



Review

Recognition, reward and responsibility: Why the authorship of scientific papers matters

Elizabeth Wager*

Sideview, 19 Station Road, Princes Risborough HP27 9DE, United Kingdom

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ABSTRACT

Author lists should inform readers about who did a piece of research. If authorship attribution is incorrect, the wrong people may take the credit or the blame. Correct authorship of medical papers is also important because the research and publication process relies on trust. If scientists or clinicians are prepared to lie about who was involved with a research project why should we believe their findings? Groups of journal editors, notably the International Committee of Medical Journal Editors, have tried to establish criteria for authorship but these are not universally accepted. Despite the lack of agreement, authorship of journal articles continues to be the basis for academic appointments and is used to measure the research output of departments and therefore determine future funding. Some journals have started to use contributor lists, indicating the role of each individual, in place of, or in addition to, traditional lists of authors. However, problems about the threshold of involvement that merits authorship, and the order of listing remain unresolved. Journal editors are usually unable to adjudicate on authorship disputes since detailed, local knowledge is required. Institutions might therefore play a greater role in setting and enforcing authorship policies. Disputes could be reduced if authorship criteria were agreed, in writing, among all contributors at the start of a research project.

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1. Why does the authorship of scientific papers matter?

Why should we be concerned about getting authorship right? It might be argued that authorship abuse is a victimless crime which has no impact on scientific progress or the reliability of the medical literature. But this is a poor argument. Authorship matters because the entire research and publication process relies on trust. If scientists or clinicians are prepared to lie about the people involved with a research project or a publication, why should we expect them to be any more honest about their findings?

Since authorship has become the currency of research credit, and the output of individual academics and entire departments

is judged on their publication record, authorship abuse is not a victimless crime [1]. The career of a researcher wrongly denied authorship of a paper may suffer, while guest authors may receive undeserved credit and benefit materially from this.

There is anecdotal evidence that people who flout authorship conventions may also commit other forms of research or publication misconduct. If one views publication misconduct as a spectrum of offences one can see that insisting on guest authorship (e.g. as head of department) or omitting a deserving junior researcher from an author list may be only one step away from appropriating results of a junior colleague and thus committing plagiarism.

Inappropriate authorship practices by senior researchers (such as demands for guest authorship) set a bad example and are likely to damage relationships between team members.

* Tel.: +44 1844 275814; fax: +44 1844 275034.

E-mail address: liz@sideview.demon.co.uk.

2. What is authorship?

Discussions about the importance of authorship presuppose that we understand what the authorship of scientific papers really means or, at the very least, that there are widely accepted definitions about who should (and should not) be listed as an author. Sadly, this is not the case.

Outside the world of science, an author is simply somebody who creates new written material. The authorship of a novel, poem, play or newspaper article therefore lies with its creator and is usually simple to assign. Most works of literature and journalism are the work of just one person (ignoring, for the sake of argument, the influence of editors who generally remove rather than create text). The concept of authorship is therefore intrinsically linked not only with the act of writing but also with creativity.

In the early days of scientific experiment, most researchers worked alone. It was therefore no more difficult to say that Newton was the author of *Principia Mathematica* than to say that Milton wrote *Paradise Lost*. The early scientists were true authors in terms of both creativity and writing although, interestingly, in the 17th century many scientific works were published anonymously [2].

Nowadays it is rare for research to be undertaken by a single person. Clinical research, in particular, is nearly always a collaborative effort. Yet not everybody who contributes to the project will necessarily wield a pen, so a distinction starts to emerge between roles, and authorship starts to become dissociated with writing. When people have different roles, and not everybody is (or should be) involved in drafting the report, then systems are needed to determine which roles deserve to be recognised by authorship.

3. What guidelines on authorship are available?

A number of guidelines relating to authorship are available (Table 1). Most have been produced by groups of journal editors. However, individual journals often do not give specific guidance and there are no universal standards for those that do. A survey of 234 biomedical journals found that 41% gave no guidance about authorship, 29% based their instructions on the criteria of the International Committee of Medical Journal Editors (ICMJE), while 14% proposed other criteria and 14% stated only that all authors should approve the manuscript [3].

Most guidelines on the authorship of scientific papers give greater weight to creative and intellectual aspects of research than to routine or technical contributions. Until 2001, the ICMJE guidelines stated that only people who had made significant contributions to the design of a study, or its analysis and interpretation qualified as authors [4]. However, the current version includes data acquisition as an activity that qualifies for authorship (but explicitly notes – unlike for the other activities – that data collection *alone* is not enough, the individual must also contribute to developing the manuscript) [5].

