
Original Article

Coauthorship in Pathology, a Comparison With Physics and a Survey-Generated and Member-Preferred Authorship Guideline

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Abstract and Introduction

Abstract

In a large and detailed survey of scientific coauthorship in pathology, 3500 members of the US and Canadian Academy of Pathology (USCAP) were surveyed via the Internet with a final response rate of 22.5%. The results were compared with a previous survey of members of the American Physical Society (APS). The fields are found to be very similar. For example, there is no well-defined way to determine coauthorship: the byline is arrived at without the use of public coauthorship standards according to 90% of respondents (92% in physics). A substantial amount of inappropriate authorship is present in both fields using a variety of authorship guidelines. For example, using the guideline of the International Committee of Medical Journal Editors (the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" [ICMJE]), the average number of coauthors judged to be inappropriate in pathology on papers with 4 coauthors is 1.0 (1.2 in physics), and using the guideline requiring "direct contributions to scientific discovery or invention," we find 1.6 (1.5 in physics). Finally, it is suggested that authorship guidelines should be constructed by public surveys rather than closed-door committees: an authorship guideline constructed from previous survey feedback (from APS members) was found to be preferable to USCAP members (it received 40% of the vote, the ICMJE received 24% of the vote).

Introduction

Appropriate authorship assignment is of considerable importance to both scientists and the public. Knowing who did a particular piece of work is important -- scientists can contact the appropriate colleague, ask questions, and obtain data or reagents, and the public can shift funds to better scientists and optimize its return on investment in the scientific market. Also, public recognition of intellectual achievement in terms of authorship is a very strong incentive for scientists to perform their work. Inappropriate authorship, on the other hand, makes it difficult for scientists to communicate about their findings, gives credit to those who do

not deserve it and thereby removes some of the individual incentive to perform the scientific work (though adds individual incentive to perform work below the scientific level such as provide tissue samples, provide laboratory space, etc.), and diverts public funds. The study of authorship designation is relatively new and very controversial.[1-12] No journal, as far as the authors know, actually enforces any authorship guidelines by adjusting bylines.

A quantitative understanding of coauthorship in pathology is missing. A literature search of PubMed using the terms "authorship" and "pathology" identified about a dozen publications. The majority of these are not germane, and only one can be found in a pathology journal.[13] The issues confronting coauthorship in pathology may be similar to other medical specialties (such as those arising from division of labor set by academic institutions and federal granting agencies). As an example, we would direct the readers of this article to a relatively recent article published in a premiere pathology journal that included about 30 authors.[14] While we can empathize and sympathize with this scenario, at the same time it poses a problem for all involved parties, including the journal editor. We suspect that almost all of the authors' contributions included a case(s) with accompanying clinicopathologic material. The question is: does this type of involvement represent a significant contribution?

Various ways to address current issues of coauthorship have been proposed. Most notable is the development of guidelines that are put forth by scientific society and editorial committees. This paper shows that constructing authorship guidelines in the open using survey feedback can be superior to constructing them in closed committee meetings. We find that scientists do not necessarily prefer the guidelines of their own society, and knowledge gathered from membership surveys can be useful in constructing meaningful guidelines that are preferred. Unenforced guidelines are not a solution to the problem of gift or ghost coauthorship[15] (neither the APS guidelines nor the "Uniform Requirement for Manuscripts Submitted to Biomedical Journals" [ICMJE] are enforced), and other solutions have been proposed.[2,9,15,16]

Materials and Methods

The survey (Appendix A) procedure was identical to a previous survey of physicists.[9] Most, but not all, of the questions were identical. The subject line of the email message was slightly different from the previous survey: it included the name of the society to attract more attention -- "USCAP Membership Survey: Your thoughts on authorship requirements" instead of "Your thoughts on authorship requirements." This subject line could probably be improved in future studies.

