

Unethical practices in authorship of scientific papers

Dianne M Bennett and David McD Taylor
Emergency Department, Royal Melbourne Hospital, Parkville, Victoria, Australia

Abstract

Over the past few decades, there has been an increase in the number of multi-author papers within scientific journals. This increase, in combination with the pressure to publish within academia, has precipitated various unethical authorship practices within biomedical research. These include dilution of authorship responsibility, 'guest', 'pressured' and 'ghost' authorship, and obfuscation of authorship credit within by-lines. Other authorship irregularities include divided and duplicate publication. This article discusses these problems and why the International Committee of Medical Journal Editors guidelines are failing to control them.

Key words: *authorship, co-authors, publishing, research.*

Introduction

Scientific paper authorship is an important form of academic currency for many research professionals. This importance, and the changing nature of biomedical research over the last few decades, has stimulated a rise of multi-author papers. In combination, these two factors have given rise to abuses of authorship. Although these abuses rarely impact adversely upon the efficiency of science, or seriously sap its resources, they do undermine the ethic of honesty expected within it.¹

The benefits of authorship

The benefits of authorship are numerous and are described in Table 1. Firstly, authorship benefits the progress of science because a published work creates opportunities for it to be replicated and built upon.^{2,3}

Few research publications are momentous and science largely progresses in incremental steps based upon the findings of others.

On a personal level, published work may provide the individual with a sense of achievement and is evidence of considerable intellectual effort.^{2,3} Accordingly, publications may establish a researcher's reputation by public accreditation. Publications are also seen as a reflection of an individual's productivity²⁻⁴ and are the yardsticks used, not only for peer approval and entry to professional bodies, but for worthiness of academic appointment, promotion, and funding.⁵ In the academic world, therefore, 'publish or perish' is not an idle saying.⁶

The responsibilities of authorship

In being publicly credited for work, individuals must also be prepared to accept the public responsibility

Correspondence: Ms Dianne Bennett, Research Assistant, Emergency Department, Royal Melbourne Hospital, Grattan Street, Parkville, Victoria 3050 Australia. Email: dianne.bennett@mh.org.au

Dianne M Bennett, RN, RM, BA, Research Assistant; David McD Taylor, MD, MPH, DRCOG, FACEM, Director of Emergency Medicine Research.

Table 1. Benefits of scientific authorship

Contribution to the progress of science
Personal sense of achievement
Evidence of an individual's intellectual efforts
Contribution to an individual's professional reputation
Creation of currency for:
academic appointment, promotion and research funding
entry to professional bodies

that goes with it. In accepting this responsibility, authors are certifying the integrity of their work.⁷ Responsibility for publications includes the requirement and willingness to publicly defend their content if challenged by readers.⁸ Authors also have a responsibility to honour the trust of readers who, perforce, place trust in not being able to check the work that was undertaken for the writing of the paper. This honour is fulfilled by ensuring that the contents of publications are an accurate representation of the work undertaken.⁸

The rise in multiple authorship

Until 1955, sole authorship was the predominant tradition in science.⁸ Since then, there has been a rising trend in multiple authorship, especially in medicine.⁸⁻¹¹ An analysis of the number of authors of highly cited papers published between 1945 and 1988 revealed that, every 15 years, medical papers (e.g. *BMJ*, *Lancet*, *JAMA*, *NEJM*) gained 1.26 authors while papers from other branches of science gained 0.41 authors.¹¹

There are several reasons for the rise in multiple authorship. Firstly, clinical research involving patients may require the work of contributing physicians to be acknowledged in the form of co-authorship. Furthermore, large-scale studies often require the involvement of many centres in order to recruit sufficient numbers of patients for a given study.⁹ Secondly, there has been an increase in shared student projects, which has increased the tendency of several students and faculty advisers to co-author papers.¹² Lastly, the sub-specialisation

and complexity of medicine often requires the cooperation of several laboratories in order for results to be collated.⁹

However, this increasing number of authors per paper over time cannot be explained solely by the increased collaboration between individuals and centres, despite there being a statistically significant relationship between multicentre investigations and multi-authored randomised controlled trials.¹⁰ This was confirmed in a study by Epstein, who analysed the trends in the number of authors between 1982 and 1992.¹³ Epstein found, given the continuing high quality, small group productivity seen in *Nature* and *Cell*, there was no relationship between the rise in author numbers and more labour intensive research technologies.