Table 1
Authorship guidelines.

Document	Produced by	Aimed at	Available from
Uniform requirements for submission of manuscripts to biomedical journals	International Committee of Medical Journal Editors (ICMJE)	Researchers	www.icmje.org
Role of professional medical writers in developing peer-reviewed publications	European Medical Writers Association (EMWA)	Professional medical writers	www.emwa.org
What to do if you suspect ghost, guest or gift authorship	Committee On Publication Ethics (COPE)	Journal editors	www.publicationethics.org
How to handle authorship disputes	Committee On Publication Ethics (COPE)	Researchers	www.publicationethics.org
White paper on promoting integrity in scientific journal publications	Council of Science Editors (CSE)	Journal editors and researchers	www.councilscienceeditors.org

Some journals expressly forbid acknowledging individuals such as secretaries or technicians. I have heard it argued that a person did not qualify for authorship 'because they were only doing their job' and that because these people were being paid for their services this was reward enough and they should not be listed as authors (which struck me as strange, because presumably the principal investigators were also 'only doing their job' and were certainly getting paid, yet this did not disqualify them from being listed).

Guidelines that assume investigators always report their own research are unhelpful when professional writers help to develop a manuscript but make no other contribution to the project. Failure to acknowledge professional writers turns them into ghost writers, which is undesirable especially when it masks the involvement of a commercial sponsor [6].

4. Solutions to authorship problems

Since nobody (I hope) is suggesting that the best way to solve these problems is for every individual involved with a research project to take a creative role in reporting it (which would lead to papers being drafted by large committees) we need to devise a system for recognising the various roles on the basis that drafting or revising a manuscript are not the sole qualifications for authorship.

One solution is to agree on a writing group (ideally no more than about six people) who will do the writing. Publications can be written on behalf of a larger group who are acknowledged collectively. But this system again places greater emphasis on the creative act of writing than on other functions which may not be fair and may not inform readers fully about how or where the research was done. Why, for instance, should somebody who made a minor contribution to the study design, and recruited only a handful of patients, deserve greater recognition than somebody who recruited dozens of patients and diligently recorded data from them yet was not involved in designing the study?

In commercially funded studies, the protocol may be developed largely by company employees (especially if the study is designed to meet the requirements of regulatory agencies), the data management and analysis will be done by another set of employees, and the report and publications may be drafted by an in-house or freelance medical writer. The roles of design, implementation, analysis and reporting are therefore completely separated. The clinical investigators may be involved in interpreting the findings but, apart from this, they will not meet a strict interpretation of the ICMJE authorship criteria. In a large, multicentre study, the selection of a writing group (who get the chance to interpret the findings and to contribute to the publication) can therefore seem rather arbitrary.

Another problem with the traditional system of authorship listing is that it leaves editors and readers in the dark about who did what. Traditional lists do not reveal which (if any) system has been used to allocate authorship and it is therefore impossible for anybody outside the group to determine whether the right peo-

ple have been credited with, and should take responsibility for, the work.

Almost inevitably (except in the tiniest of studies involving one or two people), the contributions of different individuals will vary in terms of their nature and size. The conventional list of authors tells readers nothing about the different types of roles (e.g. design, analysis or reporting), but does it indicate the relative size of each individuals' contribution? Paradoxically, although reward systems are based on the assumption that authors are listed in decreasing order of their contribution, this convention has virtually never been codified. In a survey of over 200 journal's instructions only 2 gave any advice about the order of author listing or suggested criteria for determining it [3].

Even if we accept the premise that authors are listed simply in decreasing order of the size of their contribution to the project (and this is by no means universally true), how can we quantify different types of contribution? Equations and mathematical formulae have been proposed for solving this puzzle but these assume that the authors agree on the relative importance of different activities (in effect, to say that 1 h designing the study is equivalent to 4 h taking measurements, or whatever) [7,8]. But as lack of agreement about the relative values of different roles lies at the heart of most authorship disagreements, this approach is unlikely to succeed.

Several studies in different countries have shown that the ICMJE authorship criteria are by no means universally respected. The proportion of scientists who disagreed that all three of the ICMJE criteria should be met was 77% in a study of 39 French researchers (who had all acted as principal investigators in clinical trials) [9] and 62% in a survey of 66 British scientists [10].