A first survey invitation sent out on September 30, 2002, reached 3554 pathologists without returning a nondelivery report. After 1 week, 450 surveys were returned (13%). Three reminders were subsequently sent out, which increased the response rate by 4.2%, 3.4%, and 2.3%, yielding a final response rate of 22.5%, compared with the return rate of 16% in the previous survey[9] that was carried out without reminders. While this suggests that further reminders will enhance the response rate, these have to be weighed against annoying the survey respondents. Four returns were removed because they were either incomplete or tried to inappropriately influence the average.

Surveys via the Internet give somewhat different answers from surveys via other media and may be more effective in addressing sensitive issues,[17] which suggests that email was an appropriate survey media for the sensitive topic of who gets credited with authorship and why.

This and other works of the first author have been criticized because of low return rates. An appropriate return rate is usually quoted to be 70%, but the first author believes that this "common wisdom return rate rejection" (CWRRR) is fundamentally incorrect. As far as the first author knows, the CWRRR has no support in the survey research literature. Rather, CWRRR is based on the following back-of-the-envelope calculation: if a survey finds 98% "yes" answers and had a 50% return rate, the "true" answer can be anywhere from 99% "yes" to 49% "yes" because the nonrespondents could answer the survey completely differently from the respondents. Because this uncertainty is too large, the survey results are not worthy of publication. This exposes the first fault in CWRRR: even if we go along with the back-of-the-envelope calculation, the survey with a 50% return rate still contains information; it quantifies an interval in which the "true" result is to be found and therefore it should be published as long as this interval is a new interesting finding. The second problem with the CWRRR is that it appears to have no consequence in science other than in the review process: no findings with a 70% rate are subject to any consequences -- if the above example had a 70% return rate, the "true" answer should be quoted in an interval of 98% and 69%; it never is. Third, and most seriously, CWRRR assumes that the nonresponding population is a qualitatively different population than the responding population, in medical terms that one of the populations has a well defined "disease," and, on top of that, with one of the symptoms being not answering anonymous surveys. Relevant to the current subject, no published experiment the author knows of shows the existence of 2 distinct human populations with different ethical judgments and, even more improbably, that one of those populations do not answer anonymous surveys.

In the previous survey of physicists,[9] the quality of the data was examined in 2 ways, and the findings should carry over to the present investigation. First, the age demographics obtained were compared with publicly available graduation numbers (no publicly available membership information exists) corrected by life tables of male death rates (older physicists are overwhelmingly men). There was excellent qualitative and good quantitative agreement: the subjects who graduated in the 1950s, 60s, and 70s were underweighted by 12%, 6%, and 11%, respectively, the 1980s were overweighted by 27%, and the 1990s were off by less than 1%. These differences may originate in differences in Internet access/usage (underweighting the older population), in inaccurate email addresses for the youngest members (who may move around more often), or real factors that may have caused real differences between the graduation rates and society membership such as job availability upon graduation and immigration. Second, the time dependence of the survey results was studied for 2 representative questions, and it was found that respondent time was not tied to the results and thus consistent with the view that the further returns would not change the results appreciably.

The respondents were asked to identify the "the most recent paper published in a refereed journal with yourself as an author." The average number of authors was 4.8 and the average respondent author number was 2.6, showing that the combined respondent/survey sampling was close to the mathematically correct ratio of 2:1.

Finally, the comparisons across fields in this paper should be more accurate than the results for either field since, mathematically, differences between similar results are typically more accurate than either result.

In hindsight, question 20 should have had another answer choice "other" to cover nonacademic pathologists.

The statistics reported in this article refer to papers that "report a discovery or invention" unless specified otherwise.

Results

The responses to most of the questions are summarized in Table 1.

The survey asked whether publicly available authorship requirements were discussed among potential authors and then used as the agreed-upon criteria for authorship. The response was negative in 90% of publishing experiences (compared with 92% in physics).

