How do you define authorship and order of authors?

Juan Pablo González-Rivas

A crucial element in a good research team is to define in an appropriate, harmonious, and satisfactory way, who are the individuals of the team that meet the criteria of authorship of the work, and in what order they should be located. A meta-analysis that included 118 studies of various scientific specialties indicated that 29% of the authors have experienced a misuse of authorship.1 Generally, this misuse of authorship implies “phantom authors”, which includes the exclusion of individuals that generated a substantial contribution to the research, and the "gift authors", where the authors have made little or no contribution.

In health sciences the most widely adapted set of standards for attributing authorship in a publication are the recommendations of the International Committee of Medical Journal Editors (ICMJE -).2 According to this committee “Authorship It is based on the following four criteria:

1. Substantial contribution in the conception or design of the work, or in the acquisition, analysis or interpretation of the work data; and
2. Development of the critically important draft or revision for an intellectual contribution of the content; and
3. Approval of the final version to be published; and
4. Agree to be responsible for all aspects of the job by ensuring that questions related to the accuracy and integrity of any part of the job are properly investigated and resolved.”

Despite the completeness of the criteria recommended by the ICMJE, it does not name in any aspect what order the authors that meet these criteria should have. In addition, these criteria are specific to biomedical science and do not apply to all multi/interdisciplinary disciplines or fields.

Elise Smith and Zubin Master proposed the following 5 steps3 to determine the contribution and order of authorship in multi / interdisciplinary research:

**Step 1: Define the roles**

In a discussion group, discuss the roles and responsibilities of individuals using the taxonomy provided by Allen et al., 4 (Figure) and establish those that will assume the leadership roles of the project. Project team members must establish a dispute resolution system.

**Step 2: Determine the order of the authors**

Begin by determining the order of the authors based on the individual initial contributions, being aware that the authorship order may change with the evolution of the project.

**Step 3: Continuous Dialogue**

Continuously and openly discuss the contributions, authorship, and order of the authors throughout the research project.

**Step 4: Final Decision on the contribution and order of the authors**

Prior to submitting the article for publication, researchers should have a final discussion on the contribution and order of authorship resulting in a consensus decision.

**Step 5: Develop a contribution and order of the authors**

Develop a declaration of contribution to the manuscript according to the guidelines of the journal as well as a declaration of authorship.

| **Taxonomy category** | **Description of role** |
| --- | --- |
| Study conception | Ideas; formulation of research question; statement of hypothesis. |
| Methodology | Development or design of methodology; creation of models. |
| Computation | Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms. |
| Formal analysis | Application of statistical, mathematical or other formal techniques to analyse study data. |
| Investigation: performed the experiments | Conducting the research and investigation process, specifically performing the experiments. |
| Investigation: data/evidence collection | Conducting the research and investigation process, specifically data/evidence collection. |
| Resources | Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation or other analysis tools. |
| Data curation | Management activities to annotate (produce metadata) and maintain research data for initial use and later re-use. |
| Writing/manuscript preparation: writing the initial draft | Preparation, creation and/or presentation of the published work, specifically writing the initial draft. |
| Writing/manuscript preparation: critical review, commentary or revision | Preparation, creation and/or presentation of the published work, specifically critical review, commentary or revision. |
| Writing/manuscript preparation: visualization/data presentation | Preparation, creation and/or presentation of the published work, specifically visualization/data presentation. |
| Supervision | Responsibility for supervising research; project orchestration; principal investigator or other lead stakeholder. |
| Project administration | Coordination or management of research activities leading to this publication. |
| Funding acquisition | Acquisition of the financial support for the project leading to this publication. |

Table from Allen L, et al., Nature 2014;508:312-3.

These steps will allow us to clearly and accurately handle the authorship criteria, clarifying the aspects related to inclusion and order. Optimum communication is the fundamental tool to handle any aspect of teamwork.

**References:**

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