Authorship guidelines

In the early 1980s, John Darsee dishonoured the trust of both readers and his co-authors.¹⁴ Darsee caused a scientific scandal by falsifying studies at Emory and Harvard Universities, the publications of which carried the names of prominent heads of department. These heads were not involved in the fabrication of data but they were guilty of allowing themselves to receive credit for work without accepting public responsibility for it.^{14,15}

This scandal exposed the potential for deceptive authorship and dilution of responsibility within multi-author papers. Partly as a response to this scandal, the International Committee of Medical Journal Editors (ICMJE) — the 'Vancouver Group' — developed criteria for authorship, in an endeavour to ensure honest practice.^{14,15} The ICMJE concluded that, in order to qualify for authorship of a medical paper, an author must fulfil three criteria (Table 2).

The guidelines also require that an author should have participated sufficiently in a paper to take public responsibility for appropriate portions of the content. In addition, *all* authors who meet these criteria should be listed.¹⁶

Table 2. International Committee of Medical Journal Editors (ICMJE) Authorship Guidelines¹⁶

All three of the following criteria must be met for individuals to qualify for authorship:

Substantial contribution to the conception and design of a study; or acquisition of data; or interpretation of data
Drafting the study manuscript or critically revising it for important intellectual content
Giving final approval of the version to be published

Order of names in a by-line

Disputes over who will or will not co-author a paper are often easier to negotiate than disputes that arise over the order of the names in the by-line.⁹ The order of authorship in the by-line should be a joint decision between the co-authors.¹⁶ Conflict over this ordering arises, however, because of the tacit assumptions made of authors according to their position in a by-line, namely that the contributions of all authors, other than the first, second and last, are minimal.⁹ These assumptions are important because they can influence a person's career.¹⁰ Scholars use the purported information in author lists to form impressions about the capabilities and achievements of individuals when assessing them for promotion, hire or receipt of awards or honours.¹⁸

The assumptions made of the first or principal author are particularly important. This point is illustrated well by landmark studies that become known by the name of the principal author of the paper. These studies, in addition to suggesting that this person played a pivotal role in the paper, enhance their reputation.¹⁷ Theoretically, the first author should be the person who contributed the most work to the study, including the writing of the manuscript¹⁷ and, generally, readers may correctly assume this to be true.⁹

A study by Shapiro *et al.*⁷ which examined the contribution of each author to multi-author biomedical research papers, found that first authors made a substantial contribution to every element of the research except the provision of resources. They also showed that first author position is the only one that conveys the level of participation with consistency.⁷ However, occasional misappropriation of first author credit does occur; for example, instances of pressured authorship when a senior member of staff usurps the position for him or herself because of the prestige inherent within it.⁹

In comparison to first authors, second authors usually contribute substantially less work to a manuscript, although they still contribute a majority of the time to each task involved in a paper except for conception and design.^{7,8} It is true that middle authors (those not listed first, second or last) are the least likely to contribute to the intellectual tasks of a study, such as the initial conception, design, analysis, interpretation, manuscript writing and revision.⁷ But to believe that the contributions of middle authors are always minimal is a false assumption. The study by Shapiro *et al.* also revealed that there is great variation in the contributions of middle authors, both within and

among papers, and that many of them do in fact make extensive contributions to research.⁷

The patterns of contribution of last authors of biomedical papers are similar to first and second authors. Nevertheless, similar to middle pattern authors, the contributions of last authors may vary greatly because, at times, the last author is simply the person who contributed the least.¹⁸ What is found with most consistency among last authors is that they are the people most likely to have contributed resources and the least likely to have collected data.⁷

The last position often denotes the senior member of a research team or a departmental head. This is because the position is reserved for this person out of tradition or, alternatively, the senior member has chosen to place him or herself last as an act of *noblesse oblige*.^{8,17} Because generously placing oneself at the end of the by-line is a well known practice it can, paradoxically, have the effect of highlighting the cachet of the individual rather than down-playing it.¹⁸