Four estimates of appropriateness of stated authorship are reported in Table 2. In addition to the APS and ICMJE guidelines (see the Survey in Appendix A for definitions), a third definition limited authorship to those authors who contributed "directly" to the "scientific discovery or invention," and we added the "Proposed" guideline from the previous survey[9]: "Authorship should be limited to those who have made a significant contribution to the concept, design, execution or interpretation of the research study. All those who have made significant contributions should be offered the opportunity to be listed as authors. Other individuals who have contributed to the study should be acknowledged, but not identified as authors. Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not justify authorship." The survey asked which authorship definition the respondents preferred. The "Proposed" guideline was preferred by 40%, while the ICMJE guideline was preferred by 24%, the APS guideline was preferred by only 16%, 7% preferred unspecified requirements, and 11% preferred no requirements.

Figure 1 shows various measures of the number of inappropriate coauthors in pathology; papers with 8 or more coauthors were combined into a single category. The curves were fit starting with the function[9]:

$$\text{probability that the nth coauthor is inappropriate} = a*(1-e^{(-n/b)}) \quad (1)$$

where a and b are the fitting parameters. For n > b the probability that the nth coauthor is inappropriate becomes a and for b > n >/= 0 the probability is somewhere between 0 and a. The values of a (b) are 45% (4.7) for the APS guideline, 65% (5.0) for ICMJE, 56% (1.7) for direct contributions, and 54% (5.0) for the "Proposed" guideline. This is to be compared with the earlier survey of physicists that yielded 23% (2.6) for the APS guideline, 67% (3.8) for ICMJE, and 59% (2.1) for direct contributions. For example, on papers with 4 coauthors, the average number of coauthors judged to be inappropriate in pathology is 0.7 (0.5 in physics) according to the APS guideline, 1.0 (1.2 in physics) according to the tighter guideline of the ICMJE, and 1.6 (1.5 in physics) if the guideline is "direct contributions to scientific discovery or invention." (One of the data points is negative, implying that some of the bylines were too short. Since bylines are more often too long than too short [see below], this data point is a fluctuation that would disappear with more survey responses.)

