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The gradual diffusion of responsibility for multi-authored, collaborative studies has led to publications for which no single author can or is prepared to take full responsibility. Publications may thus have two (usually fairly co-equal) authors or three or more authors. Complex studies may lead to the production of multiple publications, each with its own set of lead, senior, corresponding, and other authors. For ease of explication here, we assume that one study yields one publication, but the criteria and decision-making procedures generalize to multiple publications.

Research can be divided into six areas:

- Conception
- Design (procedures, method)
- Collection and analysis of data
- Interpretation of results
- Manuscript preparation
- Publication of results

The relative importance of each area varies considerably among various disciplines, and some areas may not exist at all in certain disciplines. Some investigations are innovative and emphasize an original idea rather than the extensive collection of data. In other investigations, the idea of the research is not new and most of the effort is in the collection and/or analysis of data. Nevertheless, each participant should be aware of the emphasis, and every research participant should be aware of the work involved in writing publications from the research.

In all multi-authored publications, each co-author must actively participate in verifying the part of the manuscript falling within his or her specialty area and in designating one author to be responsible for the validity of the entire manuscript. In some cases, as for peer-reviewed articles, all authors must affirm that they can take responsibility for the entire article.

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Both decisions (who is an author, and what is the order of authors) should be based on contributions in one or more of the facets of the research noted above, and those decisions should reasonably represent the proportions of effort in the overall project and publication. That is, all authors on a given publication should have made some significant contribution to the research and to the publication itself, and their responsibilities should determine the way they are listed in any resulting manuscript or publication.

All parties should agree to the authorship lists and the ordering, and the eventual authorship should be announced.

No single criterion or algorithm exists for determining authorship. Each research study presents a particular set of circumstances that should be considered when deciding about authorship, and different publications from a single study may themselves present different circumstances. In general, to qualify as an author, significant participation in at least three of the following criteria should be established:

- Contribution of research ideas
- Leadership in the study
- Design of experimental procedure, model, or protocol
- Responsibility for acquisition and/or analysis of data
- Interpretation of results of the data analysis
- Writing (drafting, revising) the manuscript
- Approval of the final manuscript
- Ability to defend part or all of the publication related to the professional discipline
- Acceptance of responsibility for final manuscript

For example, a minimal requirement may be active participation in conception and design or analysis, interpretation of the data, and writing (drafting, revising) the manuscript. In addition, authors must be able to defend part or all of the publication related to the professional discipline. The lead, senior, or corresponding author must accept responsibility for the final manuscript.

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Persons who were involved in the study but who do not qualify for authorship should be acknowledged in the manuscript.

### Authorship Order

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