

# The Ethical Assignment of Authorship in Scientific Publications: Issues and Guidelines

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## Abstract

Properly assigning authorship of academic papers is often an ethical challenge. Through a hypothetical case study, the authors examine some of the potential ethical issues involved in determining who should and should not be listed as an author: the problems of honorary authorship, coerced authorship, and ghost authorship, as well as the question of how to order authors. Guidelines for avoiding and negotiating these issues are also discussed.

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**Keywords:** ethics, authorship, research

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## CASE VIGNETTE

A postresidency emergency medicine (EM) research fellow (RF) is working on a study to validate a clinical prediction rule for deciding which patients admitted for chest pain require telemetry monitoring. The chair of RF's department (DC) derived and published the rule, but he has moved on to other projects and is not involved in the current study. RF's fellowship director (FD) designed the study with the assistance of RF and submitted it to the institutional review board. A senior investigator (SI) from the cardiology department who has worked on other projects with FD helped obtain funding for the study from a medical device manufacturer. The manufacturer further offered to write a first draft of the manuscript once data collection and analysis were complete. The data were gathered by three summer medical students (MA, MB, MC). After a manuscript listing RF, SI and FD as authors has been drafted by a scientist working for the sponsor, DC lets FD know that he expects to be listed as an author, given his role in deriving the rule.

Should DC, who is not involved in the current project, be listed as an author? Should SI be included as an author solely for obtaining the funding? Should the medical students be included as authors? Should the device manufacturer's contribution to the drafting of

the paper be acknowledged? In what order should the authors be listed?

## BACKGROUND

Properly assigning and representing authorship is an ethical challenge for academic physicians. In addition to the interpersonal issues involved, researchers must have "honesty in data collection, reporting of research results, collaboration, and authorship credit" and this is recognized as an explicit component of professional behavior in EM.<sup>1</sup> Maintaining honesty and integrity in research collaboration and the assignment of authorship credit is an important ethical standard. In the past, when single, or at most dual, authorship of scientific papers was the norm,<sup>2</sup> this standard was relatively easy to meet. Today, however, the majority of papers list multiple authors, with correspondingly greater difficulty in assuring proper distribution of credit. In a survey of EM journals published between 1975 and 1995, while the average length of papers remained constant at 4–6 pages, the average number of authors per article increased from 2.4 to 3.8.<sup>3</sup> There are several possible explanations for this trend. One is the increasing collaboration among scientists and institutions working on complex projects together.<sup>2,4</sup> Another explanation is that with the increased pressure to "publish or perish," researchers have an increased incentive to push for a place on as many papers as possible.<sup>4–6</sup> A final possible cause, particularly salient in a younger specialty like EM, is the sharing of projects of junior researchers with well-established faculty mentors, often from other departments.

Whatever the explanation for the change, the extraordinary pressure on researchers to publish makes appropriate assignment of authorship imperative.

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Establishing who is an author determines not only who gets credit for the work, but also who, as a result, accepts responsibility for this work. It is important that those taking credit for the work actually have done the work and are able to guarantee the findings.<sup>7</sup> One study has shown that the increased number of authors per paper has been accompanied by an increased number of authors who do not meet appropriate authorship criteria.<sup>8</sup> Placing too many people on the byline dilutes the efforts of those who have substantially contributed to the manuscript.<sup>2</sup>

Furthermore, the increased number of authorship relationships has brought an increased number of disputes about authorship. In one study published in *JAMA*, authorship issues accounted for 2.3% of confidential complaints made to the Harvard Ombuds Office in 1991, but increased to 10.7% of all complaints in 1996. Disputes over authorship had become the single most common reason for complaint.<sup>9</sup>

Decisions such as who is and is not an author, and the order of authorship, are all potential ethical issues. Before discussing the details of these problems, and possible responses to them, we should understand the general principles regarding the proper assignment of authorship credit. The first principle is that all authors should be able and willing to accept responsibility for the publication, at least the parts in which they were involved. Second, appropriate credit must be assigned in listing authors. All that follows below is commentary on these basic principles.