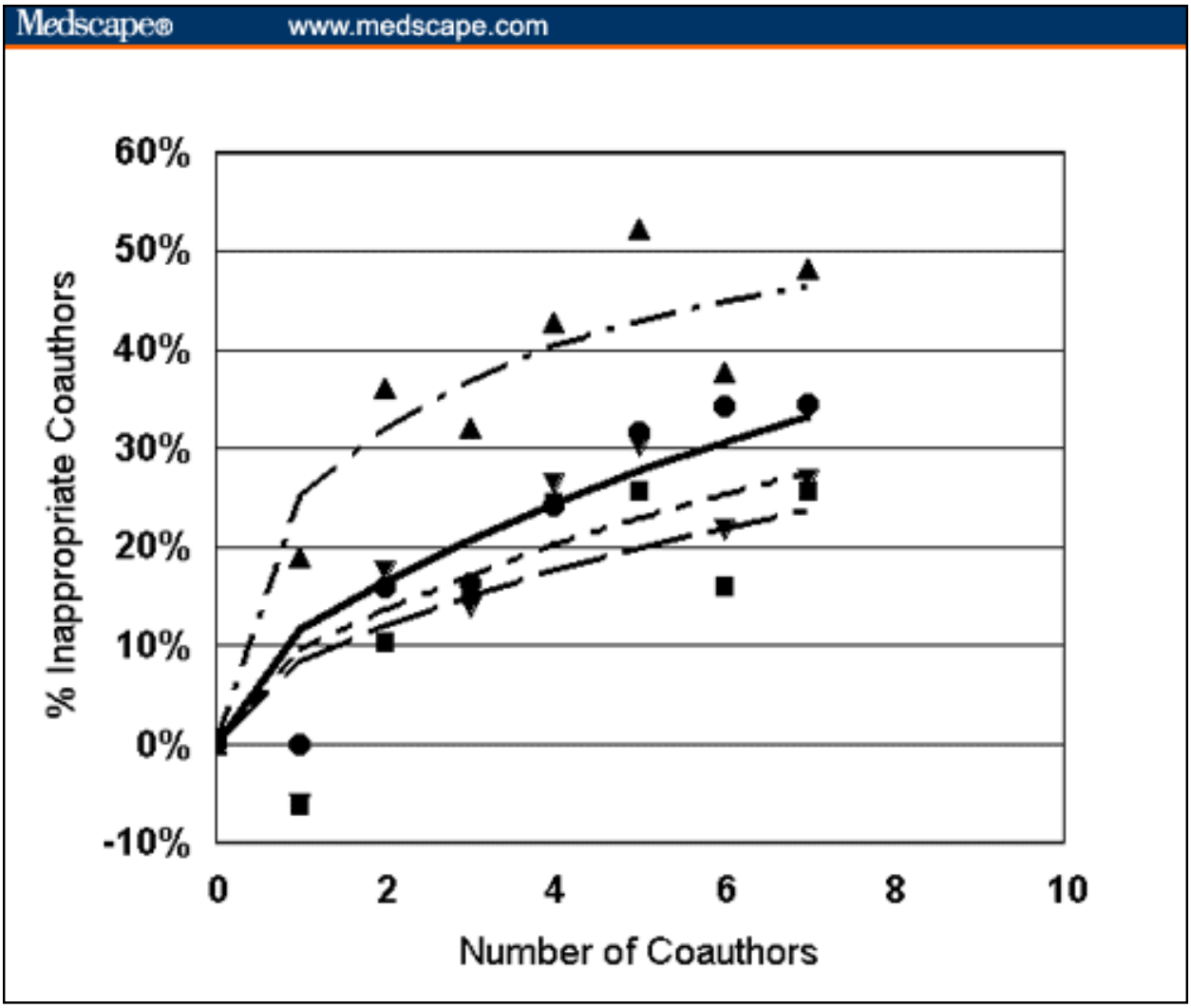

Figure 1. Inappropriate coauthorship on all papers reporting discoveries using 4 different guidelines. American Physical Society (APS) guideline is shown in filled squares (fit is dashed line), International Committee of Medical Journal Editors (ICMJE) in filled circles (fit is solid line), the direct criterion in filled upward-pointing triangles (fit is dash-dotted line), and the proposed guideline in filled downward-pointing triangles (fit is short-long dashed line).

When attempting to judge the meritocracy of authorship, one measure is whether a peer can tell from the list of authors who contributed the most (Question 9). We specified "peer" to control for unwritten authorship conventions that particular subfields may use (head of the lab goes first, head of the lab goes last, most important contributor goes first, etc.) -- a peer is expected to know such conventions. For papers with at least 1 coauthor, the respondents answered no 38% of the time (46% in physics). Finally, the final authorship list was longer 18% of the time, the same for 67%, shorter in 3%, and, unknown in 12%. The reasons mentioned for making the byline longer included additional contributions that could be minor (61%), politics (24%), and some did not know the reason (15%). The reasons mentioned for making the byline shorter included removing minor contributors (60%), politics (20%), some did not know the reason (20%), and journal restrictions (5%); these latter numbers are very approximate since the number of returns with shorter bylines were very small.

In Table 3, there is a cross tabulation of preferred authorship requirements (Question 9) and whether the respondent were the most significant author (Question 13). The data suggest that there does not seem to be a big correlative effect. Similarly, as seen in Table 4, there does not appear to be a large difference between

the preferred authorship guideline and academic rank.

Discussion

Appropriate coauthorship has been a subject of increasing interest among biomedical investigators; see for example the list of selected articles from the ICMJE at: http://www.councilscienceeditors.org/services/atf_references.cfm. Nevertheless, authorship criteria are not universally applied and remain unenforced (according to an article published in the *Annals of Internal Medicine*,[8] 40% of coauthors do not fulfill even a generous interpretation of the ICMJE guidelines. (The first contributor has not succeeded in obtaining the raw data from this investigation despite several requests).