Authorship problems are common. Among the 39 French investigators interviewed by Pignatelli et al., 41% considered they had been unfairly left off author lists and 62% had discovered that they were an author only after publication [9]. In a study of 77 Indian researchers at a teaching hospital, 39% reported having had a conflict over authorship [11].

It appears, then, that although many journals encourage the use of the ICMJE criteria, many researchers do not agree with these. Also, the criteria give no guidance about how to determine the order in which authors are listed. Several journals have therefore adopted a different approach. Instead of treating a research paper like a novel, with a clearly defined author (or authors), they treat it like a film and list contributors like the credits at the end of a film so that readers can see who did what [12,13]. Instead of having to guess what contribution each individual has made, this is explicitly stated. Contributorship has several advantages over conventional author lists. It is more transparent and makes it easier to spot 'guests' (who did not do enough to merit being on the list) and 'ghost' roles (i.e. contributions that have not been acknowledged). For example, if nobody is listed as having drafted the manuscript, an editor can ask about this. Although the ICMJE encourages journals to develop a contributorship system, only around 10% of biomedical journals list contributors [3].

However, contributorship is not a panacea. It does not solve the problem of the order in which authors are listed, although it does provide information so that editors and readers can judge the contributions. It also does not prevent dishonesty. Authors who are prepared to flout conventions (for example by demanding to be guest authors although this is clearly outlawed by the ICMJE guidelines) are probably also prepared to lie when it comes to describing their contribution to a project.

Editors from the Croatian Medical Journal showed that, as in other types of questionnaire, people may give 'socially desirable' rather than truthful responses [14,15]. They set up a randomized trial and compared responses when individuals described their contribution in their own words, and without any guidance, or when they completed a checklist supplied with a reminder of the

ICMJE criteria. Those given the copy of the ICMJE criteria and asked to tick boxes were more likely to indicate that they fulfilled the authorship criteria than those left to describe their contribution in their own words.

Another problem of both the traditional authorship and the contributorship systems is whether responsibility can be divided between co-authors/contributors. The ICMJE criteria state that "Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content" [5]. This suggests that authors need not be held accountable for the entire project. In a multicentre study, especially one spanning several continents, is it reasonable to blame all authors if misconduct is discovered at one centre or is committed by a single author? Can a statistician be held responsible for inadequate patient consent procedures or a clinician be expected to defend the statistical techniques used? Some journals require that at least one contributor is named as the 'guarantor'. The ICMJE defines guarantors as people "who take responsibility for the integrity of the work as a whole, from inception to published article".

Following disclosure of research fraud, co-authors have sometimes tried to distance themselves from the offence. In some cases, journal retractions have indicated that only some authors are to blame [16]. Yet in other cases, when serious misconduct has been discovered, all authors have been held culpable [17].

One of the problems with editors setting authorship criteria is that they are rarely in a position to be able to verify whether the rules have been followed or to adjudicate in disputes. The ICMJE URM note that "It is not the role of editors to make authorship/contributorship decisions or to arbitrate conflicts related to authorship". COPE has produced guidance on what editors should do when faced with authorship disputes or requests to change the list of authors but they rely on the contributors' institutions to resolve the conflict [18]. Similarly, the US Office of Research Integrity will not investigate authorship disputes but refers these to the researchers' institutions.

Local knowledge of the specific research project, and who was involved in reporting it, are needed to resolve disagreements about authorship. Many disputes could be avoided if institutions had clear authorship policies, promoted these to all researchers and checked to ensure that the policies were followed. For multicentre projects, the listing and acknowledgement criteria should be agreed at the outset, in writing, by all researchers [19]. At the start of a project it may not be possible to name the eventual authors (since personnel may change), but it is helpful to identify the roles that will qualify for membership of a writing team, or for listing as an author or contributor.

While it might be desirable to have universal criteria for how researchers are recognised in publications, local and specific knowledge about the relative importance of different roles for different types of study are also important. If responsibility for authorship policies were devolved to the researchers' institutions or employers, rather than directed by journal editors, it might initially result in variation between institutions but probably no worse than at present. In time, policies would probably be harmonised, as researchers move between institutions. Although it is generally helpful to separate rule-makers from enforcers in judicial systems, where detailed knowledge is required to verify statements about who did what, this is probably impractical. Institutions could provide checks and balances to minimize unfair practices or abuse, for example, by establishing an independent ombudsman to arbitrate in disputes between institutions or those that cannot be resolved at the departmental level. Having institutional systems for agreeing and enforcing authorship policies might seem to add a layer of bureaucracy for researchers but if policies are well-designed and criteria agreed at the start of projects, disputes should be

rare and, when they do arise, should be able to be resolved quickly.