## PROBLEMS IN AUTHORSHIP

Because funding agencies, institutions, and other scientists use a track record of publication as a measure of success, it is imperative that authorship be assigned appropriately.<sup>10</sup> There are many ways this can fail to happen, including: 1) honorary authorship, 2) coercion authorship, 3) ghost authorship, and 4) the inappropriate ordering of authors. Most of these can be illustrated with respect to our hypothetical case.

### Honorary Authorship

Honorary authorship, also known as guest or gift authorship, is the inclusion as author of an individual who has not contributed adequately to the project,<sup>11</sup> often someone senior to the legitimate authors of the paper. One study found honorary authors on 19% of papers reviewed,<sup>3</sup> while another found them in 39% of Cochrane reviews.<sup>12</sup>

There are essentially two forms of honorary authorship. One form, to which the term "honorary authorship" is often restricted, occurs when the legitimate authors of a paper voluntarily list as an author someone who has not contributed, or not contributed, significantly. A common reason for doing this is the belief that the inclusion of a more well-known author will increase the chance that the paper will be accepted for publication.<sup>11</sup> Even if the paper is to be blindly reviewed, the authors may believe that readers will take the paper more seriously if a more senior author is listed.<sup>7,13</sup> In these circumstances, the honorary authors may even be unaware that they have been listed on the

paper.<sup>11,13</sup> Another common reason for including honorary authors is to seek favor with them through the "gift" of publication. This may be done to express gratitude for the influence a mentor had on the career of the first author or to foster collaboration on future projects. Sometimes it may be done in the hope that the honorary author will return the favor.<sup>11,13</sup>

In our case, we may be concerned that SI is an honorary author. We may ask whether obtaining funding, without participating in the conduct of the project itself, constitutes an adequate contribution to the project to be considered an author. If not, SI is an honorary author, with the "payback" perhaps coming in the form of future collaboration and good-will between the two research teams.

### Coercion Authorship

The second form of honorary authorship is often given its own name: coercion, or pressured, authorship. The distinction is that, whereas in honorary authorship, the impetus to include the inappropriate authors comes from the legitimate authors, in coercion authorship, the impetus comes from the inappropriate author, not the research team. A senior member of a lab or department may use his or her position to pressure researchers to add his or her name to a paper.<sup>13</sup> Although this pressure is often overt, even an author included as a result of more subtle, "environmental," pressure that is just "understood" by junior faculty, would be a coercion author. If, however, superiors show a sufficient level of involvement in the project, then this is, of course, a legitimate reason to include them as authors.

In our case, DC appears to be a coercion author. In addition to not contributing to the current project, he is using his authority, albeit indirectly, to obtain authorship credit on this paper. Had DC been at a separate institution, it is highly unlikely that he would be included as an author on this study.

### Ghost Authorship

Ghost authorship can be thought of as the opposite of honorary authorship. In the words of the World Association of Medicine Editors: "Ghost authorship exists when someone has made substantial contributions to writing a manuscript and this role is not mentioned in the manuscript itself."<sup>14</sup> This happens especially frequently in industry-sponsored articles, as the sponsors may wish to avoid making clear their connection to the paper. A recent study identified ghost authors in at least 75% percent of such papers,<sup>15</sup> whereas another study found ghost authors in only 11% of the general medical literature.<sup>8</sup> Thus, research actually performed by employees of a corporation may appear solely under the names of (possibly honorary) authors not affiliated with that company. Instances of ghost authorship may also occur when investigators leave in the middle of a project. If they have contributed adequately to the project before departing, then their exclusion as authors would constitute ghost authorship. Finally, the exclusion from the byline of junior members of a team who have contributed to the project also constitutes a form of ghost authorship.

Our case raises two potential issues of ghost authorship. First, the sponsor's employee participated in a significant part of the project, namely, writing the manuscript, and may be a ghost author if he or she is not listed. Second, if data gathering is considered a significant contribution to the project, then the medical students will be ghost authors if not listed.