On a different note, whenever inappropriate authorship is brought up in a conversation with a physicist, the same idea is often voiced: biomedical scientists must be less ethical. ("Physicists assume this only happens in the medical area," stated new McArthur awardee Paul Ginsparg when asked to comment about the 2 latest physics scandals involving nonresponsible coauthors at Bell Labs and at Lawrence Berkeley Laboratory. Interview in *New York Times Magazine*, October 13, 2002 by William Speed Weed. A similar attitude is taken by CalTech's Vice Provost David Goodstein at http://www.its.caltech.edu/~dg/conduct_art.html.) Strangely, the same idea seems to exist in the biomedical sciences as well -- they also seem to think physicists are ethically superior. The physics community recently had 2 serious incidents of misconduct (tens of articles in *Science* and *Nature* were found to be based on made-up data, and these articles led many groups across the United States to set up research in one of the fields) and has failed to make substantive changes. (See, for example, "Independent committee finds one researcher committed scientific misconduct, clears the 19 other authors investigated," at http://www.lucent.com/news_events/researchreview.html). The authorship guidelines were indeed changed but remain unenforced and are not used by the authors themselves.

In the present contribution, the coauthorship of physicists was compared with the coauthorship of pathologists.

The survey found that physics coauthorship is surprisingly similar to coauthorship in pathology: neither field uses public authorship guidelines in the vast majority of bylines. Further, in both fields in a substantial amount of bylines, the most important author cannot be identified, and there is a considerable and similar amount of inappropriate authorship in both fields. Pathology seems to include somewhat more inappropriate authors if one uses the APS guideline but seems to have somewhat more transparent bylines with respect to the ability to identify the principal worker.

In addition to describing the state of coauthorship in science, this survey also succeeded in eliciting a preferred authorship guideline.[9] The Proposed guideline (see above) received 40% of the vote while the APS and ICMJE guidelines received a considerably lower rate of support of 18% and 24%, respectively. It is suggested that to get society members to endorse coauthorship guidelines, their input should be used to construct such guidelines rather than have those guidelines be constructed in closed committee meetings.

Tables

Table 1. Answers to Select Survey Questions

Question	Answer	
	Mean	
3 (how many authors?)	4.8	
4 (what author # were you?)	2.6	
5 (how many authors met ICMJE?)	4.0	
6 (how many authors met APS?)	4.0	
7 (how many authors met "Proposed"?)	3.9	
11 (how many authors contributed directly?)	2.2	
	Yes	**No**
12 (would a peer be able to tell which author(s) were most significant?)	62%	38%
13 (were you the most significant author?)	52%	48%
15 (did you write the first draft?)	52%	48%
16 (how did the authorship list change)		
longer	18%	
same	67%	
shorter	3%	
unknown	12%	
18 (did you deny authorship?)	5%	95%
19 (were public authorship criteria discussed?)	11%	89%

Table 2. Answers to Questions 8 and 9

	Question 8	Question 9
ICMJE requirements	46	26
APS requirements	35	17
Proposed requirements	N/A	40
Different requirements	9	6
No requirements	11	10

Table 3. Cross Tabulation of Preferred Authorship Requirements (Question 9) and Were

You the Most Significant Author (Question 13)

	Prefer ICMJE Requirements	Prefer APS Requirements	Prefer Proposed Requirements	Prefer Different Requirements	Prefer No Requirements
Yes	51%	49%	52%	61%	53%
No	49%	51%	48%	39%	47%

Table 4. Cross Tabulation of Preferred Authorship Requirements (Question 9) and Academic Rank (Job Title) (Question 20)

	Prefer ICMJE Requirements	Prefer APS Requirements	Prefer Proposed Requirements	Prefer Different Requirements	Prefer No Requirements
Assistant Professor	27%	34%	34%	40%	39%
Associate Professor	33%	41%	32%	32%	26%
Full Professor	39%	25%	34%	28%	35%

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Appendix A -- Survey

1. In which year did you obtain, or do you expect to obtain, your MEDICAL doctorate (MD; please use four digits for the year; if you do not have an MD degree, please enter 9999)?