Subtle clues may exist to help readers interpret whether a last author's name has any importance. For example, if the names that precede the last author in the by-line are less prominent, then the last author is likely to have special significance. Another clue is the correspondence-line; if this person is the last author, then he or she is more likely to be the senior author of the paper and, therefore, have a higher likelihood of support staff to assist with correspondence.¹⁸

Hence, the nature or extent of contributions to a paper, beyond the first author, cannot be reliably discerned by order of authorship. This means by-lines, because of the tacit assumptions made of them by readers, are prone to misinterpretation.² The existence of a standard method for determining name-order would be ideal because it would eliminate disputes among authors, as well as enable readers to accurately interpret author contributions. An ideal such as this is not feasible, however, because authorship cannot be structured and enforced to such a refined degree.¹⁸

Attempts to correct authorship order inequity

Some journals have attempted to remove the tacit loading in by-lines by neutralising them through insisting on authors' names being listed alphabetically. This action is ineffective as it simply motivates authors, whose names start with a letter occurring late in the alphabet, to avoid those journals.⁸ Interestingly,

a study by Chambers *et al.* demonstrated that authors whose surnames have an initial letter towards the beginning of the alphabet have an unfair advantage for order of authorship, compared to those whose surnames start with a letter closer to the end of the alphabet.¹⁹

The journal of the Swedish Medical Association endeavoured to offset arguments about who should be an author, and what order authors should appear in the by-line, by recommending that researchers decide upon these issues before the outset of the work.¹⁴ These recommendations may be counterproductive, however, because they have the potential to reward those who promise in advance at the expense of those who deliver.²⁰

Another reason why the order of names in a by-line can cause contention among authors is because most journals place a limit on the number of authors cited per paper in the reference section. Hence, the closer the name of an author is to the end of the by-line, the greater the likelihood that their name will not appear in the reference section of another paper citing their own. The Uniform Requirements for Manuscripts¹⁶ instructs authors to list the first six authors, followed by *et al.* While this recommendation has been adopted by *The Lancet* and *Emergency Medicine* other journals vary (Table 3).

The US National Library of Medicine has also adopted a policy on the number of authors it will electronically list, printing only the first 24 authors of a paper, plus the last author when there are more than 25.¹⁶

Authorship irregularities

Existing and evolving authorship guidelines are designed to ensure that authorship credit is given when

Table 3. Permitted number of authors allowed in journal reference lists

<i>Uniform Requirements for Manuscripts</i>	if more than six authors, list the first six then <i>et al.</i>
<i>Medical Journal of Australia</i>	if more than four authors, list the first three then <i>et al.</i>
<i>Journal of the American Medical Association</i>	if more than six authors, list the first three then <i>et al.</i>
<i>New England Journal of Medicine</i>	if more than six authors, list the first three then <i>et al.</i>
<i>Nature</i>	if more than five authors, list the first author then <i>et al.</i>
<i>The Lancet</i>	if more than six authors, list the first three then <i>et al.</i>
<i>Emergency Medicine</i>	if more than six authors, list the first three then <i>et al.</i>
<i>Annals of Emergency Medicine</i>	if more than three authors, list the first three then <i>et al.</i>

due and not inappropriately. However, patterns of authorship irregularities exist and are defined in Table 4.

Guest authorship

Guest authorship, also known as 'gift, honorary or unjustified' authorship, has been reported to exist in 17–33% of papers.^{1,21} Guest authors do not help write the paper and may not have seen the final version submitted to the journal. Therefore, they are incapable of defending its contents.¹ Pressured authorship, a variation of guest authorship, may be subtle or overt

Table 4. Definitions of authorship and publication irregularities

<i>Guest authorship:</i>	inclusion of an individual in the by-line who does not meet authorship criteria
<i>Pressured authorship:</i>	a person who uses their position of authority to apply pressure upon staff more junior to them to include them as an author, even though they do not qualify.
<i>Ghost authorship:</i>	the failure to name an individual as an author when they have contributed substantially to the research or writing of the article.
<i>Divided publication:</i>	the fragmentation of data and findings from a single study: the researcher(s) publish their work in several short papers when it probably could have been published as one single, longer paper.
<i>Duplicate publication:</i>	the same content being republished in successive papers.

in nature. Accordingly, it may be difficult to detect and its incidence has not been reported.