### Ordering of Authors

Once the team has generated a list of authors, they must determine their order. The order in which authors are listed is usually understood to indicate how much credit they deserve for the project<sup>16</sup> and is thus important in academic medicine. Controversy can often develop at this stage, even in the most successful collaborations. Recognition as the first author is important for several reasons. The first author is understood to be the person who contributed the most not only to the work involved in doing the study but also to the writing of the article.<sup>16</sup> Often landmark articles become known by the name of the first author. The sequence of authors after the first author is usually ordered by the relative contribution of each individual, although many designate as last author the senior supervisor of the research team.<sup>17</sup> If there is no senior member of the team, last authorship may be as controversial as first authorship. As the general province of the team leader, last authorship is often taken to imply possession of independence and the skills and resources to get a project done, which may be important in grant and promotion reviews. Often the contributions of all authors, other than the first, second, and last authors, are assumed to have been minimal. This is not always the case, however, as one study found many middle authors did in fact make extensive contributions to the research.<sup>18</sup> In another variation, some groups place the person who contributed the least as the last author.<sup>16</sup> Ordering of authors can thus influence careers, signifying the intellectual credit due to each author. At the same time, this information can be difficult to interpret and be misleading.

Although there are no unique problems of author ordering in our case, as in any group project, the participants in the study must be careful to submit an appropriately ordered list of authors with the manuscript.

### REAL PROBLEMS

The issues identified in the preceding section are not merely theoretical issues or ethical niceties. Each has real and significant ramifications.

The most problematic cases of honorary authorship involve those cases where a senior author is added to aid in getting an article published or taken seriously. To the extent that these efforts succeed, the content of the paper is not being assessed on its own merits, but on the merits of its (supposed) authors. A particularly egregious case of this sort of honorary authorship occurred in England in 1994. In publishing a paper describing the successful transplantation of an ectopic pregnancy into the uterus, the surgeon, Malcolm Pearce, added as an author the director of his laboratory, who

was also the editor of the journal in which the paper appeared. When the report was found to be false, the director insisted that he knew nothing of the case itself and only agreed to have his name listed "as a courtesy."<sup>19</sup> Nonetheless, there was real concern at the time that the editor's name on the paper allowed the fraudulent research to be published.<sup>20</sup> Here we have a case where honorary authorship not only could have inappropriately advanced a researcher's career, but could have subjected women to needless and possibly dangerous surgery.

Ghost authorship, especially when it is related to corporate influence, can be especially problematic. In such cases, papers, which may be original research or reviews, may be written almost entirely by employees or contractors of the corporation and are often heavily biased to support the corporation's interests.<sup>21</sup> This "injects bias and untruth into the scientific dialogue"<sup>22</sup> on a scale much larger than that of the Pearce case because the bias can be introduced directly into the presentation of the data, which can influence reader's interpretation of the study's results. Even though the listed authors may subsequently revise the paper, the tone of the first draft often carries through to the final draft.<sup>23</sup> A recent paper<sup>24</sup> reveals that corporate authorship by Merck occurred in a large portion of the literature written about rofecoxib between 1999 and 2004, including both the Advantage<sup>25</sup> and Vigor<sup>26</sup> papers. These were two of the papers in which it was later revealed that data showing that rofecoxib may cause heart attacks were not reported.<sup>27,28</sup> Ghost authorship may thus have contributed to the deaths of scores of patients.

Problems resulting from coercion authorship and questions of the order of authors may not result in newsworthy stories, but they are significant nonetheless. Authorship credits are the currency with which academic advancement is secured, and the value of these credits is substantially determined by the length of the list of authors on a paper and one's place on this list. When the list of authors is artificially lengthened by coercion, or even honorary, authors, the value of the contributions of those who actually did work on the project is diluted.<sup>11</sup> Promotion review committees will not see the true authors' contributions as being as significant as they were.<sup>2</sup> The coercion, or honorary, authors thus effectively steal credit from those who did the work.

As noted above, inappropriate placement of authors can have a similar effect. Review committees often make certain assumptions about individual authors' contributions to a publication based on where the author's name appears on the list of authors. Giving someone inappropriately significant credit on title page of a paper thus diminishes the credit other authors who did more work on the project will receive when their academic productivity is reviewed.