In many countries, such as the UK, research output is largely measured by authorship of peer-reviewed publications, so academic departments should have an interest in ensuring that contributions are fairly reflected. Vouching for the accuracy and completeness of a contributor list could become a routine procedure.

Journal editors might continue to have a role in suggesting criteria for the authorship of non-research publications such as editorials and non-systematic review articles. While such publications may not be so crucial in assessing the productivity of departments, it is still important for readers to know who was involved in their development. In particular, readers and editors deserve to know about any possible conflicts of interest. Some journals now have a transparency policy covering such articles – for example, the BMJ asks who had the idea for an article, whether the named authors received assistance in writing it, were paid to write it or have links with organizations that might benefit from its publication [20].

5. Conclusions

Although the authorship criteria proposed by the ICMJE are the most widely promoted by medical journals, they are not universally accepted and some journals have acknowledged this. While most journals retain the traditional system of listing authors, some have replaced (or augmented) this with a list of individuals' contributions to the research and/or the publication. Neither system determines the order in which authors/contributors are listed, although it is generally assumed that individuals are listed in decreasing order of their contribution. However, this convention is virtually never explained, and importance is sometimes also attached to being the last or corresponding author. Listing contributors does, however, increase transparency, provides more information for editors and readers, and may help detect (and therefore prevent) problems such as guest and ghost authorship.

Journal editors can do little to ensure that authorship policies have been followed. They should therefore consider encouraging institutions and employers to set and enforce policies on listing and acknowledgement. If listing and acknowledgement criteria are agreed, in writing, between all parties, at the start of every project, this should reduce the incidence of authorship disputes.

References

- [1] Sheikh A. Publication ethics and the research assessment exercise: reflections on the troubled question of authorship. *J Med Ethics* 2000;26:422–6.
- [2] Kronick DA. Peer review in 18th-century scientific journalism. *JAMA* 1990;263:1321–2.
- [3] Wager E. Do medical journals provide clear and consistent guidelines on authorship? *Medscape Gen Med* 2007;9:16.
- [4] Huth E, Case K. The URM: twenty-five years old. *Sci Ed* 2004;27:17–21.
- [5] International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. www.icmje.org.
- [6] Wager E, Field EA, Grossman L. Good publication practice for pharmaceutical companies. *Curr Med Res Opin* 2003;19:149–54.
- [7] Merz JF, Gorton GE, Cho M, Merz MLH, Sankar P. Calculating coauthors' contributions. *Lancet* 1997;350:1558.
- [8] Hunt R. Trying an authorship index. *Nature* 1991;352:187.
- [9] Pignatelli B, Maisonneuve H, Chapuis F. Authorship ignorance: views of researchers in French clinical settings. *J Med Ethics* 2005;31:578–81.
- [10] Bhopal R, Rankin J, McColl E, et al. The vexed question of authorship: views of researchers in a British medical faculty. *BMJ* 1997;314:1009–12.
- [11] Dhaliwal U, Singh N, Bhatia A. Awareness of authorship criteria and conflict: survey in a medical institution in India. *Medscape Gen Med* 2006;8:52.
- [12] Rennie D. When authorship fails. A proposal to make contributors accountable. *JAMA* 1997;278:579–85.
- [13] Smith R. Authorship: time for a paradigm shift? *BMJ* 1997;314:992.
- [14] Marusic A, Bates T, Anic A, Marusic M. How the structure of contribution disclosure statements affects validity of authorship: a randomized study in a general medical journal. *Curr Med Res Opin* 2006;22:1035–44.
- [15] Bates T, Anic A, Marusic M, Marusic A. Authorship criteria and disclosure of contributions. *JAMA* 2004;292:86–8.
- [16] Anon. Retraction of Matsuyama et al., Discoidin domain receptor 1 contributes to eosinophil survival in an NF-kappa B-dependent manner in Churg–Strauss syndrome. *Blood* 2007;(January)109:22–30; *Blood* 2008;111:2537.
- [17] Dyer O. Consultant struck off for fraudulent claims. *BMJ* 1995;310:1554–5.
- [18] COPE flowcharts. www.publicationethics.org.
- [19] Albert T, Wager, E. How to handle authorship disputes: a guide for new researchers. COPE Report 2003, Committee on Publication Ethics. www.publicationethics.org.
- [20] BMJ. Transparency policy. <http://resources.bmj.com/bmj/authors/editorial-policies/transparency-policy>.