2. In which year did you obtain, or do you expect to obtain, your PHILOSOPHY doctorate (PhD; please use four digits for the year; if you do not have a PhD degree, please enter 9999)?

In this questionnaire, THE PAPER will refer to the most recent paper published in a refereed journal with yourself as an author.

3. How many authors are there in total on THE PAPER?

4. If you number the authors on the byline of THE PAPER from 1 to n, which number were you?

5. In your opinion, how many of the authors on THE PAPER fulfill the requirements for authorship as defined by the BIOMEDICAL JOURNAL EDITORS:

"Authorship credit should be based only on 1) substantial contributions to 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) final approval of the version to be published. Conditions 1, 2, and 3 must all be met. Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not justify authorship."

6. In your opinion, how many of the authors on THE PAPER fulfill the requirements for authorship as defined by another scientific body, the AMERICAN PHYSICAL SOCIETY:

"Authorship should be limited to those who have made a significant contribution to the concept, design, execution or interpretation of the research study. All those who have made significant contributions should be offered the opportunity to be listed as authors. Other individuals who have contributed to the study should be acknowledged, but not identified as authors."

7. In your opinion, how many of the authors on THE PAPER fulfill the requirements for authorship as given

by the following COMBINED DEFINITION:

"Authorship should be limited to those who have made a significant contribution to the concept, design, execution or interpretation of the research study. All those who have made significant contributions should be offered the opportunity to be listed as authors. Other individuals who have contributed to the study should be acknowledged, but not identified as authors. Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not justify authorship."

8. Which authorship requirements do you prefer (combined definition not included)?

Biomedical Journal Editors
American Physical Society
I would prefer different requirements
I prefer not to have requirements at all

9. Which authorship requirements do you prefer (combined definition included)?

(International Committee of) Biomedical Journal Editors

American Physical Society
The combined definition
I would prefer different requirements
I prefer not to have requirements at all

10. Please explain your answer to the previous two questions.

11. In your opinion, how many of the authors on THE PAPER contributed DIRECTLY to the scientific discovery or invention presented? (If THE PAPER did not report a discovery or invention, please enter 0).

12. Would a peer be able to tell from the authorship listing on THE PAPER which author(s), in your opinion, made the most significant contribution(s)?

Yes
No

13. Were you the most significant contributor on THE PAPER?

Yes
No

14. If you know, please explain the history of the authorship list on THE PAPER from when it was conceived until it was written down the first time (if you do not know, enter "don't know").

15. Were you the person who wrote down the initial version of the authorship list on THE PAPER?

Yes
No

16. How did the final authorship list change from the initial version?

The final authorship list was longer than the initial list
The final authorship list was the same as the initial list
The final authorship list was shorter than the initial list
I don't know

17. If the final authorship list changed from the initial version, why did it change (if it did not change, or if you don't know, enter that)?

18. On THE PAPER, did you deny authorship to a scientist who expected authorship but who, in your opinion, did not qualify for authorship?

Yes
No

19. On THE PAPER, were any publicly available authorship requirements discussed among potential authors and then used as the agreed-upon criteria used for authorship?

Yes
No

20. Please indicate your current job title:

Trainee (including resident, graduate student, post-doctoral fellow, etc.)
Assistant Professor
Associate Professor
Professor

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[1]**Eugen Tarnow, PhD:**
1) Designed the survey questions using his previous authorship investigation in physics as basis.
2) Performed the survey.
3) Performed the data analysis and interpretation.
4) Wrote the draft and the critical revision.
5) Will serve as Guarantor.

[2]**Michael B. Cohen, MD, and Barry R. De Young, MD:**
1) Idea to survey authorship among pathologists having received Eugen Tarnow's previous paper on authorship in physics.
2) Identified the group to survey and obtained the mailing list. Interacted with the Exec. Director of USCAP about the survey
3) Conducted the pathology literature search and review to create that part of the reference list.
4) Dr. De Young presented the paper at the annual USCAP meeting.
5) Reviewed the original survey questions.
6) Reviewed and edited the manuscript at various stages of development.

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