Finally, even ghost authorship can create these sorts of problems. For, ghost authors need not be corporate employees whose job it is, essentially, to be ghost authors. Ghost authors may also be junior members of the team who contributed much to a project but whose names are not on the publication. In that case, the credit due to these anonymous members of the team,

is, again, effectively stolen and redistributed to the listed authors.

As this section makes clear, all of the issues we identified in our case may have important ramifications. Most significantly, perhaps, failing to list the sponsor's author will leave readers unaware of the possible bias present in writing the paper. Furthermore, the various issues surrounding the listing of DC, SI, and the medical students show that care is necessary to avoid giving too much authorship credit to some and too little to others.

## POTENTIAL SOLUTIONS

In response to these issues, especially those involving fraud,<sup>29,30</sup> the International Committee of Medical Journal Editors (ICMJE) has proposed that, to be listed as an author, one must contribute to all three of the following stages in the preparation of the manuscript: 1) making a "substantial [contribution] to the conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) [having] final approval of the version to be published"<sup>30,31</sup> (see Table 1). Furthermore, anyone who meets these criteria should be listed as an author.<sup>30,31</sup> In addition to these three criteria, the ICMJE guidelines further state that each author "should have participated sufficiently in the work to take public responsibility for appropriate portions of the content."<sup>30,31</sup> The potential impact of these guidelines on several of the problems identified above is clear. Honorary and coercion authors will not meet these criteria and thus should not be listed. Most ghost authors, on the other hand, should not be left out under these guidelines.

Although the ICMJE guidelines would appear to address most of our concerns in principle, they are viewed by many as being overly restrictive,<sup>7,11,32,33</sup> with more than 60% of respondents in one study believing that not all three ICMJE criteria should be required for assigning authorship credit.<sup>33</sup> This attitude is especially prevalent among clinician-researchers, who may be deeply involved in the first ICMJE stage of data acquisition and perhaps even analysis, but not involved in writing at all, leaving this to their colleagues with fewer clinical responsibilities.<sup>11,32,33</sup> Exclusion of key members of the research team from authorship was the most common reason given for finding the ICMJE criteria too narrow.<sup>33</sup> Whereas it may be reasonable to exclude from the authorship list, for example, a research associate who does nothing more than interview subjects according to a predesigned questionnaire, clinicians often feel that the ICMJE criteria greatly undervalue

their real contributions to research. Perhaps somewhat because of this concern, until recently at least, few if any journals have strictly applied the ICMJE criteria, with researchers finding that 15%–45% of papers in prestigious journals have honorary authors as defined by the ICMJE.<sup>8,12,34</sup>

A second criticism directed at the ICMJE guidelines is that they do little to prevent the inappropriate authorship claims they were designed to deter.<sup>26,35</sup> Although they clearly define what should count as authorship, merely publishing the guidelines has done little to deter ghost and honorary authorships.<sup>8,12,15,34</sup> Neither editors nor readers have any way of knowing if a listed author meets the criteria. As a result, some journals now require authors, along with their submission, to list the ways they have contributed to the paper, usually via a checklist with categories similar those listed in the ICMJE guidelines. This allows editors at least to make an informed decision about who deserves to be an author.

## Contributorship

To give readers access to this information, several journals have recently begun listing contributorship information as well as authors in the published manuscript. This idea was first put forward in 1997 by Rennie et al.<sup>7</sup> and has since been endorsed by the ICMJE.<sup>30,31</sup> Contributorship information is usually presented in the form of a brief paragraph immediately after the main text of the paper. Thus, if this journal published such information, this article would be followed by a paragraph stating something like: "VRF and JRS each contributed to the conception, design, and writing of the paper. Each approved the final version." For a paper by four authors containing original research the text might read: "AB originally conceived and designed the study. AB, CD, and EF supervised the conduct of the study and data collection. AB and GH supervised recruitment of subjects and managed the data including quality control. GH drafted the manuscript, and AB contributed substantially to its final revision." With this information, readers can assess the relative value of the various contributors to an article, which would not be easy to do with a traditional list of authors.

