JACC Vol. 8, No. 5
November 1986:1240–2

EDITORIAL

Who Should Be an Author?*

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Integrity and quality control in scientific publication in peer review journals have been topics of increasing concern and discussion. Publication of repetitious material and trivial observations are among the more innocent problems; outright fraud with falsification of observations and findings is the ultimate expression of the problem. Leading journals, including JACC (1), have retracted publications because of admitted fraud. Public attention has been directed to the real and perceived problems involved. Lay books, news journals and magazines and the daily newspapers have reported on these problems in recent years (2–5). A series of essays in the recent *Annals of Internal Medicine* (6), especially the position paper by its editor, Edward J. Huth, are important in this respect. Multiple authorship, often involving five or six authors, has become commonplace. This practice may have liabilities in reference to quality control. In this editorial, guidelines to define authorship more precisely are proposed as a simple approach that might assist in preserving quality control and integrity in research publications.

No set of rules or guidelines can guarantee protection against or always detect fraud and deception in research and ensure high quality. Attempts to guarantee authenticity of authorship include requiring all authors to sign a "responsibility statement" indicating their participation in the research and preparation of a manuscript. However, this cannot define the role of each author. The critical checkpoint in reference to ensuring high quality manuscripts must be the site of origin in the manuscript. The decision concerning who is privileged to be an author is the key issue.

In some instances, it seems probable that increasing the number of authors on a manuscript can diffuse the responsibility for the integrity of the data and compromise accuracy. Such a blurring of responsibility can result in lapses in quality control. Even with great experience, senior authors, caught up with the urgency for publication or support of younger colleagues, may circumvent principles of critical review and rigorous quality control.

The Increasing Number of Authors

To confirm the impression that the number of authors is increasing, selected journals were surveyed for 1964, 1974 and 1984. Original articles were reviewed for 6 consecutive months in each of these years. Several journals were reviewed for 1 year's publication and it did not change the data. Case reports, reviews, invited articles and editorials were not included in the survey. Table 1 summarizes the mean data.

Alexander (7) in 1953 expressed concern about the increasing number of authors per manuscript. He stated that "a reversal of present trends will require the stringent elimination of the practice of carelessly offering co-authorship to one's colleagues as a token for small services rendered in the conduct of research." Of the journals surveyed, it is interesting that *Circulation Research* has shown the smallest increase in number of authors.

There are many reasons for an increase in the number of authors. Study complexities, involving technologic needs and methodologic considerations, require special expertise not found in a single investigator. Reports of clinical trials involving multiple institutions necessarily lead to multiple authorship. However, even allowing for all these "mandatory increases" in authorship, the number of authors on manuscripts appears to have been systemically increasing over the last 20 years. Although case reports were excluded in the survey, it is not rare to find a case report that involves four, or sometimes as many as eight, authors even though only one or a few cases are included!

Author responsibility. The critical issue is not the increase in the number of authors, but the role of each in contributing to the manuscript and his or her responsibility for the total project. All authors should be able to defend the content of the manuscript. Hewitt (8) stated the matter in a persuasive way, "Authorship cannot be conferred; it may be undertaken by one who will shoulder the respon-

*Editorials published in *Journal of the American College of Cardiology* reflect the views of the authors and do not necessarily represent the views of JACC or the American College of Cardiology.

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0735-1097/86/$3.50

Table 1. Survey of Number of Authors of Original Articles in Selected Journals*

	1964	1974	1984
Journal of the American College of Cardiology (American Journal of Cardiology for 1964 and 1974)	3.2	4.1	5.2
Annals of Internal Medicine	2.9	3.8	6.5
British Heart Journal	2.4	3.3	5.0
Circulation	3.0	4.3	5.4
Circulation Research	3.2	3.2	3.6
Journal of Clinical Investigation	3.0	3.4	4.5
New England Journal of Medicine	2.9	4.0	6.0

*Data based on 6 consecutive months in each of the selected years.

sibility which goes with it." More recently Relman (9) stated "A scientific paper is a creative achievement—and coauthorship ought to be unequivocal evidence of meaningful participation in the creative effort— the use of coauthorship as a kind of payment for faithful technical assistance for data collection violates this principle." Because no journal can have a policy that judges the legitimacy of authorship or define the contribution of individual authors, it seems prudent for the originating institution to exercise discretion and be specific in determining authorship. Although the following three guidelines are simplistic, they may serve as a point of departure for determining authorship.

Who Is an Author?

One who provides critical suggestions and guidelines for the total project. The ideas leading to the project were so specifically from an individual that the project would not have started without this input. Such a contributor would also be an integral part of the thinking and data collection as they evolve. Continuing personal and *intellectual* commitment to the project, including frequent review of the data, discussion of the information evolving and review of activities in the laboratory, would be a part of this author's contribution.

One who provides critical help with data collection. The key issue is a personal *intellectual* involvement and responsibility for the data as well as a specific commitment to the project. Many sophisticated contributors, including scientifically oriented colleagues, such as nurses, doctors of philosophy and other personnel are involved in data collection, but as a routine assignment resulting from the circumstances of their employment rather than from a primary *intellectual* involvement with or responsibility for the research, or both. Such persons are essential to completion of the project, but their participation may not justify authorship.

One who provides critical help with data analyses and writing. As with guidelines 1 and 2, judgment is involved in including as an author a person who makes this contribution. People who merely provide editorial assistance or critical review, as a kind of technical assistance, or who participate in data processing as a circumstance of employment, would not be included. A collaborator spending a great deal of time with data analyses or writing, or both, and providing *intellectual stimulus* would be entitled to authorship.

Who Is Not an Author?

Some colleagues important to the work would not be included in authorship under these guidelines. Such persons may provide a general overall stimulus to the conduct of the research project; for example, they might provide laboratory space, help enhance funding, arrange schedules of the participants to make their research activity possible and provide administrative support. Others might provide access to a critical technology or methodology needed for the project or serve as important ad hoc consultants, but not be otherwise involved. As stated in guideline 2, colleagues whose *job* requires involvement in the conduct of the studies, including data collection and analyses, do not automatically quality for authorship. It is common courtesy, and appreciated, to acknowledge editorial review, scientific counseling, technical help and overall nonspecific support. This seems best done in a footnote rather than authorship.

When the preceding guidelines are used, many research projects and manuscripts will probably involve only two or three authors. When reviewing intrainstitutional policies and attitudes when a lapse in quality control in conduct of research had occurred, Neil C. Moran, MD concluded " . . . the real lesson for science is that everybody on a research team has to be completely involved intellectually." To follow his dictum would almost certainly reduce the number of authors and likely enhance the overall quality of scientific publications in the cardiovascular literature.

Implications. This brief comment has considered only one aspect of a many-sided issue, determining authorship. Like other important matters facing medicine, the quality of scientific data and manuscripts resulting from cardiovascular research cannot be legislated, rigidly defined by policy or dictated by editors. It is a highly individualistic matter with ethical and moral connotations. However, it is possible that critical assessment at each institution concerning who is privileged to be an author on a manuscript is one important step in the process. Although we can take pride in the overall performance of the system and can be pleased that fraud is a very rare event, the fact that it can occur is so shocking and devastating that every reasonable effort must be taken to prevent it. A constant vigilance in reference to determining authorship could be a practical and worthwhile measure.

I thank Yvonne Barnard, RN for assistance in data collection for the table and Gretchen Denison and Nicholas Fortuin, MD for review and critique.

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