The most common reason for guest authorship is the pressure to publish. This pressure sometimes provokes junior researchers to add a senior colleague, whose name carries kudos within the scientific community, to the by-line in the hope that this will increase the chances of their work being published.²² Other reasons for guest authorship include repaying favours; for example, referral of a patient, motivating a team and encouraging collaboration, or including laboratory technicians whose contribution was nothing more than their routine work that would have been done regardless.^{1,22}

Occasionally, researchers are unaware they are guest authors. A survey by Bhopal *et al.* conducted within the faculty of a British university, revealed that almost one-third of authors had experienced the situation of being unaware of their inclusion as a co-author of a paper at the time of its publication.²² Bestowing authorship to fellow researchers without their permission can cause resentment if the individual believes their participation was not sufficient to warrant inclusion or because the conclusions are incongruous with their scientific philosophies.⁹

Guest authorship is seen as intellectually dishonest, deceptive, unethical and causes dilution of credit for scientific work and the validity of a paper.^{8,17,22} It has been suggested that guest authors are guilty of graft — someone who acquires money or accolades in a questionable or dishonest manner, if they acquire prestige and citation without having properly earned them.²³ The ICMJE guidelines were designed to help prevent the problem of guest authorship, which is thought to be a contributing factor to the rise in multiple authorship.

Despite the perceived negativity of guest authorship, a study by Eastwood *et al.*²⁴ into ethical issues related to biomedical research and publishing found that one-third of all respondents would list an undeserving author on a paper. This is done to increase the chances of their work being published or to benefit their research career. Paradoxically, this proportion increased to 75% among authors who had experienced being unfairly denied authorship, had co-authored a paper with an undeserving author, or who had been pressured to list an undeserving author on a paper.

These results suggest that when it comes to authorship assignment, researchers are willing to compromise their principles on the matter.²⁴ This may be because the culture within research, of placing

more value on numbers of publications than on actual contributions, encourages researchers to preserve the *status quo* of authorship misuse out of self-interest.⁸

This preservation was highlighted when the *BMJ* attempted to correct authorship misuse by asking all correspondents sign a document confirming that the criteria for authorship was met by all authors, and that nobody meeting the criteria was excluded. The request was ineffective because, after it was made, there was almost no response to changes in authorship, despite the editors knowing that many of the stated authors did not meet the criteria.²⁵

Ghost authorship

Ghost authorship is almost the reverse of guest authorship and may exist in several forms. In all cases, the individual is not listed as an author but could have either made contributions worthy of authorship or participated in the writing.²¹ An example is when a corporation hires a professional writer to write a review article on topics related to a new product in order to promote it. Notable clinicians are then invited to submit the article to a journal for publication, with their names as authors, in exchange for honorariums and without revealing any conflict of interest.²³ Bhopal *et al.* found that almost half of their respondents had felt slighted by being excluded from authorship on a manuscript when they felt it had been deserved.²²

Paradoxical situations of ghost authorship have been known to occur. In one instance, a researcher intentionally excluded his name from a manuscript that reported the poor performance of a cholesterol analyser because the negative conclusion may have been perceived as being unfriendly to industry and therefore have the potential to jeopardise future funding.²³

Why authorship guidelines are not working

Thus, the multi-author style of publication within modern biomedical research is fraught with authorship obfuscation for the readers and discontentment among some authors. Current definitions of authorship are thus no longer working and there are several reasons for this.^{8,22,25–27} One is that they are misunderstood or inconsistently interpreted.²² Another is that, despite their wide publication, they are not well known.^{22,26,27} More publicity may not help the

guidelines work, however, because of the widespread disagreement between the ICMJE criteria for authorship and researcher values. Most researchers agree with the three criteria individually but disagree with the stipulation that all three are met. This stipulation is considered to be too restrictive and so, inevitably, it is flouted.^{22,25,26}