A further advantage of disclosing contributorship information is that it bypasses the need for rigid definitions of authorship like that provided by the ICMJE guidelines, which, as we saw, many consider problematic. In the contributorship system, those who worked on the project decide who is listed as a contributor.<sup>7,35</sup> They are free to acknowledge in print whatever and as many contributions they feel are important, so long as these contributions are made clear.<sup>7</sup> Everyone who

Table 1  
International Committee of Medical Journal Editors (ICMJE) Authorship Guidelines<sup>31</sup>

- All three of the following criteria should be met to qualify for authorship:
1. Substantial contribution to conception and design *or* acquisition of data *or* analysis and interpretation of data.
  2. Drafting the manuscript or revising it critically for important intellectual content.
  3. Final approval of the version to be published.

contributed may thus receive credit, academic and otherwise, for their work.

Of course, even contributorship lists do not completely solve the problems of honorary and ghost authorship. The chair of a department may be credited with “giving overall guidance and supervision to the project” or some other vague task. However, unless those who submit the paper lie, the minimal contribution of honorary authors will be clear.<sup>7</sup> In the case of ghost authorship, lying by omission, of course, is still possible. However, the lack of involvement of the nominal academic author, and the failure to credit anyone for doing substantial parts of the study, will be clear from contributorship information and may put pressure on the other authors to include all those who made significant contributions the project.

A contributorship system can also mitigate disputes about the order of listing authors. Again, the minimal information available in the author listing is no longer the only, or even main way, to assign credit for the project. Readers, most importantly tenure and promotion committees, will therefore not need to make assumptions about who did what based on indirect and weak evidence.<sup>7</sup> An issue may still remain in that some electronic databases may index papers by only a limited number of authors, typically the first six. Thus, being listed toward the front of the list may still be valuable for raising one’s profile. However, as the ordering of authors becomes separated from the degree of credit they deserve for the work, and as computer memory becomes more available, databases may move toward indexing all authors, or contributors.<sup>7</sup>

### Alternatives to Contributorship

Although switching to a contributorship system would mitigate several of the problems associated with attributing authorship credit, it is acknowledged as radical even by some of its proponents<sup>29</sup> and has not been adopted by most journals. Thus, despite the merits of contributorship, resolving ethical quandaries within the current system often requires other strategies. We believe that adhering to the following strategies and rules of thumb will help make resolving these issues less difficult.

**Open and Direct Communication.** First, have early and explicit conversations with all interested parties about who will be listed as an author and where. Furthermore, revisit the issue as the project progresses, since what was initially expected of various contributors and what was ultimately delivered may differ, sometimes greatly, and this could affect both the order and even composition of the authors’ list. Although disputes may still be inevitable, early and transparent discussions will keep these to a minimum.

**A Climate of Inclusiveness.** Second, include anyone who would be considered an author by the ICMJE guidelines. Although these guidelines may be considered too restrictive to use as a basis for excluding a potential author, anyone who meets these criteria should be included as an author (for their own benefit) and must be included (to avoid the problem of ghost

authorship). Furthermore, in the interests of justice, once a decision has been made to include one person as an author, no one who has contributed at least as much to the project as that person should be omitted from the byline unless there are substantial reasons to do so.

**Objective Tools and Measures.** Further tools for avoiding and mediating authorship disputes are objective measures such as that suggested by Ahmed et al.<sup>36</sup> and the quantitative uniform authorship declaration (QUAD) system.<sup>37</sup> These tools allow one to score each potential author’s contribution to a paper in various categories, helping both to identify appropriate authors (any and all contributors who have adequate scores) and to order them (by score). For example, the scheme of Ahmed et al. gives authors 0, 1, 3, or 5 points in each of seven categories, such as conception, design, implementation, and drafting the article, depending on whether the author made no, minimal, some, or significant contributions to the project in the given category (see Table 2, and Table 4 for an example). Each author’s total score is calculated, and the authors are listed in order of descending scores. A cutoff could also be set to determine the minimum score needed to be included as an author on the publication, although Ahmed et al. do not suggest such a number. The QUAD system asks authors to state their “percentage share of the total credit” in four categories: conception and design of the project, data collection, data analysis and conclusions, and writing of the manuscript (Table 3). Authors are listed in descending order of total percentage contributions across all four categories. The original proposal states that a minimum contribution of 10% within a single category should be required for claiming authorship, but care should be taken to avoid having this practice conflict with the maxim to include everyone who meets ICMJE criteria. Adherence to these practices, especially if they are agreed to before beginning a project, should result in avoiding, or rapidly resolving, all but the most intractable problems in assigning authorship.

