36] and the latter cases [37, 38] frequently appear in the peer-reviewed publications globally. Editors can prevent such an ambiguous authorship by requiring a list of authors' contributions on a regular basis. They are also in a position to resolve the authorship misattribution by referring to the authors' research institutions [39]. Publishers in turn are in a position to adopt and familiarise authors and editors with the editorial policies on authorship developed by learned associations.

Many international associations are developing educational materials, guidelines and policy statements, incorporating authorship issues along with other ethical and research integrity points [40]. The International Committee of Biomedical Journal Editors (ICMJE), Committee on

Table 2 Essential editorial policy statements and criteria on authorship

Source	Society, date	Main messages/comment	References
Ethical Considerations in the Conduct and Reporting of Research: Authorship and Contributorship	ICMJE, 2009	Widely promoted authorship criteria for biomedical journals. The interpretation of the criteria may vary across the journals. Minimal and substantive contributions are not defined, and order of listing authors is not explained	[42]
Guidelines for Authors and Translators of Scientific Articles to be Published in English	EASE, 2011	First authors are those who contribute most. Those who contribute substantially but do not meet authorship criteria should be acknowledged. Listing contributors without their agreement is ethically unacceptable	[43]
CSE's White Paper on Promoting Integrity in Scientific Journal Publications	CSE, 2012	A comprehensive editorial policy document stressing out, among many other points, the importance of defining authorship or contributorship in a journal's Instructions for Authors and settling authorship disputes by editors in cooperation with corresponding authors and research institutions. Authorship bears responsibility for integrity of the work. Each co-author in multiauthor articles should be responsible for specific part of the work and aware of other co-authors' contributions	[44]
A position statement developed at the 2nd World Conference on Research Integrity, Singapore, 2010	COPE, 2011	Journals should adopt an authorship policy relevant to their field of science. Instructions for authors should guide on what constitutes authorship. For multiauthor articles, each author should take responsibility for a certain part of the work; all authors should contribute significantly to and be familiar with the entire paper. Contributions should be disclosed in a separate statement. Settling authorship disputes is the prime responsibility of authors	[49]
Algorithms on common publishing ethics problems	COPE, 2008	Flowcharts guide on how to resolve authorship disputes (addition and removal of authors before and after publication), how to spot authorship problems and what to do when ghost, guest or gift authorship is suspected	[50]
Policy statements	WAME, 2007	A scholarly journal's authorship policy should be transparent and accessible. Ghost and guest authorships are dishonest acts. Editors can require limit number of authors, if not all authors satisfy the criteria. Order of authors should be decided by authors themselves	[51]

Publication Ethics (COPE), Council of Science Editors (CSE), European Association of Science Editors (EASE) and World Association of Medical Editors (WAME) have taken the lead in tackling authorship problems (Table 2).

Interestingly, no strict definition of what constitutes authorship was available until 1985, when the ICMJE publicised a set of authorship criteria [41]. These criteria are a part of the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, last updated in 2009 and extensively cited in the recent EASE guidelines, in the sections related to correct listing and transparent acknowledgement of contributions [42]. Many biomedical journals declared adherence to the ICMJE criteria, considering authorship when an individual provides 'substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data (1), drafts the article or revising it critically for important intellectual content (2), and gives final approval of the version to be published (3)'. All the three criteria should be met to justify authorship [43]. The same criteria are suggested for all types of scientific articles (i.e. original research papers, reports on large trials, reviews, editorials, case studies and letters). Apart from defining authorship, the ICMJE discourages attributing authorship to those who merely secured funding or performed laboratory tests or acted as a formal supervisor. Accordingly, statistical analyses or writing assistance alone are also insufficient for satisfying the authorship criteria. In the CSE's recently updated policy paper on integrity in scholarly journals, it is reaffirmed that the writing assistance, research advice, financial, technical or administrative support alone do not justify authorship. For transparency, all such contributions should be detailed along with any conflict of interests in a corresponding section of journal article [44].

Despite the declared wide acceptance, the adherence to and interpretation of the ICMJE criteria by biomedical journals varies [45]. A survey on a sample of 59 Indian medical journals pointed to the fact that authorship guidance was mentioned in the instructions for authors in 38 (64.5 %) journals, whereas the adherence to the ICMJE criteria in only 35 (59.3 %) journals [46]. Likewise, an unsatisfactory guidance over the authorship was noted in a

study on Pakistani biomedical journals, with only 6 out of 37 indexed journals (16.2 %) properly referring to the ICMJE criteria and one-third of the journals lacking any authorship guidance [47]. Finally, a larger-scale study on a randomly selected sample of 252 journals edited by members of the ICMJE, WAME and indexed on MedLine, including *The New England Journal of Medicine* and *The Lancet*, reported surprisingly low adherence to the ICMJE criteria (68/252, 29 %) or reference to its outdated versions among journals declaring the adherence (18/51, 35 %) [45].

The ICMJE criteria do not reflect on the authors' order and do not distinguish minimal contribution warranting authorship. The issue was partly clarified in the EASE guidelines, recommending to list authors with most contributions first [42]. Critics also point to the role of medical writers and other contributors, who do not meet the ICMJE criteria but provide indispensable service, upholding standards of manuscripts and making them acceptable for high-rank journals [48]. In this regard, a position statement of the 2nd World Conference on Research Integrity in Singapore, 22–24 July 2010, provided useful points on multiauthored papers, suggesting to attribute responsibility for each part of the work to an individual author and to oblige all authors to be familiar with and support the whole paper [49]. To ensure transparency of research publications, the statement advises to disclose all authors' contributions.

To help editors tackle ethical problems and disputes with authorship, the COPE experts published a set of flowcharts in the form of algorithms in 2008 [50]. Of the seventeen available flowcharts, six deal with changing authorship before or after publication and provide guidance on how to spot and resolve ghost, guest and gift authorship. Essentially, the main message of these flowcharts is to pay attention to the declaration of authors' and nonauthors' contributions and to follow journal policies on authorship. Editors should facilitate transparency and accessibility of such policies in their journals and websites [51].

Conclusion

Authorship problems in scholarly journals are multifaceted. Different types of articles and journals may be affected by a range of inappropriate practices. Current trends in interdisciplinary and international collaborations and citation analyses largely influence authorship patterns in big and small, specialised journals alike, which, in turn, determines the scientific quality of publications [52]. Inappropriate authorship may take extreme forms and spread widely in rapidly growing disciplines and in countries in transition towards 'big science'. The 'Publish or Perish' mantra is thought to drive honorary authorship in some cases [6, 53]. Though exact causes of this and other inappropriate practices remain ill-defined, global awareness of what constitutes authorship and the adherence to the guidance from learned associations may help avoid some unethical instances. Integrity at an individual level supported by acceptable policies of research institutions and practices of all parties involved in publishing should be the bottom line in this regard.

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Conflict of interest AYG is a sponsored member of the European Association of Science Editors and member of the World Association of Medical Editors. He also serves as the chief editor of *European Science Editing* and editorial advisory board member and reviewer of more than 20 rheumatological, cardiological and general medical journals. LA declares no conflict of interest. GDK is editorial board member of 5 international journals and reviewer for more than 30 international journals and research funding bodies.

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