Suggestions for encouraging honest authorship

The authorship criteria are regularly debated at meetings of the Vancouver group although consensus on modifications remains elusive. One different system that has been suggested to overcome the restrictiveness of current authorship guidelines is to footnote papers with a list of the exact contributions of each person who has been conferred authorship.^{1,8,12,25,28} There are several perceived advantages to such a system. Firstly, apart from being more informative for readers, it may strengthen scientific teams because it would make it more difficult for individuals to usurp rewards not belonging to them. Secondly, the system may obviate possible disharmony over positioning within the by-line because, irrespective of their position, authors would be given full credit according to their personal contribution.²⁸ Thirdly, a contributor's list would enable merit for academic productivity to be more accurately measured and aid potential employers in assessing the work of those they may employ.^{28,29} Finally, listing the contributions of all researchers involved in a paper would make it easier for other scientists to contact the right person when they are seeking further information about a specialised area within the paper.²⁸

Despite these perceived merits, others believe a contributor's list will not end unethical reporting of academic effort.^{30,31} Hueston has pointed out that disclosing authors' contributions will not necessarily stop individuals from claiming authorship, just because they do not know about a manuscript to the extent that they can take public responsibility for it.³¹ Nor will a contributor's list stop authors being able to defend their ignorance of any fabrications; a credit list could, in fact, conveniently serve as evidence of the limitations of an author's knowledge of a paper.³⁰ Moreover, a long list of names in a credit list, apart from taking up too much space, may be seen as being irrelevant to many readers, and not contributing anything that would increase confidence in a study.^{15,25,32}

Despite the controversy surrounding contributor lists, some journals have adopted this format.³ The *BMJ*, in addition to publishing a list of authors' names at the beginning of the paper, also publishes a list of 'contributors' and their respective roles at the end of each paper. One or more of these contributors is nominated as a 'guarantor'. This designation does not necessarily imply that the person concerned has checked every last detail of the data but it does mean that he or she is prepared to take public responsibility for the paper as a whole.³⁴ The *Lancet* also publishes a list of contributors at the end of each paper and early report. The journal has not adopted a system of guarantors, however, believing this concept may only be of benefit in extreme circumstances, such as fraud, to help clarify where final responsibility lies.³³

Rafal has made light of the mire of controversy over the issues of authorship, devising the amusing Relative Authorship Weighting Scale (RAWS), a tongue-in-cheek method for determining who should be listed as authors and the order of by-line names.³⁵

Publication irregularities

Regardless of authorship, irregularities relating to the content of published articles exist and are defined in Table 3.

Divided publication

Another rising trend is journal publications of shorter length.³⁶ One of the reasons for this is because journals are increasingly passing on the rising costs of operation to authors in the form of page charges. Another is the fact that short manuscripts are more likely to be processed quickly.³⁶ This trend for papers of shorter length has precipitated divided publishing, otherwise known as the 'Least Publishable Unit (LPU)', 'salami science' or 'slicing the salami'. Divided publication is difficult for journal editors to police because they are usually not informed that other papers have been derived from the work they have accepted, or that these other papers have been simultaneously submitted to other journals.¹

One problem with divided publication is that it swells the amount of literature published, and not necessarily for the better. This style of reporting also places a burden on the resources of scientific publishing, including the time and expense of peer reviewing, increased press and postage costs for journals, and the costs of multiple indexing and abstracting.¹

Duplicate publication

Duplicate or redundant publication is also a burden on the resources of scientific publishing.¹ A good example of this abuse is two papers that have been published by the same author, in separate journals but in the same year, on communication failure among medical personnel.^{37,38} The papers are close to identical, except for the order in which examples of cases of failed communication have been discussed.

Duplicate publication can also manifest when a case is reported for a second time, only by a different author. This type of duplication is misleading because it misrepresents the incidence of the case in electronic literature searches.¹

An acceptable form of duplicate publication, however, may be for the conveying of information to separate audiences. For example, a paper being republished in a second journal because the one in which it was originally published is not available in the country of its republication. In all cases, duplicate publication requires written permission of the original journal editor, formal acknowledgement of the original journal and publication of the original article.

Conclusion

Authorship guidelines cannot solve the problem of unethical authorship. This is because authorship misuse does not occur because of guidelines being unknown or unpopular. Rennie contends that misuse occurs because of the academic system that measures the merit of researchers using the number of publications they have to their name.⁸ Therefore, it is this system that needs modifying if unethical authorship is to be stemmed. Thus, the onus to solve this inherent problem lies with academic institutions.³¹ In the meantime, failure to comply with existing guidelines may impact adversely upon scientific writing in general, and the authors' reputations in particular.

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