### CASE RESOLUTION

RF was able to deal with each of the issues in turn. Regarding listing DC as an author, after reviewing the ICMJE guidelines, RF became uncomfortable with listing DC, who had not participated in any of the three stages specified by the ICMJE. When she approached her university’s ombudsperson about the potential conflict, she was informed that the university itself supported the ICMJE guidelines. When FD discussed the ICMJE guidelines and the university’s policy with DC, DC agreed that he should not be listed as an author.

The case of SI was easier to deal with. He had never expected to be listed as an author simply for obtaining support and was surprised when the draft listed him as one. He was fully aware of and supported the ICMJE guidelines and agreed with RF’s inclination not to include him on the final paper. He said that he obtained the funding simply as part of the ongoing relationship between the two research teams.

After receiving the draft from the device manufacturer, RF asked the author about listing him on the

Table 2  
The System of Ahmed et al.

	Author A	Author B	Author C	Author X
Conception				
Design				
Implementation				
Data analysis/interpretation				
Drafting the article				
Revising/reviewing the article				
Public responsibility				
<i>Total</i>				
Each Author is Given 0, 1, 3, or 5 Points in Each of Seven Categories The points are totaled for each author, and authors are listed in descending order of their total points. <sup>36</sup>				

Table 3  
Quantitative Uniform Authorship Declaration (QUAD) System\*

	Author A	Author B	Author C	Author X
Concept/design				
Data collection				
Analysis/conclusions				
Writing				
<i>Total</i>				
*Each author's percentage contribution in each category is entered into the grid. Authors are listed in descending order of their total percentage contribution. <sup>37</sup>				

Table 4  
Final Contributions to the Paper, according to the System of Ahmed et al.<sup>36</sup>

	RF	FD	MA	MC
Conception	0	5	0	0
Design	3	5	0	0
Implementation	5	1	3	3
Data analysis/interpretation	5	5	1	1
Drafting the article	5	3	0	0
Revising/reviewing the article	5	3	0	0
Public responsibility	5	5	1	1
<i>Total</i>	29	27	5	5

byline. She was informed that the manufacturer would not allow its employee to be listed on the paper. RF became uncomfortable with publishing the device manufacturer's work under these conditions and was furthermore concerned about covert bias in the draft. She therefore decided to write her own version of the paper without reference to the manufacturer's draft and thus avoid the problems of ghost authorship and bias.

In considering the contributions of the medical students, RF and FD decided that data collection alone was not significant enough to warrant authorship. At the outset of the project the medical students were told this and were also told that if they participated in the sessions discussing the data analysis and results they would be listed as authors. At the end of the summer, MA and MC attended these meetings, while MB opted to go overseas. Therefore, MA and MC were listed as authors on the final paper (the device manufacture was not aware of the medical students' participation in the project and hence they were not listed on that first draft).

In considering the ordering of the authors, all concerned agreed to use the system of Ahmed et al.<sup>36</sup> The calculations are illustrated in Table 4 and resulted in a final author list of RF, FD, MA, and MC, with the equally contributing medical students being listed alphabetically.

## CONCLUSIONS

Proper attribution of authorship is important for appropriately distributing intellectual and academic credit, accurately assigning responsibility, maintaining cordial academic relationships, and attaining the highest standards of professionalism without which further work cannot proceed. Attention to the issues and solutions

raised in this article can assure that all authors are properly identified and credited.

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